HOT AIR BALLOON MAINTENANCE MANUAL

This Manual is specific to the following balloon:

Model _____ **Constructor's Number** _____

Registration _____ **Year Of Construction** _____

Note: The manual is only required to be constructor number specific where the balloon is operated with optional systems or equipment which require the insertion of applicable maintenance manual supplements

Manufacturer: **CAMERON BALLOONS LTD**
St. Johns Street, Bedminster, Bristol BS3 4NH
UNITED KINGDOM
Tel: +44(0)1179637216 Fax: +44(0)1179661168
email: technical@cameronballoons.co.uk website: www.cameronballoons.co.uk

STATEMENT OF INITIAL CERTIFICATION

This manual provides the maintenance instructions and inspection schedule for all types and variants detailed in EASA.BA.012 and EASA.BA.013 as required by EASA Certification Specification CS31HB, Amendment 1, paragraph CS31HB.82. The technical content of this document is approved under the authority of DOA nr EASA.21J.140.

Signed..... Date.21 December 2011.....

For and on behalf of Cameron Balloons Ltd.

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Amendment Number	Description	Pages Affected	Date	Approval
1	List of Supplements and List of Effective Pages updated. Section 2: Completely re-issued to include 12 mm polyester load tapes. Pages 2-19 and 2-20 added. Section 4: 4.1.6 and Cylinder Torque values deleted (moved to Supplement 7.52) 4.1.7 and 4.1.8 renumbered accordingly. Section 6: Periodic testing of cylinders moved to Supplement 7.52. Cylinder rejection limits revised. Pages 6-23 and 6-24 deleted. Section 8 Page 8-2, 12mm tape description updated. Appendix 4, 12mm loadtape introduced, Typographical errors for O Types and Colt A Types corrected. Introduction of Supplement 7.51 Introduction of Supplement 7.52	i-iii, i-iv, i-v, i-vii to ix 2-1 to 2-20 4-2, 4-3, 6-1, 6-13 to 6-22, 8-2 A4-1 to A4-3	05/10/07	The technical content of this document is approved under the authority of EASA.21J.140 (C485)
2	List of Effective Pages, List of Supplements and contents updated. Section 2: Para. 2.1.3-Text updated, 2.1.4.4 moved to Supplement 7.2, 2.4.1 Repair limitations updated. Section 6: Para 6.5 (9) deleted (duplicate of 3) 6.17.2 amended to reflect Flight manual permitted damage limits. “general condition” para. deleted.	i-iii, i-iv, i-v, i-vii. 2-1,2-2, 2-4, 6-3, 6-8, 6-9	03/03/08	The technical content of this document is approved under the authority of EASA.21J.140 (C504)
3	Front Page updated to make manual constructor no. specific (where required) List of Effective Pages updated, List of Supplements removed (now on website) and Contents updated. Section 1: Prohibited repairs deleted, Propane cylinder guidance added, Section 2: Completely revised, Section 4: 4.2.7 alternative method of assembly, 4.5.1 100hr lubrication deleted (now part of maintenance schedule), 4.6.1 100hr lubrication deleted (now part of maintenance schedule), 4.7.4 alternative assembly method, 4.9.3-4 New gimbal block added. Section 6: Completely revised Section 7: Completely revised Section 8: Hose assembly part numbers updated, Appendix 1: Deleted, Appendix 2: 3mm wire added, 7mm wire added to table A2-2, Appendix 3: A3.2.5. Sherwood Date code corrected, Appendix 4: TR and GP Type loadtape spec. revised, Appendix 5: Completely revised. Supplement 7.52 updated Introduction of Supplement 7.53	i-iii, i-iv, i-v, i-vii. 1-1 to 1-2, 2-1 to 2-16, 4-3, 49, 4-17, 4-28, 4-30 to 4-32, 6-1 to 6-20, 7-1 to 7-2, A1-1, A1-2, A2-2, A2-4, A3-1, A3-2, A5-1, A5-2, Supp 7.52: All Supp 7.53 All	21/12/11	The technical content of this document is approved under the authority of EASA.21J.140 (C547)

Note: Any new or amended text in the revised page will be indicated by a black vertical line in the right hand margin, and the Amendment Number and the date will be shown at the bottom of the page.

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	i-iv	21 December 2011		4-10	10 April 2006		6-22	Deleted
	i-v	21 December 2011		4-11	10 April 2006		6-23	Deleted
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SECTION 4 : FUEL SYSTEM REPAIRS

1.1 INTRODUCTION

This manual sets out the procedures for the maintenance and repair of Cameron hot air balloons.

