



# **RIGGER TRAINING MANUAL**

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## **British Skydiving Manual Update Policy**



The British Skydiving Rigger Training Manual is updated periodically. As British Skydiving rules are continually evolving, the primary operational document, the British Skydiving Operations Manual, is regularly updated at meetings of British Skydiving Safety & Training Committee which are held every two months.

Therefore, in the case of any conflict between rules or requirements set out in the British Skydiving Operations Manual and any other British Skydiving manual, the provisions in the British Skydiving Operations Manual shall always have primacy as the definitive statement of the current position.

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## **Introduction**

"Parachute Rigging is an interesting and demanding aspect of our sport."

If you are still reading, then this guide may be for you, as it is intended for the person who is beginning their Rigger Training.

It is vital that all trainee Riggers work closely with a qualified supervisor and gain a wide knowledge of the equipment used in Sport parachuting.

The requirements to begin training as a Basic Rigger will be found on form 199.

This manual provides a framework for the new rigger and their supervisor, there are many alternatives to the examples given and these should be explored with an open mind.

It aims to give a broad introduction to the basics of rigging and set the new rigger on the road to their PR rating.

## **Acknowledgements**

The creation of this guide was only possible as the result of many people's efforts and experience. Amongst those I must thank are;

Katie Boyce, Dave Chapman, John Curtis, Alan Hewitt, TSE Ltd and, not least, Dan Poynter, without whose efforts I could not have even begun this project.

Peter A Sizer

# Background Information and Study

There are many things that a rigger needs to know, and a good all-round knowledge of the technical side of sport parachuting is important. In this section we are going to find and familiarize ourselves with some of the written material of particular relevance to riggers.

## Dan Poynter

The books by Dan Poynter are a fountain of knowledge, every rigger should have access to copies of the Parachute Manual Volumes 1 & 2, ideally you should have your own copy of Volume 1. Much of this manual will refer to Poynters for further study. You can obtain these from various publishing companies.

### Parachute Rigger Handbook

[https://www.faa.gov/regulations\\_policies/handbooks\\_manuals/aviation/media/prh\\_change1.pdf](https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/media/prh_change1.pdf)

Published by the FAA.

### British Skydiving Rigging Technical Manual & Reserve Packing Guide

<https://britishskydiving.org/wp-content/uploads/2022/06/Reserve-Packing-Guide-November-2022.pdf>

These are fairly slim publications so get hold of copies.

### British Skydiving Operations Manual

<https://britishskydiving.org/wp-content/uploads/2022/06/Operations-Manual-Jun-2022.pdf>

Every Rigging Room should have an up to date copy of this and every Rigger should be familiar with Section 6 and Section 14.

### British Skydiving Safety Notices and Safety Information

<https://britishskydiving.org/wp-content/uploads/2022/02/Index-of-Safety-Notices-February-2022.pdf>

Every Rigger and Reserve Packer should be on familiar terms with the collection of Safety Notices and Safety Information issued by the British Skydiving.

It is not practical to read all of them, so get used to using the Index, and keep it up to date by checking:

### STC and Riggers Committee Minutes

You may find these with the [members](#) area of the British Skydiving Website:

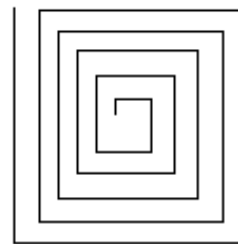
1. Who may repair a Reserve Parachute?
2. Describe a Span wise constructed canopy.
3. What is meant by Warp and Weft?
4. Which are the shortest lines on a Ram Air Parachute?
5. What is a chafing strip?
6. What is meant by the term "Aspect Ratio"?
7. Some Large Rings on 3 Ring Release systems were defective, when was this and what was done about it?

## Use of the Straight Stitch Machine

Read Poynters Vol 1 para 3.600 - 3.910.

1. Sit at the machine and learn the names of the component parts.
2. Learn to adjust the upper tension.
3. Learn to change the stitch length.
4. Learn how to change the bobbin.
5. Wind a new bobbin while working.
6. Change the upper thread and learn the way most riggers take a short cut.
7. Change the needle.

Take two pieces of medium fabric, something a bit heavier than F111, and stitch a square spiral pattern, keeping the lines parallel and turning the corner by stopping with the needle down, lift the foot and turn the work, then continue.



Repeat this exercise until smooth and controlled.

1. When removing work from the machine what should we consider?
2. If the threads loop under the material what should you do?
3. Where should the knot be made in relation to the plies of material?
4. What SPI is recommended for patching F111?
5. How do you adjust the pressure applied by the presser foot?
6. On a straight stitch machine, the long slot on the needle faces which way?
7. How do you increase needle thread tension?
8. How do you adjust bobbin thread tension?

# Materials Recognition

Using Dan Poynters books, Parachute Rigger Handbook and the Paragear catalogue;

1. Describe Type 7 webbing.
2. What is the official name for binding tape?
3. What webbing has a red line down each edge?
4. What size of Dacron line is used for brake lines?
5. What do we use for static lines?
6. What thread do we use for machine-sewing canopies?
7. Describe Type 4 Webbing.
8. Describe Type 4 Tape.
9. What is Type 8 Webbing used for?
10. What line is used on Manta canopies?
11. What webbing is used on mini risers?
12. What is the smallest Maillon Rapide link allowed to be used on canopies?
13. What is the SWL on the adjusters used on leg straps?
14. What is the SWL on a lightweight quick fit adapter (chest strap)?
15. Describe Type 5 tape.
16. What advantages does Kevlar line have over Dacron?
17. What disadvantages are associated with Spectra / Optima line?
18. What do we use Type 4 webbing for?
19. Name three materials used for making risers.
20. What material is used for modern containers?



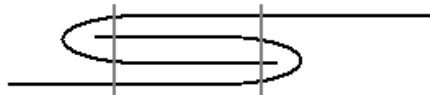
## Sewing F111

New F111 material is quite easy to work with, and it is this material that you will make patches out of, however you will be sewing onto older more flexible material, and this difference is particularly noticeable when remaking seams after repair.

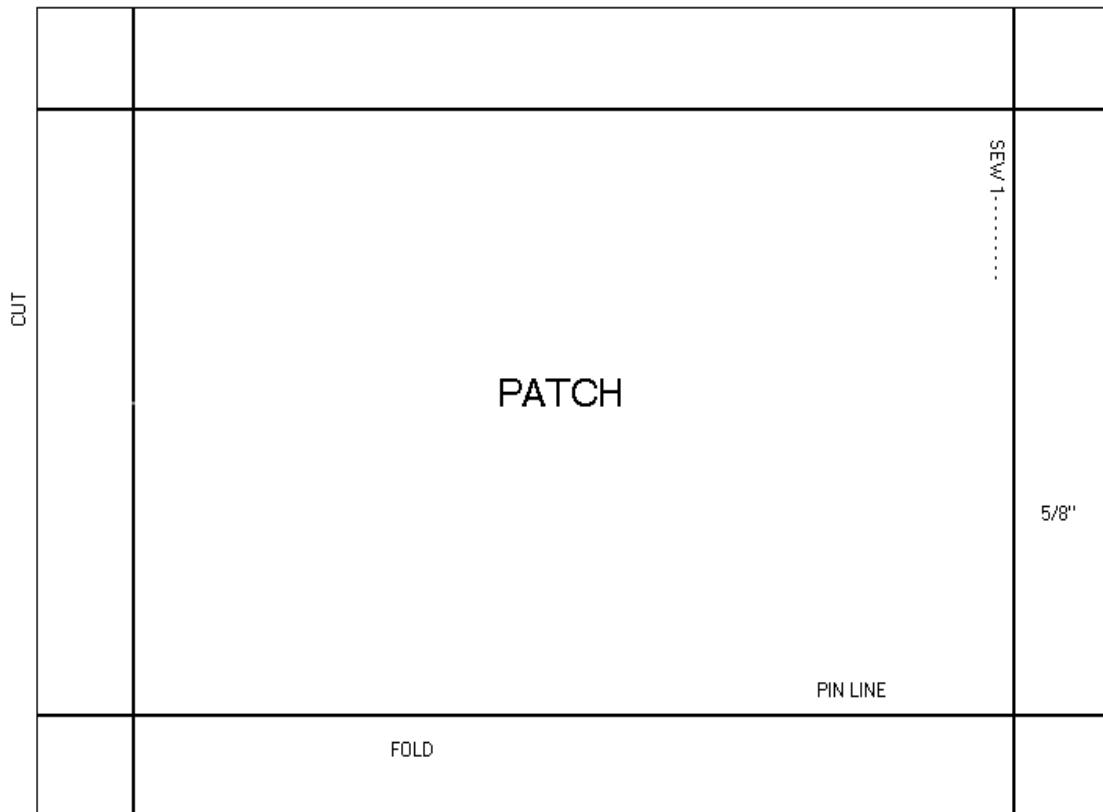
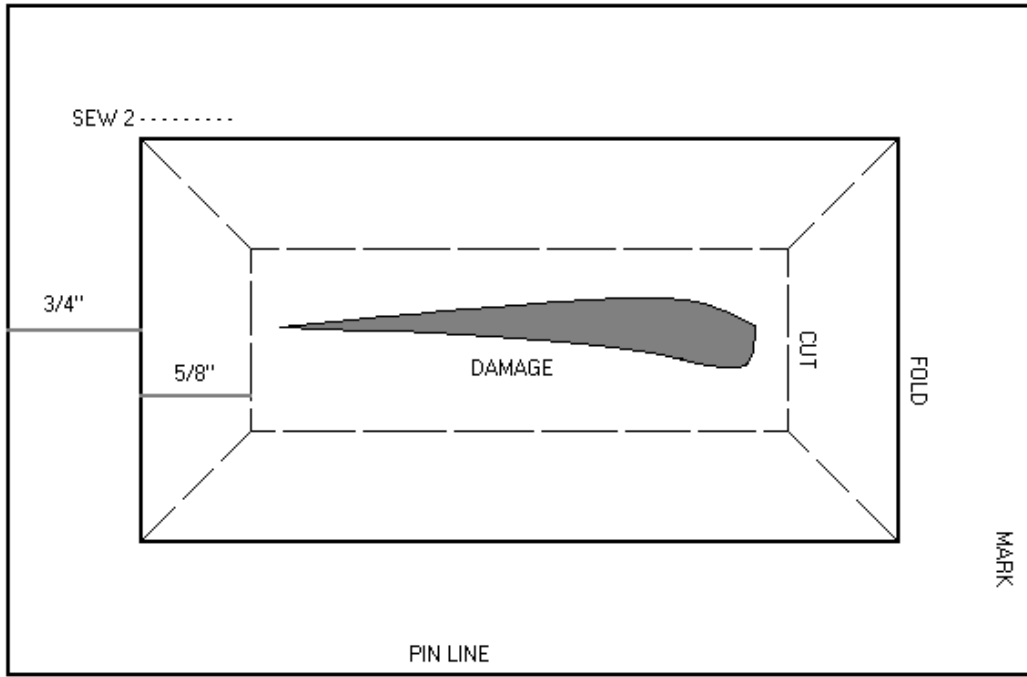
Read: Poynters Vol 1: 7.01 and 7.11 - 7.14.  
Vol 2: 7.10 - 7.14 (note comments on ripstop tape).  
Parachute Rigger Handbook 7.1.3.

Exercises:

- a. Sew the paper patch attached to get into the idea of patching.
- b. Sew a simple patch on a piece of F111 (adjust tension as necessary).
- c. Repeat this exercise until proficient.
- d. Sew a French Fell seam, attaching another piece to the patched piece of F111.



1. How many stitches per inch when sewing F111?
2. How much overstitch should there be?
3. How close to a seam can we patch without going into/onto the seam?
4. What is the minimum 'turn under' of material?
5. What is the strength of the thread we use on canopies?
6. Which side of the material do we fix the patch?



# Canopy Design and Construction

It is important that riggers understand the differences in design and construction in the canopies and related components that they may be called upon to repair.

Therefore, you will look at the construction of both round and ram-air parachutes.

Read: Poynters Vol 2 8.00 - 8.30.  
Parachute Rigger Handbook A-3 (TS100).