The schedule for inspections, inspection criteria and acceptance standards are detailed in Section 6.

1.2 REPAIR PARTS AND MATERIALS

The balloon must be maintained using replacement parts and materials approved by Cameron Balloons Ltd.

A list of common repair parts and materials is contained in Section 8 of this manual.

Where repair materials are not listed contact Cameron Balloons Limited.

1.3 APPLICABILITY

This manual contains maintenance and repair instructions for all Cameron and Thunder & Colt envelopes, baskets and fuel cylinders. Also covered are the maintenance and repair of Shadow, Stealth, Sirocco and Stratus burners.

For maintenance and repair instructions for all Sky envelopes, baskets and fuel cylinders, reference should be made to Sky Flight & Maintenance Manual Issue 1.5.

The following tables list burners not covered by this manual, and the applicable manuals which contain the relevant maintenance and repair information.

Thunder & Colt Burners

Approximate Date	Manual	Burner Types
1976 - 1987 1983 - 1987 1987 - 1999	Thunder Issue 3 Colt Issue 4 Thunder & Colt Issue 5	Thunder Mk2 Colt C2 C3, Magnum

Cameron Burners

Approximate Date	Manual	Burner Types
1977 - 1980 1980 - 1988 1988 - 1992 1992 - 1999	Cameron Issue 4 Cameron Issue 5 Cameron Issue 6 Cameron Issue 7	Mk3 Mk3 Mk4 Mk4 Super

For burners not listed above, Cameron Balloons Ltd. should be contacted for advice.

The Maintenance Schedule, Section 6, applies to all parts of all balloons manufactured by Cameron, Thunder & Colt and Sky regardless of their date of manufacture, and supersedes all previous inspection schedules applicable to these balloons.

1.4 PROPANE CYLINDERS

Note: The use - including handling, transportation and filling - of transportable gas cylinders manufactured prior to 2004 could be prohibited by legislation (e.g. ADR, RID, ADN) in many countries unless the cylinder has been reassessed for conformity against accepted design/manufacturing standards (e.g. pi-marked).

The owner/operator of the cylinder is responsible for establishing if compliance is required and ensuring that compliance is maintained. Cameron Balloons Ltd. is unable to provide advice on this matter and local guidance should be sought in the country of operation.

2.1 GENERAL

The general arrangement of balloon envelopes and systems are shown in the Cameron Balloons Flight Manual Issue 10, Section 6.

For repairs to envelopes fitted with Trivent Deflation Systems, contact Cameron Balloons Ltd. giving the envelope Construction Number for details.

2.1.1 Stitching

Stitch Type:	Lock Stitch
Stitch Length:	5 - 8 stitches per 25 mm (inch)
Twin Needle Spacing:	8mm (5/16”) preferred or 9.5mm (3/8”)
Needle Size:	110 (18 Singer System)

Warning: Chain stitching is not permitted for envelope repairs.

2.1.2 Envelope Thread

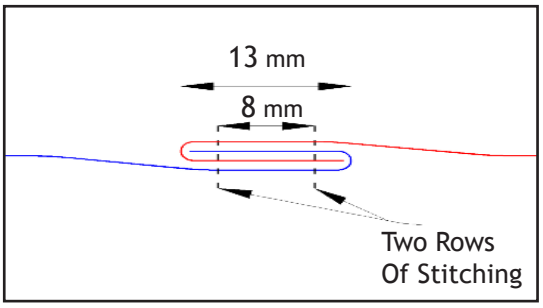
Nylon bonded three-strand metric 40 thread (Tkt No. 40 M) must be used, ideally of a contrasting colour to the fabric. Comparable specifications are VT-295E size E, Dtex 233/3 or Type 69E, T-70. The scoop or skirt is manufactured using a similar thread made from Nomex.

Nylon thread is available as ‘Universally Bonded’, ‘Usual’ (S or left-twist) wound and ‘Reverse’ (Z or right twist) wound. These thread types are interchangeable although certain types of sewing machine may require specific threads (refer to sewing machine manual).

Note: If ‘Usual’ and ‘Reverse’ wound thread is used on twin needle sewing machines, the ‘Usual’ thread should be used on the outermost needle.

2.1.3 Balloon Seam

The seam used in manufacture is known as a balloon seam (French Fell seam). To produce this seam correctly, both folded-over fabric edges should be penetrated by both rows of stitching. However it is acceptable that only one row of stitching penetrates both folded-over fabric edges (similar to the seam used in Section 2.3 Sewn Patch Repairs).



▲ Balloon Seam Cross Section

The ends of stitch lines must be locked by ‘back-tacking’ (10 mm to 30 mm) or by overlapping the stitching by a minimum of 150 mm (e.g. when a bobbin is changed) to prevent the seam from pulling apart.

2.1.4 Fabric Repair Limitations

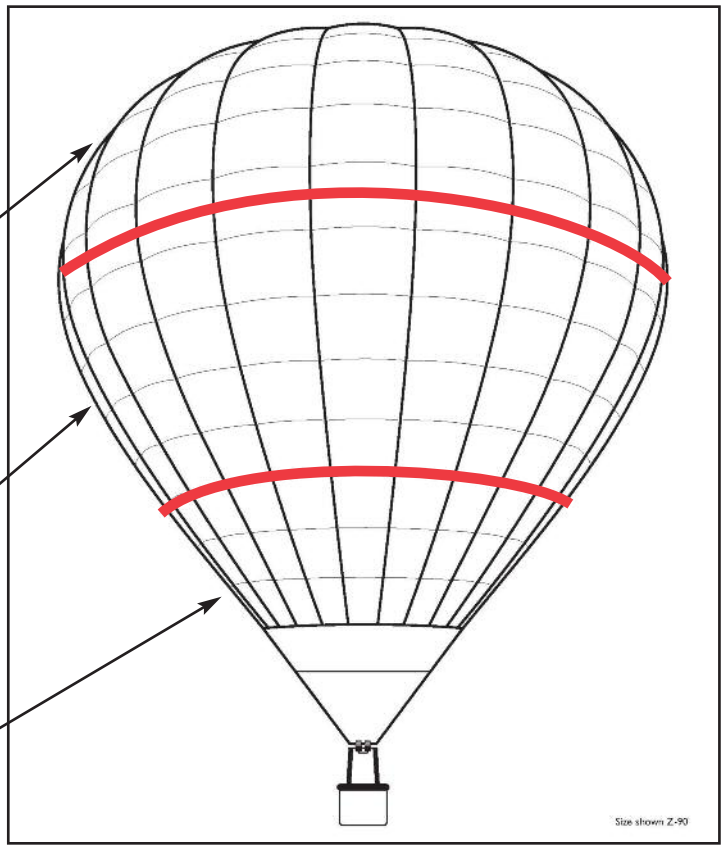
Pre-cut and pre-sewn components must be manufactured by Cameron Balloons Ltd., or by any organisation holding a written approval from Cameron Balloons Ltd. for this purpose.

The Nomex may be repaired using the sewn patch technique or by panel replacement.

Area C: Upper half of the envelope (defined as the area above the widest horizontal seam between two vertical load tapes)

Area B: Lower half of the envelope (defined as the area below the widest horizontal seam between two vertical load tapes excluding Area A)

Area A: Below the first horizontal load tape (Cameron) or the first 4 m above the Nomex (T & C).



▲ Repair area definitions

Repair / Location / Technique	Area A	Area B	Area C
Panel Replacement	Pre-cut panels or pre-sewn assemblies must be used where more than 10% of the envelope fabric panels are to be replaced at any one time		Pre-cut panels or pre-sewn assemblies must be used for all panel replacements
Sewn Patch Repairs	No limitations		
Adhesive Patch Repairs-Hyperlast	Max. diameter of hole is less than 25 mm, Max. length of tear is less than 50 mm. There must be at least 100 mm between each patch (including existing repairs).		
Adhesive Patch Repairs-Ripstop (With Stitching)	Holes and tears must be less than 75 mm in any dimension, and there must be at least 100 mm between each patch (including existing repairs).		
Adhesive Patch Repairs-Ripstop (No Stitching)	Within dimensional limitations listed above, Max. number is 60 in total (including existing repairs) and not more than 5 per panel.		
Adhesive Strip Repairs (with stitching)	Max. tear length 1.5m	Max. tear length 1.5m, Max. total length of repairs 6m	Not permitted

Note: If the damaged fabric is within 25 mm of a seam or load tape the adhesive patch or adhesive strip technique should not be used.

2.2 FABRIC REPAIRS

2.2.1 Panel Replacement

1. Unpick all the stitching around the damaged panel. If a seam is covered by a horizontal load tape, this should be unpicked to reveal the panel seam. Vertical tapes are sewn on at the same time as the vertical seams are made. Using a seam ripper, break apart every 3rd or 4th stitch and carefully pull the seam apart. Remove all traces of thread from the area unpicked. For ease of sewing, unpicking should extend at least 100 mm beyond the panel limits.