1. What is meant by the term "glide ratio"?
2. Which has the steepest angle of attack, Fury (7 cell) or PD 210 (9 cell)?
3. Why do some modern reserves have single suspension lines whilst most mains have their lines cascaded?
4. What is the purpose of cross port vents?
5. Describe a "cross braced" canopy?
6. What is the "chord" of a parachute?
7. Will an accuracy canopy have a thick or thin aerofoil and why?
8. What is the purpose of stabiliser panels?
9. What is the advantage of "elliptical" canopies?
10. What is meant by "Span wise" construction?

## Hand Sewing and Hand Tools

In the past riggers have needed to sew on cones, grommets, hooks and eyes, AAD mounting plates as well as attaching metal housings for ripcords and cutaways. Have a good look at equipment and see where hand stitching is used.

Exercises:

- a. Sew a piece of 1" Type 4 tape around one end of a metal housing, with the excess ends making a flag.
- b. Fix the other end of the housing to a flat piece of cordura or canvas.

The other hand tools in common usage are those for cutting holes and setting grommets and popstuds. On later exercises you will be setting grommets so take the opportunity to practice. Check with your supervisor which tools, grommets and cutting surface you can use! Study equipment to see which grommets are used where and which way round they go. Note that grommets should be 'rolled over' not split and there should be no rough edges.

1. What thread would you use for attaching a ripcord housing to the container?
2. What thread would you use to attach toggles to reserve risers?
3. How close to the end of the housing should a cutaway housing be fixed?
4. What knot is usually used to tie off hand tacking's?
5. What grommets are most commonly used on modern containers?
6. When would you use "long shank" grommets?
7. On a freefall deployment bag what grommets would you use?

## Introduction to Binding

A large number of items manufactured by riggers have type 3 binding tape around them. You must therefore become proficient at binding by hand with a single straight stitch machine, and where possible by using a tape folder and twin needle machine.

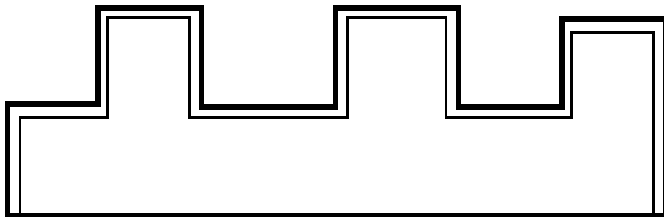
Exercises:

- a. Take a length of type 3 tape and a small piece of parapack or cordura (6" Square).
- b. Fold the tape length ways and crease it, (use the back of your scissors).
- c. Now bind one edge of the material and trim off.
- d. Bind another edge and trim etc.
- e. Having bound four sides, sew a parallel line of stitching all the way round.

If you have access to a twin needle machine repeat the exercise binding and trimming all four sides. Learn how your coaching rigger turns corners and practice this technique whenever possible. Use contrasting thread to show any faults.

Manufacture a packing mat, with a bound pocket and bound edges, or manufacture a logbook holder, or manufacture a simple wallet, or make a needle case.

Practice binding inside and outside corners using a castellated piece of cordura.



1. What sizes does type 3 tape come in?
2. What is the strength of binding tape?
3. Why do we regularly use binding?
4. What is the purpose of hot knifing the end?
5. What is the draw back to hot knifing the end?

# Contamination of Materials

There are many things that can affect canopies and harnesses and this section will consider some of them.

## Ultraviolet light

Probably the main cause of damage and deterioration to parachuting equipment, in particular canopies. Tests have shown that a canopy left outside for a week in the summer will lose as much as 50% of its strength.

Sunlight is probably the major factor in "ageing" parachutes, which would explain why Tandem and CRW canopies age faster, as they are exposed longer on every jump.

Never leave a canopy out in the sun, cover equipment when not using it.

If in doubt conduct a fabric tensile strength test.

## Acid

Another major cause of damage. Getting lifts back in farm or airfield vehicles, kit carried loose in car boots etc can lead to contamination with battery acid.

The damage is progressive, the rate of which depends on the strength of the acid involved and the thickness of the material affected.

Acid has a bleaching effect on material dyes, black webbing will show red areas, lighter colours will bleach to grey or white.

Immediately remove from service any article thought to have been in contact with any acid and test it with litmus paper or Bromocresol indicator solution.

Washing in clean water will dilute the acid and prevent further deterioration, but it is usually required that the affected area is replaced.

The mesh areas on all round reserves must be checked for acid contamination at every repack, and if the canopy has undergone a neutralisation programme it must also have a fabric strength test done at every repack - look up this subject in British Skydiving Safety Notices and in Poynters.

## Salt

Salt will usually affect a rig if it has been used on a water jump into the sea, or if it exposed to salty sea air for any length of time.

Its presence is indicated by white crystals or staining of the rig, or taste and smell.

Salt does not usually attack nylon although the presence of salt crystals creates an abrasive effect.

Its most pronounced effect is on the corrosion of metal components. Here it attacks the surface and promotes rusting.

If salt contamination is suspected, then separate the canopy from the harness and rinse in clean water several times (the bath is a good place for this) then hang the canopy up to dry (keep out of direct sunlight).

Soak the container and harness for a couple of hours then rinse and soak again, then rinse again.

Drying of modern container systems can take a day or two. Do not use direct heat to speed this up!

Once dry, carefully inspect all metal components for signs of rust and clean if necessary.

Check all hand tacking's as the wax can be removed by washing and they will come loose.

### **Rust**

Often metal components show signs of discolouration where the plating has become damaged. If the rusting is active there is the reddish-brown powdery appearance. As well as affecting the metal components this can attack the material and needs to be cleaned off straight away.

### **Heat**

Damage by heat is not easily detectable, apart from the tell-tale round holes of cigarette burns! Tensile strength testing will need to be done if suspicious.

### **Oil and Grease**

These do not greatly affect parachute components, which is as well considering the proximity our kit gets to them at times, hanger floors, aircraft parts when floating exits etc.

Oil stains may be removed using isopropyl alcohol and pads of clean absorbent cloth on each side of the affected material. Where possible clean outwards.

Be aware of the dangers of using solvents near heat sources and always work in well ventilated areas.

### **Mildew**

Damp packing sheds, car boots or storing damp kit can all lead to the spores of mildew leaving their mark. Not easily removed, though washing with mild soap may help, best avoided.

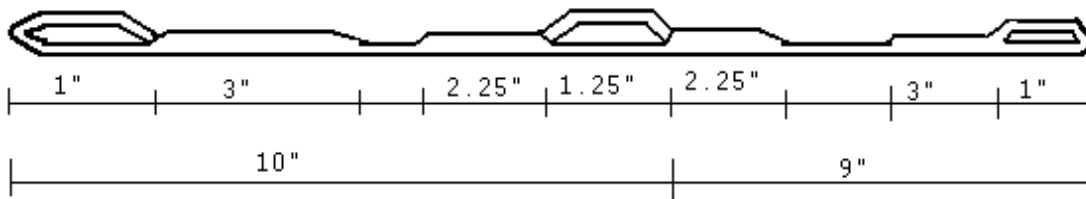
## Line Replacement

Replacing single lines on canopies is a common task for riggers, but one that must not be treated lightly. The tolerances acceptable on docile canopies with Dacron lines are generous compared with those needed on high performance, Microline canopies.

Read: Poynters Vol 1 7.24 - 7.26  
Vol 2 7.26 - 7.36  
Parachute Rigger Handbook 7.1.9 - 7.1.11

Exercises:

- Take lengths of various types and size of line, (Dacron, Kevlar, hma, Vectran Spectra) and finger trap and stitch a suitable size loop.
- Make a 'mini brake line' to the drawing below, remember that any end hot-knifed to take a fid will need to be scissor cut, before leaving inside a finger trap.
- Remember also that 3" of finger trap may shrink the host line by about  $\frac{1}{2}$ ".
- Use zig zags or bartacks to fix in place.



Practice line replacement with as many different materials as possible, (Kevlar, Spectra, hma, Dacron). Remember to copy the line and connector link attachments from the original.

Finger trap closing loops from gutted type 3 line / type 2a.

**REMEMBER;** Any repair to a serviceable canopy must be checked and endorsed by a qualified rigger before returning the canopy to service.



## AADs

Automatic activation devices are mandatory on student square equipment and since the development of the Cypres unit they have become quite common on experienced jumpers kit. It is therefore important that Riggers are familiar with their operation.

Read: Poynters Vol 2 - 9.5 and the Cypres Owner's Manual  
[https://dl.cypres.aero/userguide/991002\\_cypres\\_2\\_user\\_guide\\_en.pdf](https://dl.cypres.aero/userguide/991002_cypres_2_user_guide_en.pdf)

1. What rate of descent will trigger a FXC 12000?
2. What rate of descent will trigger a Student Cypres?
3. What is the default height at which an Expert Cypres will fire?
4. When must an FXC be turned off?
5. What is the minimum opening height when the FXC has been set for 1000ft?
6. What is the service interval for a Cypres 2?
7. What is the service interval for a J mod (or later) FXC 12000?
8. How do you adjust the altitude setting of an FXC?
9. How do you adjust the altitude setting for a Cypres i.e. for a display jump?
10. Who may install a Cypres?
11. Should the thin cable be above or below the thick cable of a Cypres?
12. What rate of descent will trigger a Vigil 2 in tandem mode?

## Introduction to Sewing Zero P

Many canopies are made from Zero P fabric with different finish to 'Harris F111'. Whilst the construction of simple patches remains the same you may find handling the material and lining up the "grain" a bit different.

Find some material and make a french fell seam and make a simple patch (repeat until proficient).

It is common practice to over sew much more on Zero P than on F111, both on patches and on remaking seams.

Note that at the edges of a bolt of material the square pattern may be distorted.

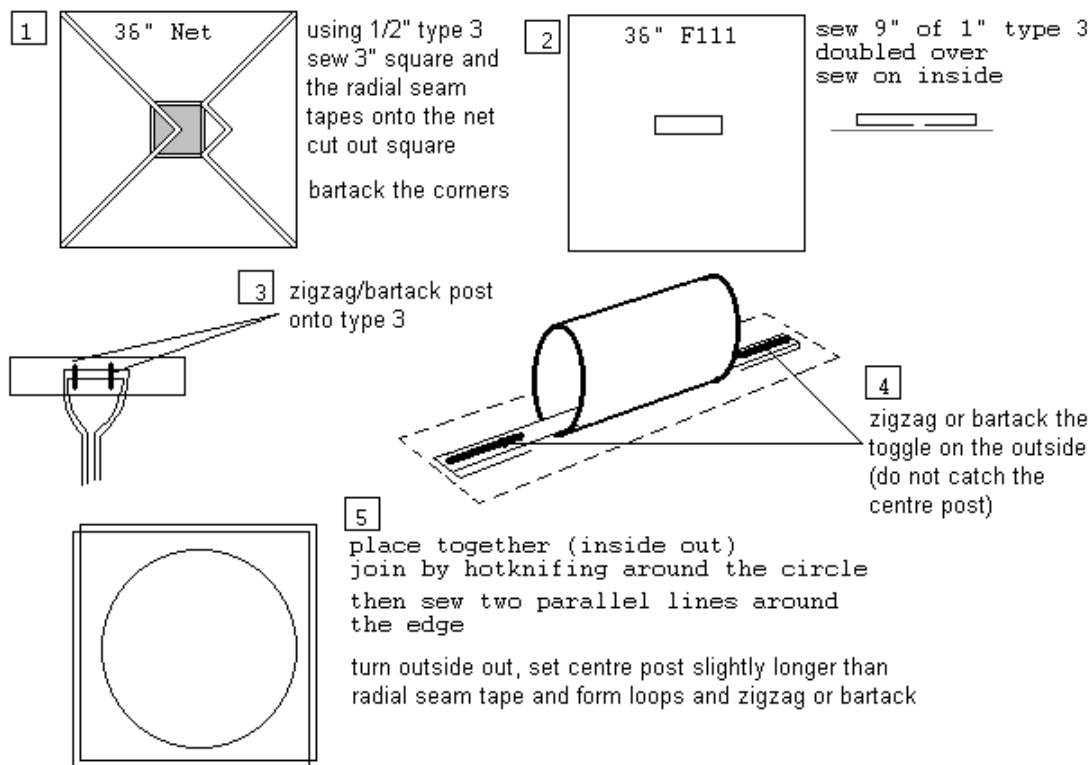
# Manufacture of Pilot chutes

See Poynters Vol 2 6.12.