2. The replacement panel may be copied from an existing panel (within the limitations of Section 2.1.4). Remove an identical undamaged panel from the envelope and draw around its edge to transfer its profile onto the new fabric.

Note: Ensure the warp and weft of the fabric in the replacement panel are in the same direction as the original panel.

3. If the replacement panel is too large or too small for the aperture in the envelope, no part of the panel or envelope should be cut to make it fit. The edge which is too long should be sewn with a row of twin needle stitching. The thread tension should be set high enough to shrink the edge as required. Load tapes that are too long should also be shortened using this method.

4. The new panel should be stitched into the envelope using a balloon seam. Start at the intersections with the horizontal seams. When stitching the vertical seams, begin and end 150 mm beyond where the seams were originally unpicked.

Note: Where seams are attached to load tapes, the seam should be sewn first. The completed seam should then be sewn to the load tape.

2.2.2 Sewn Patch repairs

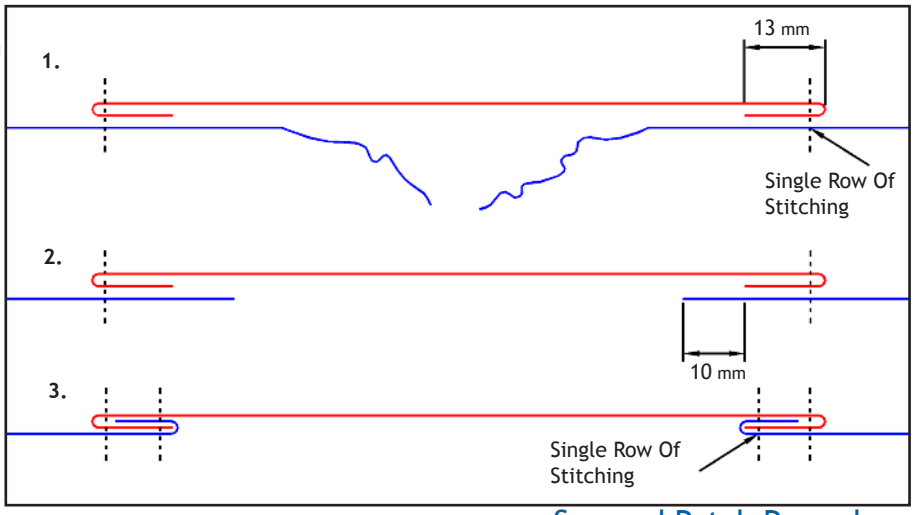
Patches may be used to make repairs to panels and should be made as follows:

2.2.2.1 Seamed Method

1. Cut patch to shape, fold edges over 13 mm and sew to the damaged area of the envelope.

2. Cut out the damaged area leaving 10 mm excess as shown.

3. Fold the excess under and sew as shown.



Seamed Patch Procedure

These seams are not true balloon seams because the outer row of stitches penetrates only three layers of fabric.

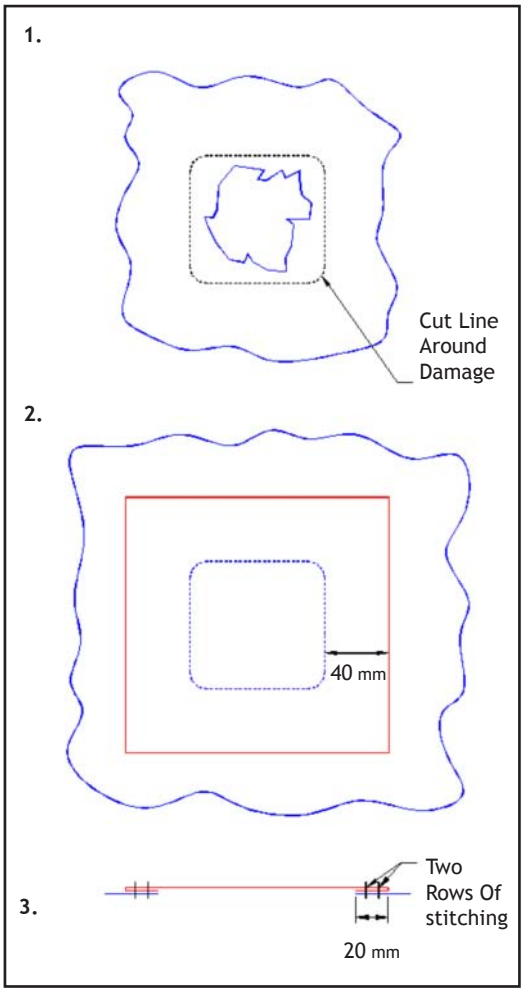
If the damage extends to within 25 mm of a seam, the seam should be unpicked and the patch continued to the panel edge. The seam at the panel edge should be re-sewn using a balloon seam.