There are many variations on the theme of pilot chutes, in size, in materials and in construction. You are expected to make both pull-out and throwaway pilot chutes to a suitable design and take examples of both to your Parachute Rigger (PR) exam course.

In this exercise you will begin by building a simple throwaway pilot chute based on a Rigging Innovations design.

Materials: 36" square of F111  
 36" square of netting  
 9" of 1" Type 3 tape  
 5 yards of 1/2" Type 3 tape  
 Suitable toggle



Pilot chutes come in different sizes.

1. What size would be suitable for a 282 Foil?
2. What size would be suitable for a Sabre 120?
3. What is the recommended range for setting the centre line?
4. What Safety Notices or Safety Information has the British Skydiving published on pilotchutes?

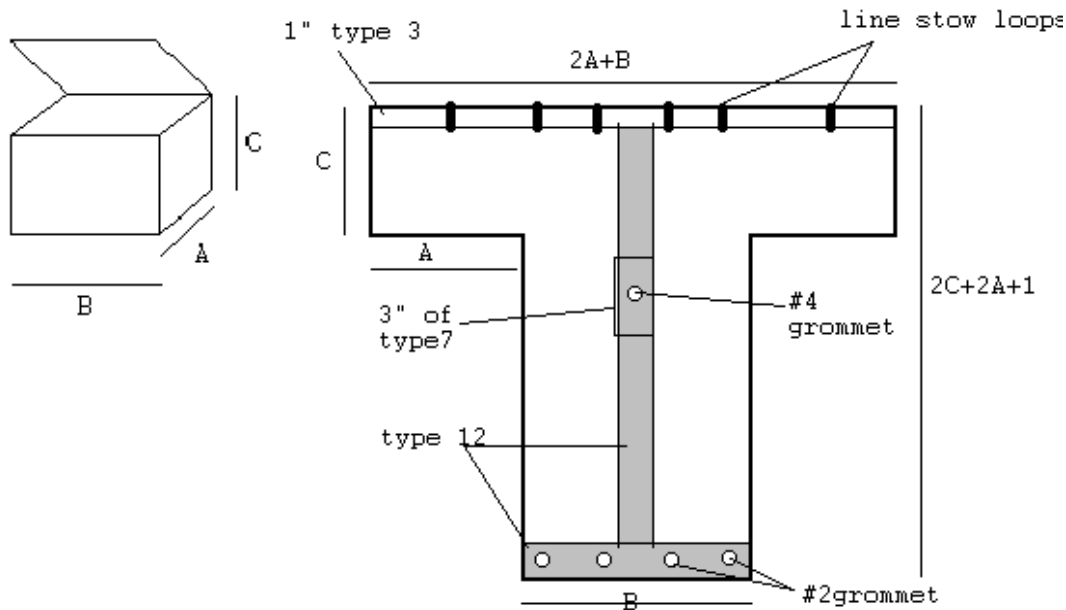
# Manufacture of Main Deployment Bags

## Freefall Square Deployment Bag

There are many different designs and variations on the market today and in this exercise, you can copy any existing design, i.e. make a new one for your own kit.

The example given is one of the simplest around.

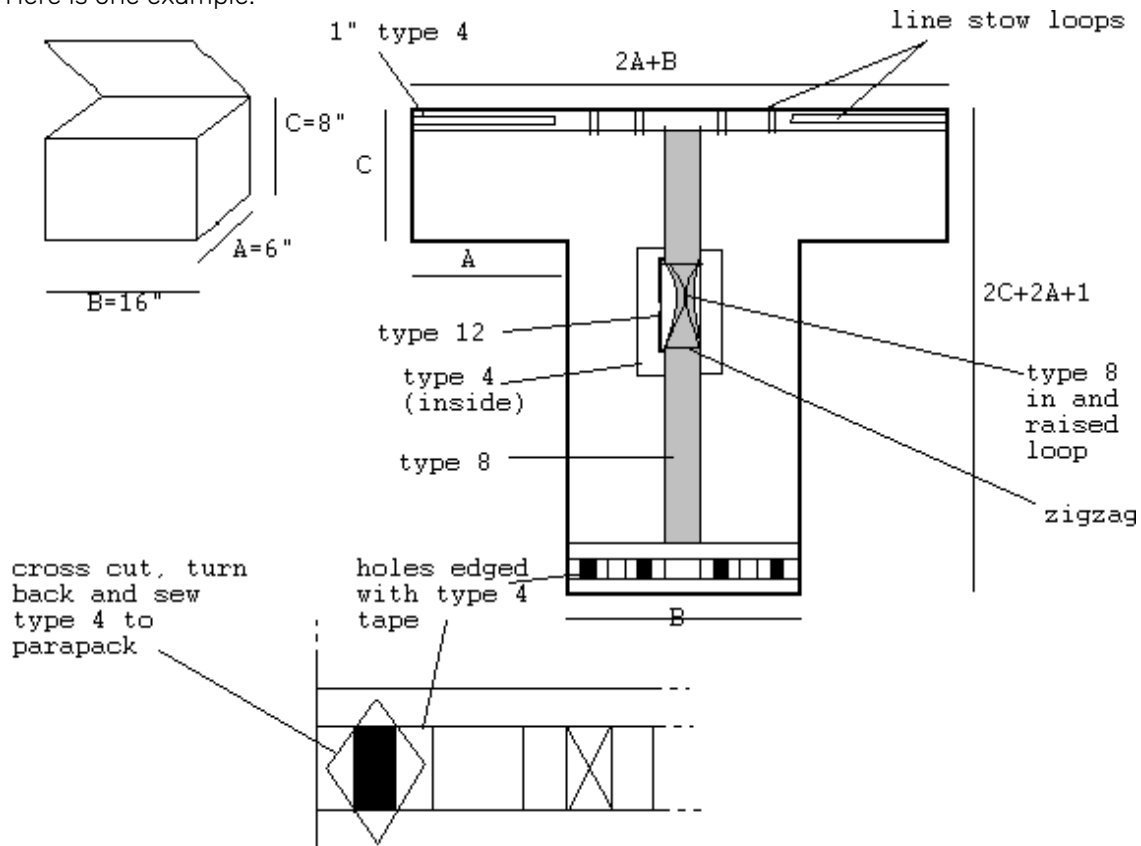
Deployment bags are made to fit the container so measure the internal dimensions of the main tray. The top flap is 1" longer than the bottom, to overlap.



1. Cut out parapak – remember to allow for the bound seam.
2. Sew long piece type 12 with type 7 underneath to support lift point grommet.
3. Sew short piece type 12 to take mouth lock grommets.
4. Line stow loops:
  - a. Sew 1" type 3 along outside edge.
  - b. Insert 2 1/2" lengths of 1/2" type 4 tape (or 9/16 herringbone).
  - c. Sew along inside edge to hold tapes.
  - d. Fold tapes over and sew outside edge to attach them.
  - e. Bind outside edge and zigzag or bartack top and bottom of loops.
5. turn inside out and sew into shape (A & C edges).
6. Bind and zigzag/bartack where appropriate (don't leave hot-knifed ends inside bag).
7. Sew extra line of stitching along inside row.
8. Fit grommets and inspect.

## Static Line Raps Deployment Bag

Probably the most useful idea is to copy existing equipment that is in local use. Here is one example:



1. Cut out parapak – remember to allow for the bound seam.
2. Sew type 4 webbing on inside.
3. Sew type 12 webbing doubled over, on the outside.
4. Sew piece type 8 to form becket, then sew onto parapak and zig zag / bartack onto type 12 (this is where you will attach the static line).
5. Soft Grommets:
  - a. Mark out holes and scissor cut the crosses, fold back and sew the short pieces of type 4 tape onto the parapak, trapping the foldback in between.
  - b. Sew the long pieces of type 4 tape, trapping the fold backs as you go.
6. Line stow loops:
  - a. Sew 1" type 4 tape along the outside edge.
  - b. Insert 2 ½" lengths of type 5 (or ½" type 4) tape.
  - c. Sew along inside edge to hold tapes.
  - d. Fold tapes over and sew outside edge to attach them.
  - e. Bind outside edge and zigzag or bartack top and bottom of loops
7. Turn inside out and sew into shape (A & C edges).
8. Bind, and zigzag where appropriate (don't leave hot-knifed ends inside bag).
9. Sew extra line of stitching along inside row and inspect.

# Manufacture of Bridle Lines and Static Lines

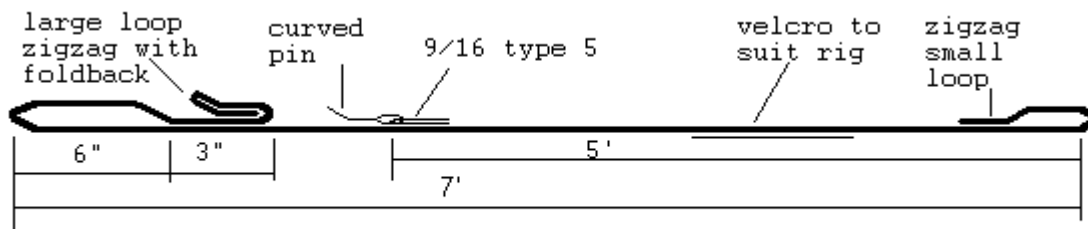
## Bridle Lines

Pull-out bridle lines must have a minimum effective length of 5 ft.

Throwaway bridle lines must have an effective length of at least 5 ft from pilot chute to pin, and there must be sufficient slack between the pin and lift point to allow the pin to pull in any direction.

Look at different manufacturers designs and compare the construction techniques.

Manufacture a throwaway bridle for a particular rig eg;



## Collapsible Bridles

These have been around for many years but have become more popular with the smaller faster canopies as they reduce drag.

Some use shock cord to collapse the pilot chute, these can be difficult to calibrate and elastic that is too strong can prove exciting!!!

Most now use a centre line attached to the canopy lift point, with the outer bridle lifting the bag.

Inspect as many variants as you can, and manufacture one for yourself.

## Static Lines

These are made from 1" tubular and must be 'continuous' i.e. no joins or knots.

The static line length depends on the aircraft being used, as it should be as long as possible without any part of the bag being able to come in contact with the tail.

Metal components should be avoided, as they will hit the side of the aircraft as the jumpmaster pulls the bag in.

Copy a static line in local use.

## Replacement of Velcro

See: Poynters Vol 1 4.152 or Vol 2 4.158  
Parachute Rigger Handbook 7.2.3

There was a time when it was hard to imagine parachuting without Velcro, now designers have moved towards tuck flaps in many areas, however Velcro remains an important component in many rigs.

Jumpers need to be encouraged to look after their Velcro, i.e. mate their toggles after landing, (prolongs the life of Velcro and brake line!) and keeping it clean (removing grass and mud etc from the hooks).

Wet Velcro remains effective, however wet Velcro that freezes becomes *very* effective!

When packing reserves you will have come across examples of rigs in need of Velcro replacement, therefore it is useful for you to get plenty of practice at what can be a simple job, i.e. replacing the pile on a bridle, or one that requires more thought and skill such as replacing the riser cover Velcro on a Racer (Take the reserve out before you start!).

Roughly speaking pile wears out twice as quickly as the hook.

Some Velcro is much more important than in other areas i.e. ROL throwaway bridles MUST be mated with effective Velcro, or they can pose a serious risk to the user and those around them.

It could be argued that Velcro on riser covers is less important, as rigs were at one time made without riser covers.

But as riggers we must ask ourselves why the manufacturer designed it the way it is? If the Velcro is there it should be effective.

Some Velcro is positioned where it becomes an Advanced Riggers task, if in doubt; ask.

**REMEMBER:** Any repair to a serviceable rig must be checked and endorsed by a qualified rigger before returning the kit to service.