2.2.2.2 Hot Cut and Overlay Method

1. Place a flat piece of wood inside the envelope, under the damaged panel. Remove the damaged area with a hot knife (this will seal the edges of the fabric). Cut a rectangular aperture with radiused corners.

2. Cut an oversize patch, adding a 40 mm seam allowance in each direction.

3. Sew the patch to the panel with a 20 mm folded hem as shown.



▲ 'Hot Cut And Overlay' Procedure

2.2.3 Adhesive Patch Repairs

Adhesive patches may be made either from envelope fabric applied using a neoprene contact adhesive or from Cameron repair tape.

The patch should be cut with radiused corners and should overlap the damage by a minimum of 25 mm in each direction.

Two patches must be used, one on each of the inner and outer surfaces of the envelope.

Adhesive patch repairs to Hyperlast fabric must have two rows of stitching around the periphery of the patch.

Adhesive patch repairs to ripstop envelope fabric should preferably have a single row of stitching around the periphery of the patch although it is permissible to omit this process within the limitations of Section 2.1.4.

2.2.4 Adhesive strip repairs with Stitching

Tears in the envelope fabric may be repaired by using strips of balloon fabric applied using a neoprene contact adhesive or with Cameron repair tape.

The edge of the strip must overlap the original fabric by 25 mm, and two rows of stitching must be sewn around the edges of the strip.

2.3 LOAD TAPE REPAIRS

2.3.1 GENERAL

Warning: The envelope load tapes are an essential part of the balloon's structure. Correct specifications for load tapes are given in Appendix 4 and all repairs must be made using tape of the same specification as the original.

To avoid excessive puncturing of the envelope fabric, the joint should be completely sewn on the tape alone. The tape is then sewn to the fabric with two rows of stitching.

Cut tape ends must be melted with a flame or hot knife to prevent fraying. Joints must be made to the same specification as the original joints at the ends of the load tape.

Joints or turnbacks in the load tapes are specified by a measured length before sewing (allowing for shrinkage during sewing) and a minimum finished length.

Special-shaped envelopes may use alternative specifications of horizontal load tape and Cameron Balloons must be contacted for advice when repairing these envelopes.

Note: An alternative method of flying cable replacement, which does not require any sewing, is given in Section 2.5.1

Note: If a tape is damaged near to an extremity, the entire Section from the damaged area to the end of the tape should be replaced.

2.3.2 Horizontal Load Tapes

All joints are secured with two rows of parallel stitching where each row of stitching must extend beyond each end of the joint for a minimum of 150 mm.

Nylon and polyester tapes must not be used together on the same horizontal load tape. Repairs must be made using the same specification of tape as is already fitted. If a complete horizontal is being replaced, 20 mm polyester or 25 mm nylon tape to the correct specification may be used.

Tape Width \ Joint Length	Measured length (mm)	Finished length (mm)
12	385	350
20	610	600
25	610	600

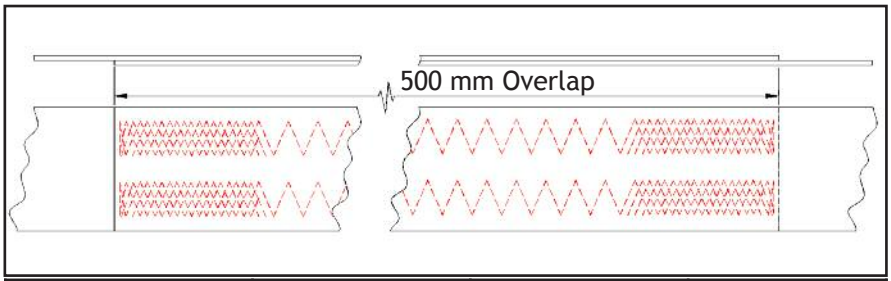
▲ Horizontal Load Tape Joints

2.3.3 Vertical Load Tapes

2.3.3.1 Standard Joint

The standard joint is constructed of parallel row(s) of 3-step zigzag stitching along the length of the joint or turnback.

The stitching is secured by back-tacking with four passes of stitching for 30 mm at the ends of each row. Care should be taken to ensure that the stitching does not run over the ends of the joint.



Tape Width (mm) \ Joint Length	Measured length (mm)	Finished length (mm)	No. of Rows
12	275	250	1
20	500	470	2
25	500	470	2
45	500	470	4

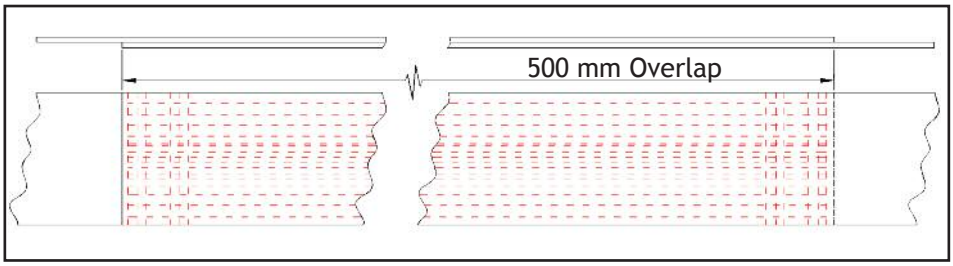
▲ Standard Zig-Zag Stitched Tape Joint Detail

2.3.3.2 Parallel Stitch Joint

Warning: Parallel stitched joints are not permitted on 12 mm polyester tape

Alternatively, if a zigzag sewing machine is not available, the joint can be secured with a number of rows of parallel stitching along its length (using either single or double needle machine).

In addition a number of rows of stitching are sewn across each end of the joint;



Tape Type	No. of Rows	No. of Rows across each end
20 mm Flat (Polyester)	8	3
20 mm Tubular (Polyester)	8	3
25 mm Flat (Nylon)	8	3
25 mm Tubular (Polyester)	14	3
45 mm Tubular (Polyester)	8	24

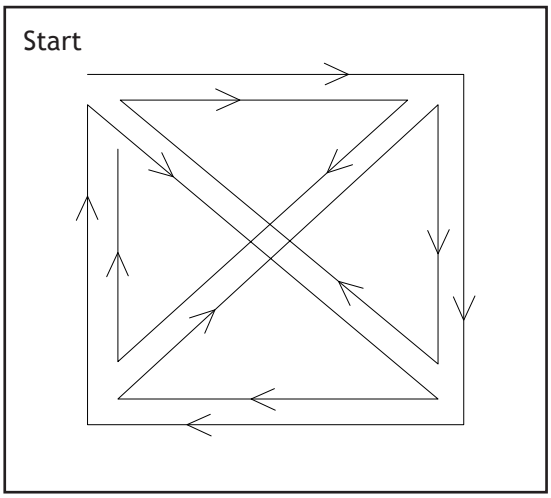
▲ Alternative Parallel Stitched Tape Joint Detail

2.3.3.3 Intersection Joint 12 mm Load Tape

Where 12 mm vertical load tapes intersect with the parachute aperture edge tape or spider tapes, the joint is made by back-tacking once across the width of the vertical tape (3 passes of twin-needle stitching)

2.3.3.4 Single and Twin Needle Box Joint

Where vertical load tapes intersect with the parachute aperture edge tape or spider tapes a single needle (20 to 25 mm wide tape) or twin needle (45 mm wide tape) box joint is used. If a "boxing" sewing machine is not available, the joint can be sewn as shown.



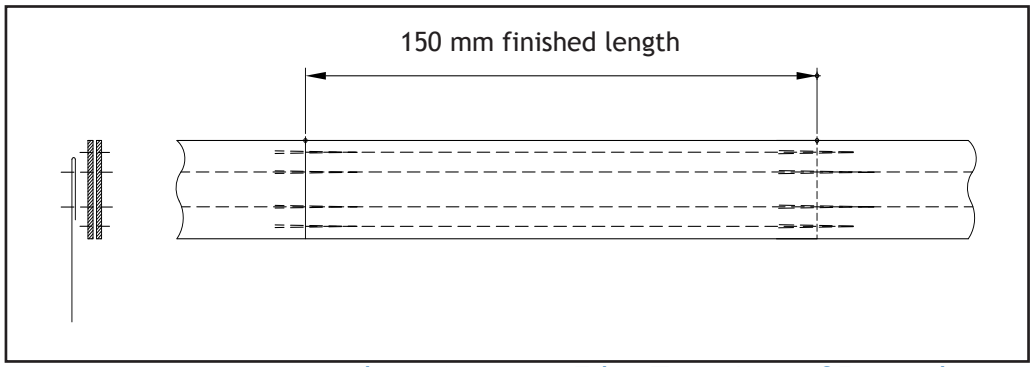
▲ Box Joint Pattern

2.3.4 Base Tape Joints

If any section of the envelope base tape requires replacement, the joints must be identical to the vertical load tapes.