## Advanced Work on Ram Air Canopies

Read: Poynters Vol 2 7.15 –7.22  
Parachute Rigger Handbook 7.1.5, 7.1.6, 7.1.12

Having mastered simple patches, you will now practice repairs in more awkward places.

### Patch into seams.

- a. If damage is within 2" of a seam, it is usually better to open the seam and take the patch off the edge of material.
- b. Note "keyhole surgery" is not called for.
- c. Open up the seam so you can work easily.
- d. Carefully realign the seams and pin before re-sewing.
- e. Patch across an unloaded seam and reattach the rib
- f. Patch into a bottom seam
- g. Apply multiple patches into a loaded seam, taking care to remake the seam accurately.

### Patch into the Tail or nose

- a. There is often a reinforcing tape along the tail or nose, study how this has been made into the seam.

### Patch near Cross-port vent

- a. Treat as a simple patch, then recut the vent as necessary.

### Replacement of line attachment flare

- a. This is loads of fun!
- b. Make the new flare, with sufficient excess support tapes.
- c. Position and sew carefully.
- d. Reattach line, checking for overall length against its clone.

**REMEMBER: Any repair to a serviceable canopy must be checked and endorsed by a qualified rigger before returning the canopy to service**

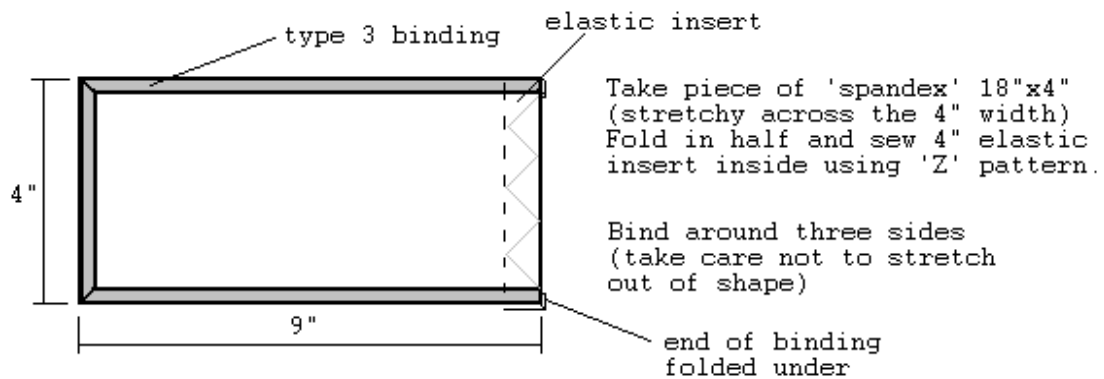
## Manufacture of Boc Pocket

See: Parachute Rigger Handbook 7.6.3

There are many versions of the Spandex throw-away pocket mounted on the bottom of container, and it is a common task for riggers to convert ROL or pull-out rigs to BOC.

Spandex type material is not cheap so take advice from your supervisor before cutting up a roll!!!

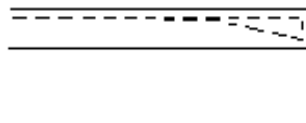
Some riggers prefer to make the pocket on a cordura backing and then sew the complete unit onto the container, but in this example, we are using what is probably the simplest construction method.



Some riggers use a piece of type 3 between the two layers of Spandex and hot-knife into shape, before inserting the elastic.

This sandwiches the type 3 between the edges of Spandex. As this sticks the Spandex to the type 3 it prevents the Spandex stretching out of shape as you bind it.

When attaching to the bottom of the main container, care should be taken with the alignment and sewing around the outer row of stitching. The open end needs to be overstitched or a triangle pattern sewn on the binding to reinforce it.



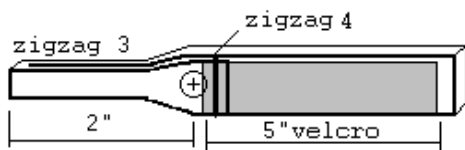
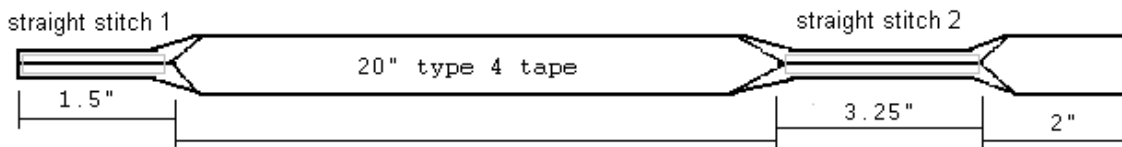
The dimensions given above may need to be varied slightly to suit a particular container. Remember the pocket should not be so deep that it is easy to push the pilot chute completely inside the pocket, nor should it be so narrow as to make for a difficult extraction.



# Manufacture of Small Items

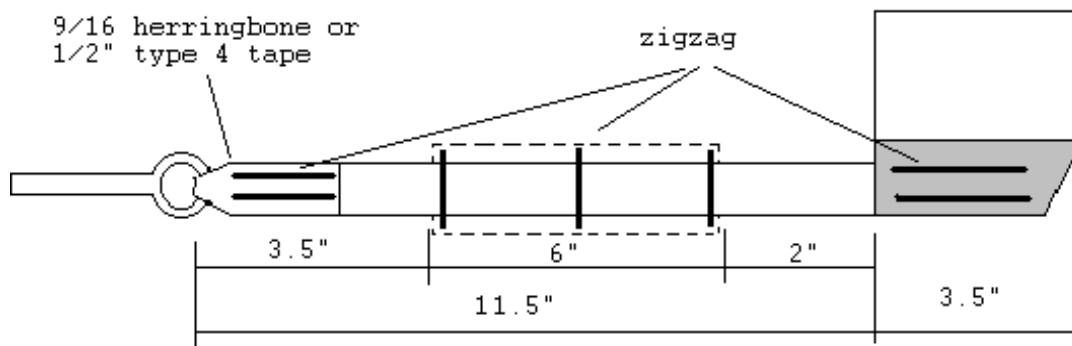
Try to get experience at making a wide variety of items e.g.

## Steering Toggles

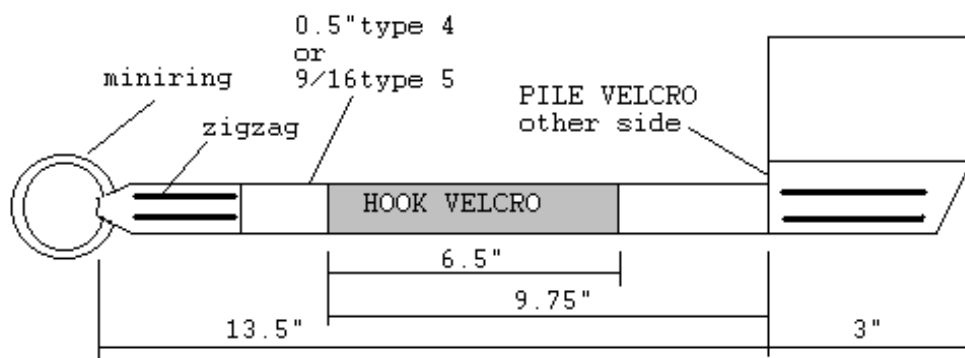


fold in edges and straight stitch 1 and 2  
fold over and zigzag tongue 3  
add 5" velcro  
zigzag or bartack all layers together 4  
Fit grommet 2" from end

## Apex Mount Pull Out Pad (Tse)



## Aff Secondary Handle for Tse Zerox

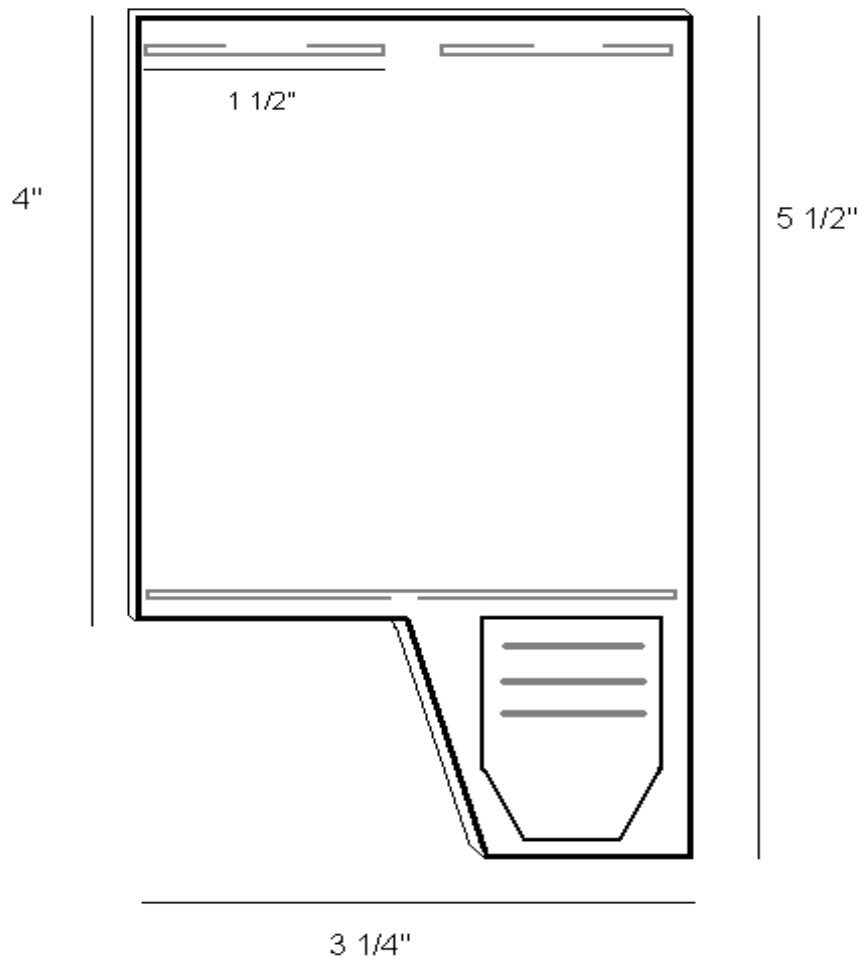


## Manufacture of Cutaway Pad

Materials:

- a. Cordura 6 ½" x 5 ½"
- b. 1" Square weave 2 ½"
- c. 5" of binding tape.
- d. 3 ½" of hook velcro.
- e. 70" Cable (48 & 22) and swage (or as suitable for rig).
- f. Padding.

Cut out the Cordura and fold in half (inside-out).



Sew bottom seam.

Sew top seam leaving ¼" gap in the middle.

Attach folded over square weave (to hold cable) with 3 bar tacks or zigzag.

Fit Cable and swage. Shorter cable should be closer to the velcro side.

Turn out – feeding cable through the hole.

Pad around cable and swage.

Bind open edge and fold ends under the hook velcro.

## Manufacture of Safety Stow

See: form 257

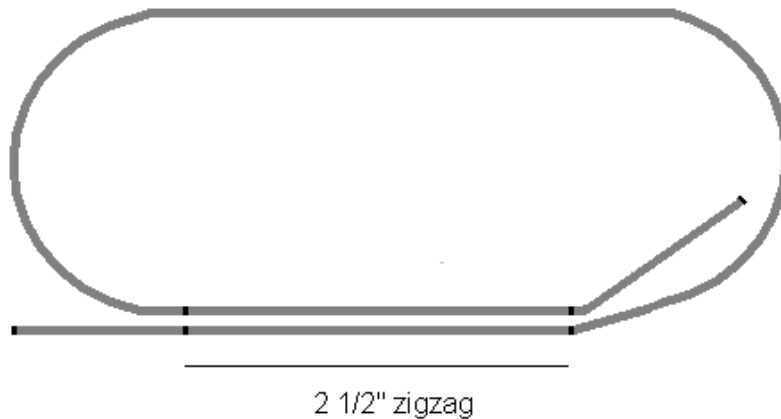
Materials:

- a. 1/8" Shock cord, nylon covered 17" length.

Mark as follows 1 1/2" - 2 1/2" - 9" - 2 1/2" - 1 1/2".

Form a loop with the 2 1/2" sections touching and zigzag together.

The 1 1/2" sections are "handling", for holding onto whilst sewing - these are then scissor cut off, at an angle, and the ends are seared.



## Manufacture of Slider

This can be an exercise in copying an existing component.

Take a slider on a common canopy, ie Fury or Manta, and take your measurements and construction notes from it.

Note where there has been shrinkage due to the different materials used, ie Type 4 tape and F111.

Copy the design exactly, this is not an exercise in innovation.

It is not absolutely necessary to fit #8 grommets, as not all rigging rooms will have setting tools for these but mark the centres and fit them if you can.

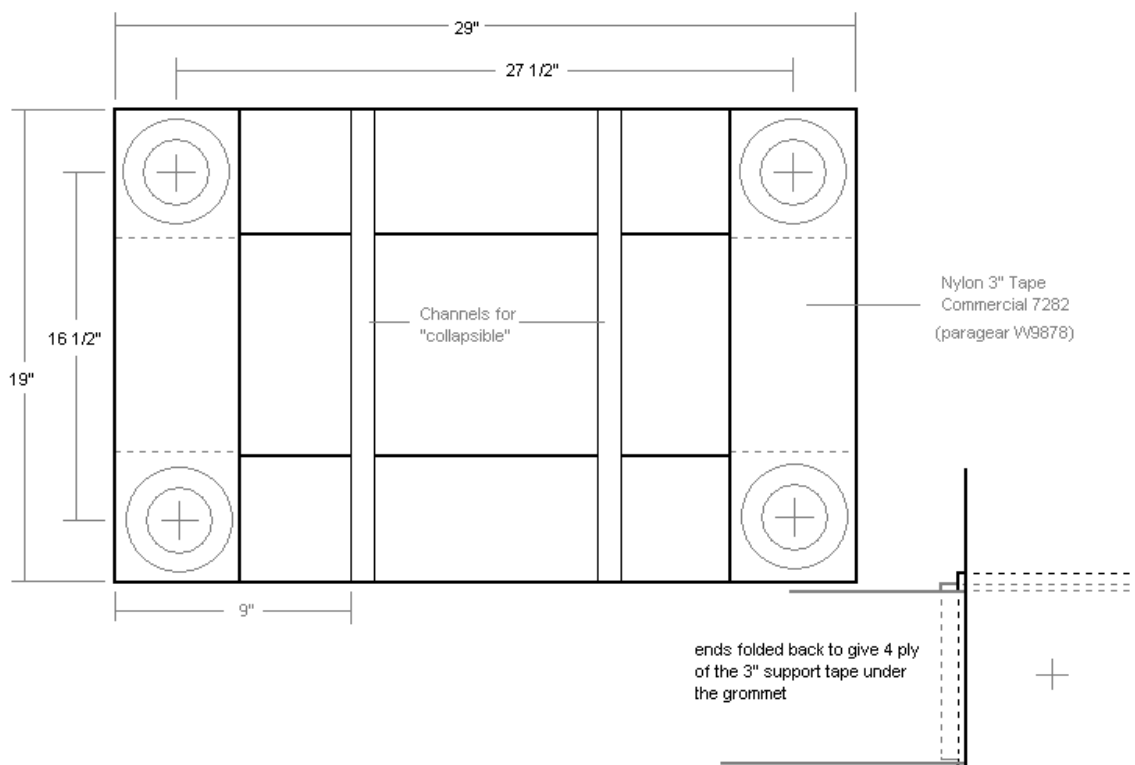
When finished check the dimensions against the original by lining the two up. Remember to take the original, or comparative photographs, when you present it for your PR exam.

An example of a simple slider can be found on a PD Silhouette 170:

24" x 34" Fabric.

124" of Nylon 3" Tape.

Remember to allow for shrinkage to end up with:

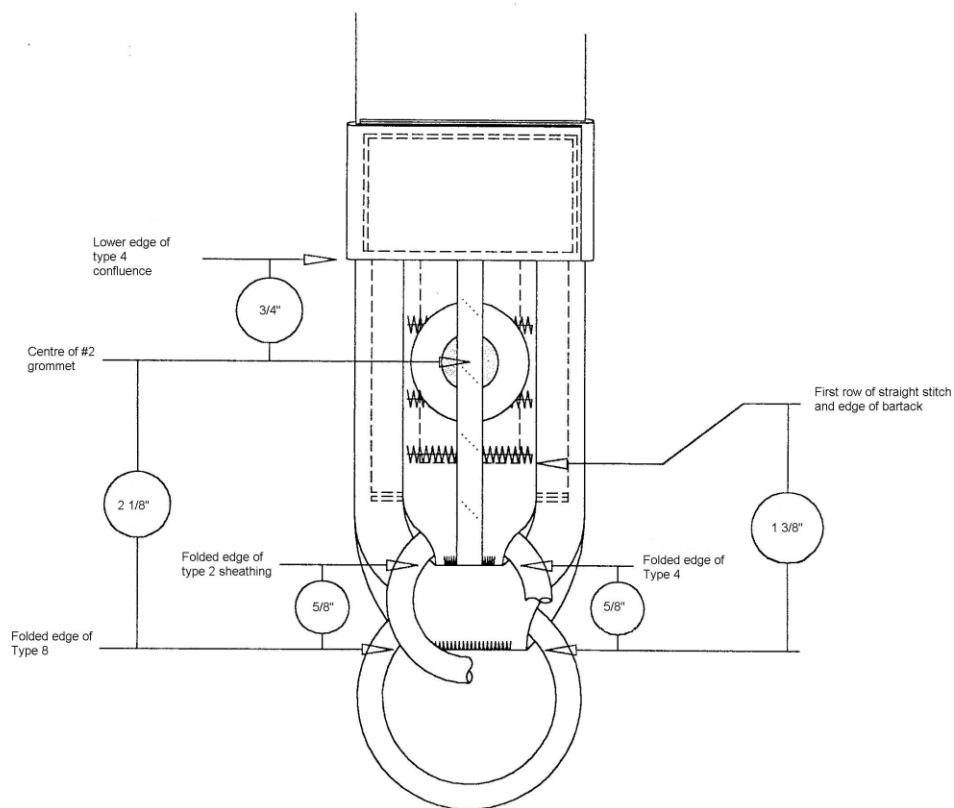


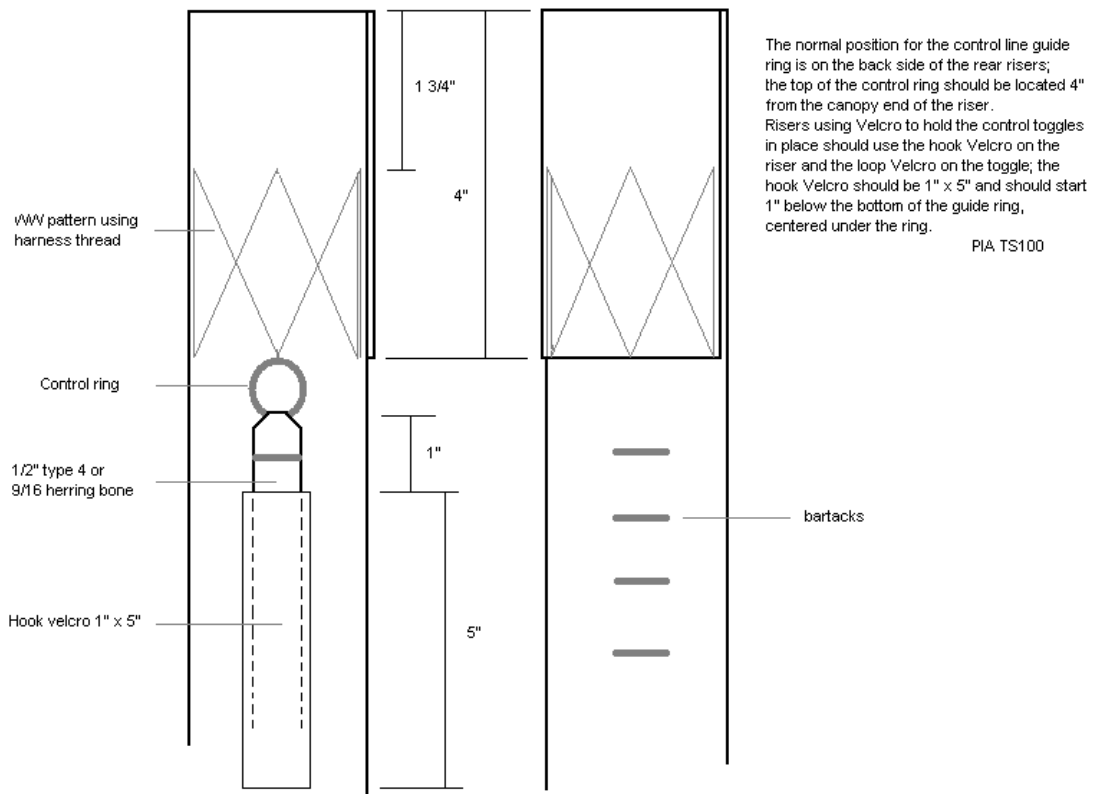
# Manufacture of Big Ring Type 8 Risers

Great care should be taken when making risers and where possible you should follow the construction drawings issued by Relative Workshop / UPT. (1998)  
Their effectiveness should also be tested before use.

Type 8 Standard 3- ring Riser

all tolerances +/- 1/16"





Remember to allow for shrinkage when sewing the Binding tape channel for the cutaway cable, and the attachment for the control ring and velcro.

Add suitable stowage for the excess line, pile velcro flag, or type 3 loops suitably positioned. Ensure the pair of risers are matched exactly.

# Log of Rigging Work

All Basic Riggers' (BRs) must keep a log of their rigging work and this must be signed by their supervisor before any item can be put into service.

All items should be identifiable, preferably with a serial number that relates to the log.

The time taken should also be recorded, along with the running total of hours. The log should reflect a variety of work i.e. 5-10 hours building 5 pilot chutes, 10 hours building 5 d-bags, 20 hours patching, etc (NOT 100 hours fitting line sets!)

|  |            |            |
|--|------------|------------|
| Date                                   | Item       |            |
| Description / Construction notes       |            |            |
| Serial No.                             | Time Taken | Total Time |
| Supervisors authorisation and comments |            |            |

## Preparation for the PR Course

The syllabus is to be found on Form 200, which includes the list of previously made items, which are to be of an approved, and identifiable, design. (bring designs, or examples that you have copied).

Your log of work must be signed by your supervising rigger and should show a variety of work. (not just fitting line sets).

Method 2 candidates must have logged at least 200 hours of rigging work, Method 1 candidates should have logged 160 hours after their BR course.

On the PR course you will be expected replace a cascaded line, and to repair a canopy, fit multiple patches and remake the seam. You will also produce serviceable examples of everything on the syllabus, copying examples or following issued design specifications.

There is a lot to do in a limited time period, so good time management is essential. Practice manufacturing items within a set time frame.

The PR Course will begin with the written exam, so study the following questions from the Question pool. New questions are contributed by each new Advanced Rigger (AR) and Rigger Examiner (RE) candidate, so the pool develops over time, and you can expect a couple of questions that are not in the following examples.

You can find the answers on the last page.

Of course, you can also ask other experienced riggers to help answer questions and further explain this information.

## British Skydiving Rigging Question Exam Pool

*last updated March 2021*

### Candidate Information

Rigging Course written tests generally occur at the start of an examination course.

They shall be multiple choice papers and require the following marks to pass and proceed with the practical part of the courses -

**Parachute Rigger - 70%    Advanced Rigger - 80%**

### Question Subject Sections

- a. Thread and Sewing.
- b. Materials, Line and Webbing.
- c. Hardware.
- d. AADs.
- e. British Skydiving Rules and Regs.
- f. General Rigging.
- g. Tandem.
- h. Contamination.



## **Thread and Sewing**

1. An initial test to identify cotton thread can be done using:
  - a) Heat.
  - b) Chemicals.
  - c) Pressure.
  - d) Smell.
  
2. When sewing, if the top thread loops beneath the fabric what would you do to correct it?
  - a) Adjust presser foot pressure.
  - b) Adjust tension.
  - c) Adjust stitch length.
  - d) Leave it.
  