2.3.5 Parachute Aperture Edge Tapes

Joints in the parachute aperture edge tape must have a minimum finished length of 150 mm with 4 rows of parallel stitching where 20 mm and 25 mm tapes are used and a minimum finished length of 255 mm overlap with 6 rows of parallel stitching where 45 mm tape is used. The end of each row should be back-tacked, overlapping the ends of the joint.

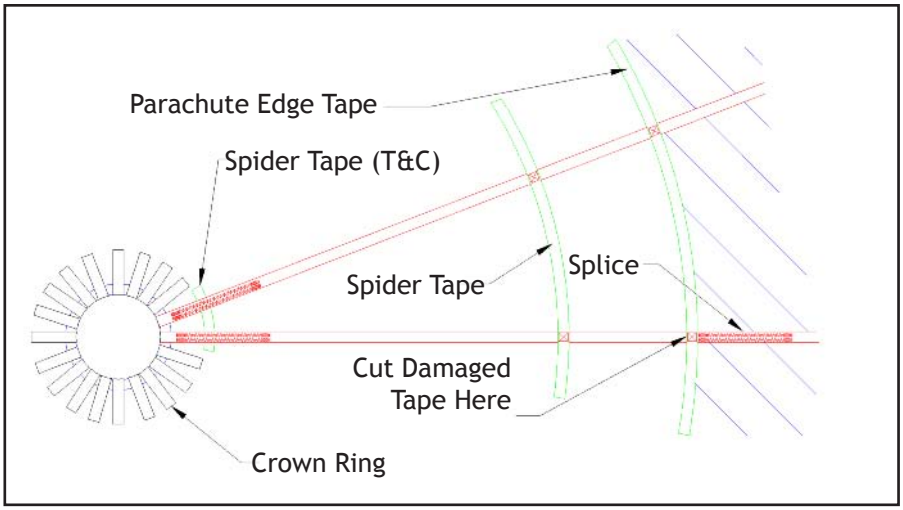


▲ Parachute Aperture Edge Tape Joint (25 mm shown)

2.3.6 Repairs to Crown Tapes: 20,25 and 45 mm tape

1. Cut the damaged tape at the point where it crosses the parachute aperture edge tape and unpick the turnback from the crown ring.

2. If the envelope is fitted with any radial load tapes (spider tapes), mark these tapes at the point at which they cross the damaged tape and unpick them from the tape.



▲ Typical Crown Tape Repair

3. Cut a length of replacement tape which is 500 mm longer than the measured length of the removed tape.

Note: It is good practice to measure an adjacent tape as a control. For the combination rip/parachute valve there are two different lengths of crown tape. The tapes over the rip panel are longer than the fixed section.

4. Stitch the replacement tape onto the original tape at the parachute aperture edge, using the standard joint method.

5. Mark the tape at 500 mm and 580 mm (500 mm and 630 mm for T&C envelopes with a spider tape adjacent to the crown ring) from the free end on the outside of the tape. If spider tapes are fitted, mark their positions on the new crown tape, as measured from an adjacent crown tape.

6. Thread the new tape 'under' (between the spider and parachute) any spider tapes and wrap round the crown ring noting the correct direction from adjacent tapes. Make sure the tape is not twisted, press the two marks together and sew the turnback.

Note: For T&C envelopes where there is a spider tape adjacent to the crown ring, the spider tape is sandwiched between the two marks before sewing the turn back.

7. Measure the repaired crown tape against an adjacent tape, there should be no more than 10 mm difference between the lengths of the two tapes.

8. Sew the spider tapes to the crown tape using the same stitch pattern as an adjacent spider tape joint.

2.3.7 Mid Gore Tapes (RDS and Smart Vent Deflation Systems)

The RDS and Smart Vent deflation systems may have additional mid-gore crown tapes. These tapes are either attached directly to the crown ring(s) or to an adjacent spider tape.

When measuring lengths for replacement tapes, care must be taken to compare the new tape length with the correct corresponding tape (main or mid-gore).

Mid-gore crown tapes that attach directly to a single crown ring are repaired in accordance with Section 2.3.5 but the replacement tape is marked 250 mm and 330 mm from the free end on the outside of the tape.