3. When stitching a patch to a canopy what spi would you use?
  - a) 6-8 spi.
  - b) 13-16 spi.
  - c) 7-11 spi.
  - d) 4-8 spi.
  
4. What is the normal spi for harness work?
  - a) 7-11 spi.
  - b) 6-8 spi.
  - c) 4-8 spi.
  - d) 5-7 spi.
  
5. How much overstitch should you make when stitching a patch to a canopy?
  - a) At least 3"
  - b) Not more than 2"
  - c) At least 1"
  - d) At least 1" and not more than 2"

6. **What stitch must be used for patching canopies?**
- a) Chainstitch.
  - b) Lockstitch.
  - c) Loopstitch.
  - d) Double throw zigzag.
7. **When selecting needles for stitching fabric what would you use?**
- a) Diamond point.
  - b) Side cut.
  - c) Round point.
  - d) Any.
8. **Hand tacks are tied off with:**
- a) Bowline.
  - b) Square knot.
  - c) Clove hitch and a half hitch.
  - d) Surgeon's knot and locking knot.
9. **Thread used in standard lockstitch sewing machines must have a:**
- a) Right twist.
  - b) Reverse twist.
  - c) Left twist.
  - d) '5' twist.
10. **The zigzag stitch is used to secure suspension line as well as in other applications because of what unique property?**
- a) It looks better.
  - b) It will expand more than the straight stitch.
  - c) Because it is difficult to sew lines with a straight stitch.
  - d) It puts in more stitches per inch.

11. **What type of thread is used to hand stitch a cable housing to a pack tray?**
- a) 'E' thread.
  - b) 'A' thread.
  - c) Super tack cord.
  - d) 3 cord cotton waxed.
12. **What stitch is commonly used in parachute manufacture and repair?**
- a) Chain stitch.
  - b) Lock stitch.
  - c) Rotary stitch.
  - d) Oscillating stitch.
13. **Ends of stitching should be secured with:**
- a) Back stitch.
  - b) Searing.
  - c) Over stitch.
  - d) Either A or C.
14. **5 cord thread is used to sew:**
- a) Lines into canopies.
  - b) Radial canopy seams.
  - c) Canopy modifications.
  - d) Harnesses.
15. **The proper size sewing machine needle to be used should be determined by:**
- a) Thread size and material being used.
  - b) Machine being used.
  - c) Speed of machine.
  - d) Size of hole in feed dog.
16. **When first starting to sew with any lockstitch sewing machine, the operator should:**
- a) Hold both threads for the first two stitches.
  - b) Not hold thread.

- c) Hold bobbin thread.
  - d) Hold upper thread.
17. **When sewing heavy material and the machine skips stitches one solution may be:**
- a) Use a larger needle.
  - b) Use a larger thread.
  - c) Increase thread tension.
  - d) Decrease presser foot pressure.
18. **The bobbin thread tension can normally be adjusted:**
- a) With a small spanner.
  - b) With a small screwdriver.
  - c) With electricians' pliers.
  - d) By hand.
19. **On light materials a lockstitch should lock in the centre of the:**
- a) Top ply of material
  - b) Bottom ply of material
  - c) Plies of material
  - d) None of the above
20. **What size thread is used to sew nylon canopy seams when making a repair?**
- a) One size larger than the original
  - b) Size B
  - c) One size smaller than the original
  - d) Same as original
21. **Which statement is correct concerning sewing and stitching as applied to parachute repair?**
- a) Seams joined by zigzag stitching are capable of great elongation without creating excessive tensile stress of the thread itself
  - b) All thread must be coated with beeswax prior to use
  - c) Use 5-cord linen thread for all hand sewing
  - d) Use 6-cord linen thread for all hand sewing

22. Which of the following has the least effect on the overall strength of a sewn seam?
- a) Type of stitch and type of thread
  - b) Moisture content of the fabric at the time of sewing
  - c) Stitching pattern and number of stitches
  - d) Type of seam used and seam construction
23. What affects the strength of a sewn seam?
- a) Thread tension and stitches per inch
  - b) Type of stitch and thread strength
  - c) Seam efficiency of the material and the type of seam
  - d) All of the above
24. Which component of the sewing machine prevents the thread from becoming tangled around the needle as it travels through the material?
- a) The sewing hook
  - b) The needle bar
  - c) The thread take-up lever
  - d) The thread controller spring
25. Which of these threads is the strongest?
- a) 3 cord.
  - b) FF thread.
  - c) 5 cord.
  - d) E Thread.
26. The US name for the thread used to stitch a patch on a canopy is:
- a) 5 cord.
  - b) FF Thread.
  - c) 3 cord.
  - d) E-Thread.
27. The UK name for the thread used to stitch a patch on a canopy is:
- a) Poly-cotton No.42
  - b) Dacron No.35

- c) Bonded nylon No.40
- d) Teflon treated nylon No.40

**28. What thread would you use to tack toggles to reserve risers?**

- a) Cotton A thread.
- b) E thread.
- c) Bonded 40 thread.
- d) Super tack.

**29. On a standard straight stitch machine, the long slot on the needle faces which way?**

- a) towards you.
- b) to the left.
- c) away from you.
- d) to the right.

## **Materials, Line and Webbing**

1. The colour code for Type 7 webbing is:
  - a) Black line along each edge.
  - b) Yellow line along each edge.
  - c) Red line along the centre.
  - d) Red line along each edge.
  
2. Type 13 webbing has a breaking strain of:
  - a) 8,000 lbs.
  - b) 5,500 lbs.
  - c) 7,000 lbs.
  - d) 4,600 lbs.
  
3. The colour code for Type 13 webbing is:
  - a) Black line at centre of warp.
  - b) Yellow lines along each edge.
  - c) Black lines along each edge.
  - d) Red line along each edge.
  
4. "Condition R" when applied to webbing means:
  - a) Regular.
  - b) Rounded.
  - c) Running end.
  - d) Resin treated.
  
5. The minimum breaking strength of Type 3, 3/4" binding tape is
  - a) 400 lbs.
  - b) 425lbs.
  - c) 750lbs.
  - d) 600lbs.
  
6. "Tensile strength" is measured as
  - a) The maximum tension a material can withstand without breaking.
  - b) The maximum tension a material can withstand after breaking.

- c) The minimum tension a material can withstand before breaking.
  - d) The minimum tension a material can withstand without breaking.
- 7. What is the strength of the webbing that has a red line down each edge?**
- a) 1000lb.
  - b) 1200lb.
  - c) 2500lb.
  - d) 4000lb.
- 8. What webbing is used for mini risers?**
- a) Type 4.
  - b) Type 7.
  - c) Type 17.
  - d) Type 24.
- 9. What is the strength of webbing that has a black line down the centre?**
- a) 2500lb.
  - b) 4000lb.
  - c) 5000lb.
  - d) 6000lb.
- 10. Canopy material that has been calendered has been:**
- a) Date stamped with the date of manufacture.
  - b) Treated by heat and pressure.
  - c) Affected by time.
  - d) Date stamped with a finite life.
- 11. The most important characteristic of parachute fabric is:**
- a) Durability.
  - b) Elasticity.
  - c) Bias construction.
  - d) Tensile strength.



12. **Porosity when referring to fabric means:**
- a) The ratio of space and voids to material.
  - b) Test strength.
  - c) Wrinkle resistance.
  - d) Stitch-ability.
13. **What is the term given to the lengthwise threads on a roll or fabric?**
- a) Warp.
  - b) Fill.
  - c) Weft.
  - d) Bias.
14. **Warp threads are those that run**
- a) The length of the seam.
  - b) The length of the bolt of material.
  - c) Across the width of a bolt of material.
  - d) Diagonally on herringbone reinforcement tape.
15. **'Weft' is another name for**
- a) Bias.
  - b) Warp.
  - c) Fill.
  - d) Webbing.
16. **What is the tensile strength of Type 3 canopy suspension line?**
- a) 550 lbs.
  - b) 1,000 lbs.
  - c) 400 lbs.
  - d) 825lbs.

17. **What is the tensile strength of Type 2 canopy suspension line?**
- a) 550 lbs.
  - b) 400 lbs.
  - c) 450 lbs.
  - d) 750lbs.
18. **Black diagonal dashes indicate:**
- a) 4000 lbs 1" tubular nylon.
  - b) Type IV rigging line.
  - c) Type II rigging line.
  - d) Type 4 binding tape.
19. **When making rigging line connector links which line do you use?**
- a) 16 strand Kevlar line.
  - b) 400 lb. flat Dacron line.
  - c) 500 lb Spectra line.
  - d) 800 lb Dacron line.
20. **Which of the following would be suitable for Ram Air canopy brake lines?**
- a) 700 lb. Kevlar line.
  - b) Type III nylon cord.
  - c) 800 lb. Dacron line.
  - d) 4000 lb. Tubular.
21. **Why and how does spectra line change length through repeated use?**
- a) Friction from the slider and different force distributions during repeated deployments cause the lines to shrink and stretch by different amounts.
  - b) All lines stretch equally due to deployment forces, but trim is usually not affected.
  - c) All lines shrink.
  - d) All lines shrink and stretch at different rates due to abrasion from packing.
22. **What is another name commonly used for Spectra?**
- a) Microline.
  - b) Kevlar Cordage.
  - c) Untreated Braiding.
  - d) Shock Cord.

## **Hardware**

1. **Another name for Rapide Links is**
  - a) Speed Links.
  - b) French Maillon Links.
  - c) Soft Links.
  - d) Removable Connector Links.
  
2. **Separable connector links are rated at:**
  - a) 3,400 lbs.
  - b) 2,500 lbs
  - c) 3,000 lbs.
  - d) 5,000 lbs.
  
3. **Parachute harness snap ejectors are rated at:**
  - a) 2,000 lbs.
  - b) 2,500 lbs
  - c) 5,000 lbs.
  - d) 3,500 lbs.
  
4. **Lightweight quick fit adapters are rated at:**
  - a) 1,500 lbs.
  - b) 2,500 lbs.
  - c) 500 lbs.
  - d) 1,000 lbs.
  
5. **B12 leg strap hooks are rated at:**
  - a) 2,500 lbs.
  - b) 3,000 lbs.
  - c) 5,000 lbs.
  - d) 4,000lbs.
  
6. **"V" ring adjusters are rated at:**
  - a) 1,400 lbs.
  - b) 2,500 lbs

- c) 4,000 lbs.
  - d) 1,750 lbs.
7. **What is the tensile strength of an American Sliding Snap Hook?**
- a) 3,000 lbs.
  - b) 1,750 lbs.
  - c) 5,000 lbs.
  - d) 2,500 lbs.
8. **Parachute hardware is:**
- a) Cast
  - b) Forged
  - c) Machined from a solid block
  - d) None of the above
9. **Hardware will not be materially weakened by chrome plating if:**
- a) It is "baked" immediately following each plating process.
  - b) It is buffed properly.
  - c) It is magnafluxed.
  - d) None of the above.
10. **Quick ejector snaps mate best with:**
- a) Deep V rings.
  - b) D rings.
  - c) Shallow V rings.
  - d) Adjusters.
11. **Ripcord cables are made of**
- a) Nickel.
  - b) Stainless steel wire.
  - c) Cadmium plated copper.
  - d) Monel.

12. Ripcord pins are usually attached to the cable by:
- a) Brazing.
  - b) Soldering.
  - c) Welding.
  - d) Swaging.
13. Ripcord assemblies must withstand a load of \_\_\_\_\_ lbs. for \_\_\_\_ seconds
- a) 300 for 3 .
  - b) 400 for 3.
  - c) 150 for 4.
  - d) 200 for 4.
14. Ripcord pins must withstand a\_\_\_\_\_ lb. bend for\_\_\_\_\_ seconds:
- a) 8 for 3.
  - b) 11 for 3.
  - c) 6 for 3.
  - d) 7 for 4.
15. Which hazard is associated with chrome plating of parachute hardware?
- a) Hydrogen embrittlement of the metal parts.
  - b) Webbing slippage due to less friction.
  - c) Weakening of the hardware.
  - d) None of the above.
16. Stainless Steel "Flip-Flop" Leg strap adjusters have a Tensile strength of
- a) 1000lb.
  - b) 2500lb.
  - c) 3500lb.
  - d) 6000lb.
17. The design principle behind the "oval" middle ring on an Aerodyne Mini-Force 3 ring riser is -
- a) That the oval ring is much stronger than the standard round design.
  - b) That the oval ring exerts a bigger lever arm on the system.
  - c) That the oval ring can be weaker because it results in a higher cutaway force.
  - d) That the oval ring exerts a smaller lever arm on the system.

18. What is the normal criteria for tightening "Rapide" connector links ?
- a) Finger tight.
  - b) Finger tight plus quarter turn.
  - c) Finger tight plus 2 turns.
  - d) Finger tight plus 1 turn.
19. On a 3000lb removable connector link, how many full turns should each screw make before the link can be regarded as being at its operational strength?
- a) 5.
  - b) 6.
  - c) 7.
  - d) 10.
20. Who is responsible for the suitability of materials and components used during repair and manufacture?
- a) The Supplier.
  - b) The parachute rigger.
  - c) Ebay Supply chain.
  - d) The customer.
21. What is the purpose of ripcord and cutaway housings?
- a) To enhance the appearance of the rig.
  - b) To protect the internal cable and help prevent premature activation.
  - c) To decrease the friction and pull force.
  - d) To preserve a minimum friction and pull force.
22. What is the maximum bend allowed on a skyhook pin?
- a) none.
  - b) 10.
  - c) 20.
  - d) 30.
23. Harness 3 ring riser 'big' rings are rated at
- a) 1000lb.
  - b) 2500lb.

c) 3000lb.

d) 5000lb.

24. What is the smallest Maillon rapide link that can be used to attach a main canopy to its risers?

a) #3

b) #3.5

c) #4

d) #5

## **AADs**

1. **What is the service cycle on a FXC 12000 J Mod AAD?**
  - a) 6 months.
  - b) One year.
  - c) Two years.
  - d) Three years.
  
2. **How often do the batteries need changing on a FXC 12000 J Mod AAD?**
  - a) 6 months.
  - b) One year.
  - c) Two years.
  - d) There are no batteries.
  
3. **What is the normal firing height for an Expert Cypres?**
  - a) 130 feet AGL.
  - b) 750 feet AGL.
  - c) 1000 feet AGL.
  - d) 1900 feet AGL.
  
4. **At what descent rate does an Expert Cypres fire?**
  - a) 29 mph.
  - b) 54 mph.
  - c) 78 mph.
  - d) 93 mph.
  
5. **At what height does an Expert Cypres arm?**
  - a) Ground level.
  - b) 500 ft AGL.
  - c) 1000 ft AGL.
  - d) 1500 ft AGL.



6. **What is the minimum opening height when the FXC has been set for 1000'?**
- a) 1000'
  - b) 2000'
  - c) 2500'
  - d) 3500'
7. **The Cypres 2 is water resistant to what degree?**
- a) Five meters for five minutes.
  - b) Ten meters for ten minutes.
  - c) Fifteen meters for fifteen minutes.
  - d) Twenty meters for twenty minutes.
8. **How can you distinguish a Cypres 2 cutter unit from a Cypres 1 cutter unit?**
- a) There is no difference.
  - b) The Cypres 2 cutter has an aluminium grip on the connector.
  - c) The Cypres 2 cutter is marked "Cypres 2"
  - d) The Cypres 2 cutter is larger.
9. **What is the maintenance due date window on a Cypres 2?**
- a) Plus, or minus 3 months.
  - b) Plus, or minus 6 months.
  - c) Plus, or minus 9 months.
  - d) Plus, or minus 12 months.
10. **How much of a reserve-closing loop made from Airtec loop material should be impregnated with silicon?**
- a) The whole loop except the knot.
  - b) The top 4 centimetres of the loop, except quick loops.
  - c) All of the knot, except quick loops.
  - d) Impregnating the loop is optional.
11. **What is the total service life of a correctly maintained Cypres 2 AAD manufactured in 2016?**
- a) Twelve Years and 6 months from the date of manufacture
  - b) Twelve years from the date of purchase
  - c) Twelve Years from the date of manufacture
  - d) 8 years from the date of manufacture

12. What is the normal firing height for a Vigil in PRO Mode?
- a) 150 feet AGL.
  - b) 750 feet AGL.
  - c) 840 feet AGL.
  - d) 1900 feet AGL.
13. Who can open the Vigil AADs main box?
- a) Advanced Riggers only.
  - b) Parachute and Advanced Riggers only.
  - c) The Vigil Factory only.
  - d) Any qualified reserve packer.
14. To what degree is a Vigil waterproof?
- a) To 1.8 meter (6 ft) depth for a maximum of 24 Hours
  - b) Not waterproof at all
  - c) To 7 meters (24ft) depth for a maximum of 4 Hours
  - d) To 1 meter (3ft) depth for a maximum of 14 Hours
15. What is the lifespan for a Vigil?
- a) 12 years.
  - b) 15 years.
  - c) 20 years.
  - d) 25 years.

## **British Skydiving Rules and Regs**

1. **British Skydiving Operations Manual places the responsibility for the safe condition of an experienced parachutist's equipment with:**
  - a) The parachutist.
  - b) An Instructor or Rigger.
  - c) The Club Chief Instructor.
  - d) The pilot.
  
2. **Packing records must be kept for:**
  - a) all parachutes.
  - b) all PTO equipment.
  - c) all reserve parachutes.
  - d) all reserves and PTO equipment.
  
3. **According to British Skydiving regulations any reserve parachute which has remained packed must be opened and inspected and repacked every:**
  - a) Year.
  - b) 4 months.
  - c) 9 months.
  - d) 6 months.
  
4. **According to American regulations any emergency parachute which has remained packed must be opened inspected and repacked every:**
  - a) 180 days.
  - b) 90 days.
  - c) 100 days.
  - d) 120 days.
  
5. **British Skydiving Insurance covers you:**
  - a) When working on British Skydiving members kit only
  - b) All rigging work
  - c) All sport parachuting equipment
  - d) When working on British Skydiving members and Affiliated Clubs kit only

6. **Who can sew Cypres pouches to a container?**
- a) Advanced Packers cleared by at least an Advanced Rigger.
  - b) Anyone cleared by Airtec.
  - c) All Advanced Packers.
  - d) Advanced Riggers, or Parachute Riggers cleared by Airtec and approved by the Riggers Committee.
7. **Who can jump a rig without either an AAD or RSL fitted?**
- a) Only jumpers at least A-licence (red).
  - b) Only jumpers at least B licence (red).
  - c) Only jumpers at least C licence (red).
  - d) Sky surfers.
8. **How many years must a Parachute Rigger have been qualified, before attending the Advanced Rigger exam course?**
- a) 5 years.
  - b) 2 Years.
  - c) 3 years.
  - d) There is no time limit.
9. **What licence and how many jumps must a Basic Rigger Candidate have?**
- a) B Licence and 50 jumps.
  - b) C Licence and 200 jumps.
  - c) D Licence and 200 jumps.
  - d) There is no requirement for a rigger to have any jumps.
10. **Which of the following repairs can be carried out by a Parachute Rigger?**
- a) Manufacture a freebag.
  - b) Replace steering lines on a main canopy.
  - c) Replace steering lines on a reserve canopy.
  - d) Repair liftweb/ legstrap harness junction.

**11. What are the requirements on a British Skydiving Rigger for packing Pilot Emergency parachutes?**

- a) Follow the manufacturer's instructions.
- b) You can only pack those used by British Skydiving jump pilots during British Skydiving operations.
- c) British Skydiving Regulations and ratings have nothing to do with packing non-skydiving equipment.
- d) The owner must be a British Skydiving member.

**12. A Riggers rating is valid until**

- a) The next British Skydiving renewal.
- b) 12 months has expired.
- c) 24 months has expired.
- d) The holder retires.

## General Rigging

1. The minimum length of bridle cord for a piggyback round reserve is:
  - a) 3ft.
  - b) 2ft.
  - c) 4ft.
  - d) 5ft.
  
2. The material used for manufacturing reserve loops used with an AAD is:
  - a) Type II
  - b) Cypres Loop Material
  - c) De-cored Type III
  - d) That authorized by the AAD manufacturer
  
3. What is the minimum allowable length of a pullout pilot chute bridle from the base of the pilot chute to the canopy attachment point?
  - a) 3ft.
  - b) 7ft.
  - c) 5ft.
  - d) 6ft.
  
4. What is the maximum recommended life of a reserve canopy?
  - a) 15 years.
  - b) There is no maximum – nylon does not degrade.
  - c) 25 years.
  - d) The canopy is verified by the packer to be fit for use at each repack .
  
5. What is the minimum effective length between the base of a throwaway pilot chute to the pin?
  - a) 5ft.
  - b) 4ft.
  - c) 7ft.
  - d) 6ft.

6. **When fitting a bridle cord what knot is used?**
- a) A granny knot and stop knot.
  - b) A larkshead knot formed from the stitched loop.
  - c) A clove hitch and 1/2 hitch.
  - d) A bowline and overhand knot.
7. **The best knot to tie off a rigging line in order to fill out a connector link are:**
- a) A clove hitch with one half hitch.
  - b) Two half hitches.
  - c) Bending hitch locked off with an overhand knot.
  - d) Double reef knot.
8. **What is the maximum allowable pull on a piggyback reserve?**
- a) 15 lbs.
  - b) 20 lbs.
  - c) 22 lbs.
  - d) 25lbs.
9. **The effect of freezing on wet Velcro is:**
- a) To increase its adhesive qualities
  - b) To decrease its adhesive qualities
  - c) To produce no change in adhesive qualities
  - d) To deteriorate the condition of the pile
10. **If you find a bent ripcord pin, what do you do?**
- a) Straighten it with a 'soft' mallet against a wood block
  - b) Heat the pin and bend it straight
  - c) Replace the ripcord
  - d) Put the tip of the pin in a hole and straighten it gently by hand
11. **The term used to describe the amount of air which will flow through fabric is:**
- a) Permeability.
  - b) Porosity.
  - c) Flow.
  - d) Wind drift.

12. **A "confluence wrap" is commonly found:**
- a) Between pieces of hardware and the harness.
  - b) Around the harness webbing, such as at the harness 3 ring.
  - c) Strung between the snaps on the inside of the reserve.
  - d) When a jumper has a canopy collision and is covered or "wrapped" in canopy.
13. **A series of stitches joining two plies of material or materials is known as:**
- a) A stitch.
  - b) A seam.
  - c) Stitching.
  - d) A hem.
14. **Why is the cable on a metal reserve ripcord longer than the housing - ie why is there some slack?**
- a) So, the jumper can slow their hand before starting to move the pins.
  - b) So, the ripcord cannot be activated if the housing is snagged.
  - c) Because cable is cheaper than ripcord housings.
  - d) All of the above.
15. **What are the design concepts and the benefits of the freebag?**
- a) The long bridle allows the pilot chute to attain a steady speed before the bag is lifted.
  - b) The non-attachment of the bag allows the canopy to extract and inflate even if the bridle snags on the jumper during deployment .
  - c) The width of the bridle allows it to be damaged and still retain enough Strength.
  - d) It avoids rubber bungies for the line stows which can rot during a 6-month repack cycle.
16. **In principle, how long should a freebag bridle be relative to the canopy it is used with?**
- a) Shorter than the lines.
  - b) As long as the span of the canopy.
  - c) As long as the chord of the canopy.
  - d) At least as long as the lines.



- 17. Why is a freebag bridle so long?**
- a) To reduce opening shock.
  - b) To ensure the pilot chute clears the jumper during a malfunction if they don't cutaway.
  - c) To allow the canopy to be extracted from the bag if the bridle is snagged during deployment.
  - d) To reduce deployment times.
- 18. Why is a freebag bridle wide?**
- a) To allow an increase in strength to enable it to work whilst partially damaged.
  - b) To smooth the appearance of the reserve pack job.
  - c) To provide extra drag to help lift the bag if the pilot chute is hindered during deployment.
  - d) To increase strength by allowing more stitching to be installed.
- 19. Where do risers most commonly break?**
- a) Just above the grommet.
  - b) Just below the grommet.
  - c) At the bottom of smallest / top ring.
  - d) At the bottom of the middle ring.
- 20. What is the PIA standard for where should a control line ring be placed on a riser?**
- a) 4 inches / 10 cm from the top of the riser.
  - b) As required by the individual canopy manufacturer.
  - c) As required by the individual container manufacturer.
  - d) 2 inches / 5 cm from the top of the riser.
- 21. What tool do we use for cutting and searing nylon fabric?**
- a) A laser cutting table.
  - b) A hot knife.
  - c) Hand Scissors.
  - d) Electric scissors.

- 22. Why do we sear nylon with a hot knife?**
- a) To seal the edge and stop it fraying.
  - b) To prevent shrinkage once off the roll.
  - c) To prepare for grommet installation.
  - d) To avoid the need for installing binding tape.
- 23. What is the spec of the tape commonly used for edging containers?**
- a) Type 3, 1¾ inch binding tape.
  - b) Type 6, ¾ inch binding tape.
  - c) Type 3, ¾ inch binding tape.
  - d) Type 2, 1¾ inch binding tape.
- 24. How long should the centre line of a pilot chute be?**
- a) Not longer than the mesh reinforcing tapes and the radius of the pilot chute.
  - b) Twice as long as the radius of the pilot chute.
  - c) It depends on whether a pull out or throw-out pilot chute.
  - d) At least as long as the mesh reinforcing tapes and the radius of the pilot chute.
- 25. Is a pull out bridle generally shorter or longer than a throw-out bridle, and why?**
- a) Longer as the pull out is less effective at slow speed.
  - b) Shorter as these are normally used by CRW jumpers.
  - c) Shorter as the effective length is to the top of the bag, not the pin.
  - d) Longer as the effective length is to the top of the bag, not the pin.
- 26. What risers should not have RSL rings attached to them?**
- a) Type 17 1" mini-risers that are not reinforced.
  - b) Type 8 mini risers.
  - c) Type 8 standard risers.
  - d) Type 17 1" mini risers reinforced.

27. **How can you determine the strength of a pilot chute spring?**
- a) Compress it using a spring scale.
  - b) Look up the manufacturer manual.
  - c) Check the spring for a manufacturer data stamping
  - d) There is no need – all springs are the same strength
28. **Which of these is NOT a purpose of a seal on a reserve parachute?**
- a) To hold the pins in place.
  - b) To protect the rigger.
  - c) To detect tampering.
  - d) To protect the user.
29. **Which of the following one-word definitions best describes the use of a grommet?**
- a) Stiffener.
  - b) Joiner.
  - c) Fastener.
  - d) Reinforcement.
30. **The raw edges of a canopy patch are turned under a minimum of**
- a) 3/8 inch.
  - b) 1/2 inch.
  - c) 3/4 inch.
  - d) 1 inch.
31. **What process is used on nylon webbing ends to prevent them from fraying?**
- a) Whipping.
  - b) Waxing.
  - c) Searing.
  - d) Sewing.
32. **Inspection of a parachute reveals a canopy section with evidence of weakness or damage. What does the parachute rigger conducting the inspection do?**
- a) Pack the parachute in the normal manner but place a rejection tag in a conspicuous place on the pack.
  - b) Compile an inspection report highlighting the damage and place a tag indicating the parachute is damaged and should not be jumped.

- c) Give the parachute back to the owner unpacked.
- d) Refuse to deal with the parachute.

**33. A chafing strip is**

- a) Normally placed between webbing and metal fittings
- b) Found around junctions of webbing such as just below the largest ring of the 3 ring on a harness
- c) A reinforcement used on the outside of deployment bags
- d) Between connector links on a chest mount reserve

**34. What is the purpose of the 6 monthly reserve repack cycle?**

- a) To inspect the equipment for any wear caused since last packed.
- b) To air the parachute to ensure it will open quicker than if it had been left packed
- c) To ensure riggers can make money
- d) To prevent loss of packing tools

**35. Brightly coloured flags are sewn to packing tools in order to**

- a) Identify the owner
- b) Make them easy to see and locate whilst packing
- c) Help them blend with the parachute
- d) Brighten up otherwise drab toolboxes

**36. What should a rigger do with the old packing card when it is full?**

- a) Attach it to the new one
- b) Keep with his records
- c) Discard the old one
- d) Give to the owner to discard

**37. Which of the following affect the stability of a canopy?**

- a) The wing loading
- b) The permeability of the fabric
- c) Line trim
- d) All of the above

- 38. When would you use "long shank" grommets?**
- a) Never
  - b) Always
  - c) When the plies of material are too thick for standard grommets
  - d) On deployment bags
- 39. Who may fit or replace guide rings on reserve risers?**
- a) Manufacturer only
  - b) Advanced Packer
  - c) Parachute Rigger
  - d) Advanced Rigger
- 40. What is the "mechanical advantage" on a set of standard 3 ring risers?**
- a) 200:1
  - b) 100:1
  - c) 80:1
  - d) 50:1
- 41. What proof load must each standard ripcord withstand during post-manufacturing inspection?**
- a) 40lb for 3 secs
  - b) 200 lb for 3 secs
  - c) 300 lb for 3 secs
  - d) 1000lb for 3 secs
- 42. Which lines take most of the opening shock on a Ram air canopy?**
- a) A lines.
  - b) Brake lines.
  - c) Centre A lines and brake lines.
  - d) Stabiliser lines.

43. What load should be applied when doing the PIA approved fabric strength test?
- a) 20lb.
  - b) 25lb.
  - c) 30lb.
  - d) 40lb.
44. Where is a finger trapped line most likely to break?
- a) at the apex of the formed loop.
  - b) at the finger trapped entrance.
  - c) at the bar tack.
  - d) at the end of the finger-trapped line.
45. Who may want a throwaway bridle with an effective length greater than 5'?
- a) CF jumpers.
  - b) Accuracy jumpers.
  - c) Wing suit jumpers.
  - d) Sky surf jumpers.

## **Tandem**

1. **What documentation is required for Tandem Equipment used within the British Skydiving system?**
  - a. Log Card/record of all descents, repairs, modifications and component replacements, reserve repacking and record card, tandem record of inspection/check list.
  - b. Whatever the manufacturer of the tandem system advises.
  - c. Club records in line with club student equipment.
  - d. Reserve repack and inspection records.
  
2. **Who can authorise a Tandem Instructor to jump a Tandem System they are not rated on?**
  - a. Advanced Rigger
  - b. Parachute Rigger
  - c. Advanced Packer (Tandem) and above.
  - d. British Skydiving STO or COO by authorizing the TI to attend a Tandem Conversion Course.
  
3. **Who may authorise modifications and changes to Tandem Equipment?**
  - a. Advanced Riggers for reserve and harness modifications, Parachute Riggers for main canopy modifications.
  - b. The British Skydiving Riggers Committee, when presented with the appropriate paperwork.
  - c. Only the original equipment manufacturer.
  - d. The owner of the tandem equipment.

## **Contamination**

**1. Mildew and fungus:**

- a) Attack nylon.
- b) Have a musty smell.
- c) Grow most rapidly in a well-lighted dry place.
- d) Should be removed with carbon tet.

**2. You are brought a canopy for repair that has been in a tree for a week. Would you:**

- a) Inspect for damage and repair as necessary.
- b) Send it to manufacturer for testing.
- c) Recommend someone else to repair it.
- d) Write it off explaining that exposure for so long a period to daylight would have caused severe deterioration to the fabric.

**3. Which of the following causes the most damage to parachutes?**

- a) Mildew.
- b) Sunlight.
- c) Static electricity.
- d) Mud stains.

**4. Probably the most serious damage which can be sustained by parachutes is:**

- a) Damage by oil and grease.
- b) Immersion in salt water.
- c) Contamination by acid.
- d) Damage by mildew.

**5. Which of the following could indicate acid contamination on webbing and container fabrics?**

- a) A musty smell.
- b) A change of colour on the surface.
- c) Growth of green mould.
- d) White crystals on the surface.



6. **How can sunlight damage to a white nylon canopy be identified?**
- a) Conduct fabric tensile strength tests if material is suspect.
  - b) Moisten an area with distilled water and test using litmus paper.
  - c) Sunlight damage is characterised by a grey colour.
  - d) Trick question – sunlight does not damage nylon.
7. **Which procedure should be followed when testing parachute fabric for suspected acid stains?**
- a) Rub vigorously with an art gum eraser.
  - b) Stretch the material between the fingers.
  - c) Twist the fabric back and forth with the fingers.
  - d) Apply litmus paper moistened with distilled water.
8. **A white crystalline substance on a parachute canopy or pack is evidence of a stain caused by:**
- a) Oil.
  - b) Salt water.
  - c) Gasoline.
  - d) Acid.
9. **What is normally used to remove bloodstains from parachutes?**
- a) Cold water.
  - b) Dry cleaning solvent.
  - c) Naphtha.
  - d) Ammonia.
10. **What is normally used to identify the presence of acid in parachute materials?**
- a) The manufacturer's guidelines.
  - b) Force required to tear in a destructive test.
  - c) Ph paper or Bromocresol green indicator.
  - d) Appearance.

11. What colour does black webbing go when exposed to acid?

- a) Red.
- b) Yellow.
- c) Green.
- d) Blue.

12. How does saltwater damage parachute equipment?

- a) It does no damage.
- b) It bleaches the webbing.
- c) The salt crystals are abrasive.
- d) It rots the stitching.

# ANSWERS

## Thread and sewing

|     |     |     |
|-----|-----|-----|
| 1a  | 11c | 21a |
| 2b  | 12b | 22b |
| 3c  | 13d | 23d |
| 4d  | 14d | 24c |
| 5c  | 15a | 25c |
| 6b  | 16a | 26d |
| 7c  | 17a | 27c |
| 8d  | 18b | 28a |
| 9c  | 19c | 29b |
| 10b | 20d |     |

## Materials, Lines and webbing

|     |     |     |
|-----|-----|-----|
| 1b  | 11b | 21a |
| 2c  | 12a | 22a |
| 3c  | 13a |     |
| 4d  | 14b |     |
| 5a  | 15c |     |
| 6a  | 16a |     |
| 7b  | 17b |     |
| 8c  | 18c |     |
| 9b  | 19d |     |
| 10b | 20c |     |

## Hardware

|     |     |     |
|-----|-----|-----|
| 1b  | 11b | 21b |
| 2c  | 12d | 22c |
| 3b  | 13a | 23b |
| 4c  | 14a | 24b |
| 5a  | 15a |     |
| 6b  | 16b |     |
| 7b  | 17b |     |
| 8b  | 18b |     |
| 9a  | 19c |     |
| 10a | 20b |     |

## AADs

|    |     |     |
|----|-----|-----|
| 1c | 6c  | 11a |
| 2d | 7c  | 12c |
| 3b | 8b  | 13c |
| 4c | 9b  | 14a |
| 5d | 10b | 15c |

## British Skydiving Rules and Regs

|    |     |     |
|----|-----|-----|
| 1a | 6d  | 11b |
| 2d | 7b  | 12a |
| 3d | 8b  |     |
| 4a | 9d  |     |
| 5d | 10b |     |

### General Rigging

|     |     |     |     |     |
|-----|-----|-----|-----|-----|
| 1a  | 11a | 21b | 31c | 41c |
| 2d  | 12b | 22a | 32b | 42c |
| 3c  | 13b | 23c | 33a | 43d |
| 4d  | 14b | 24d | 34a | 44d |
| 5a  | 15b | 25c | 35b | 45c |
| 6b  | 16d | 26a | 36a |     |
| 7a  | 17c | 27a | 37d |     |
| 8c  | 18c | 28a | 38c |     |
| 9a  | 19d | 29d | 39d |     |
| 10c | 20a | 30b | 40a |     |

### Tandem

1a  
2d  
3b

### Contamination

|    |     |     |
|----|-----|-----|
| 1b | 6a  | 11a |
| 2b | 7d  | 12c |
| 3b | 8b  |     |
| 4c | 9a  |     |
| 5b | 10c |     |

**BRITISH**  
SKYDIVING  
**Intentionally Blank**