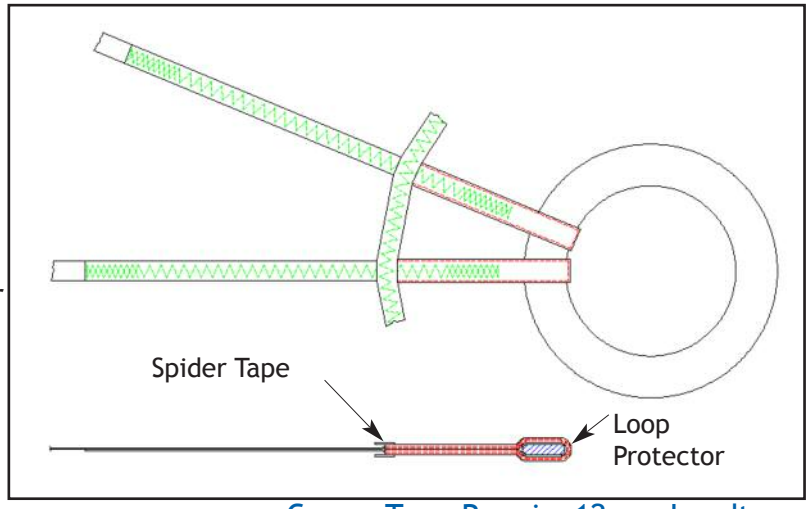
Mid-gore crown tapes that attach directly to double crown rings are repaired in accordance with Section 2.3.5 but the replacement tape is marked 250 mm and 650 mm from the free end on the outside of the tape.

Mid-gore crown tapes that attach directly to the spider tape are repaired in accordance with Section 2.3.5 but the replacement tape should be marked at 270 mm from the free end. This mark is placed against the spider and the replacement tape wrapped round it. The end of the turnback should be sewn through the spider tape.

Note: The RDS deflation system has stainless steel rings running along some of the mid-gore tapes. If one of these tapes is being replaced it is important to ensure that the ring is threaded onto the new tape before sewing the turnback.

2.3.8 Repairs to Crown Tapes:12 mm tape

The method is similar to the one described in Section 2.3.6 but the tape is protected where it passes around the crown ring by a length of 14 mm tubular webbing ('loop protector'). The spider tape is two layers of webbing between which the load tape and protector are sandwiched before the turn-back is sewn.



Crown Tape Repair: 12mm Loadtape

1. Mark both sides of the locating tape at the position were it crosses the vertical load tape.

2. Cut the damaged tape at the point where it crosses the parachute edge tape and unpick the turnback from the locating tape and the crown ring.

3. Cut a length of replacement tape which is 275mm longer than the measured length of the removed tape, and cut a 230mm length 14mm tubular webbing

Note: It is good practice to measure an adjacent tape as a control.

4. Stitch the replacement tape onto the original tape at the parachute edge, using the joint method.

5. Mark the tape at 205mm and 435mm from the free end.

6. Thread the 'loop protector' onto the replacement tape, then slide it up the tape so it sits between the two marks and pin in position.

7. Thread the replacement tape between the two layers of spider tape, around the crown ring and then back between spider tapes. Place the two ends of the 'loop protector' together and sew the turnback.

8. Measure the repaired crown tape against an adjacent tape, there should be no more than a 10mm difference between the lengths of the two tapes.

9. Sew the spider tape back together using a Zigzag stitch. Making sure to line up marks on the spider tape with the ends of the loop protector.

2.3.9 Vertical Load Tape to Flying Cable Turnback: 20,25 and 45 mm tape

2.3.9.1 Replacing Flying Cables

1. Unpick the protector and any scoop D-rings.
2. Unpick the base tape from the Nomex for 100 mm either side of the vertical tape.
3. Unpick the Nomex from the vertical tape over a distance of 100 mm beyond vertical tape joint.
4. Unpick the vertical tape turnback and remove the cable.
5. Inspect the vertical tape for wear or damage, including any caused by unpicking
6. Thread on the new cable and re-sew the vertical tape turnback.
7. Thread the cable and vertical tape between the nomex and the bottom tape and sew the vertical tape to the nomex with two rows of stitching.
8. Re-sew the base tape, making sure the vertical tape is secured to the base tape with a single needle box, or back-tacked across the junction with 12 rows of single needle stitching.
9. Re-sew the protector and any scoop D-rings.

2.3.9.2 Damage to the Tape Loop Holding the Flying Cable

1. The unpicking is the same as steps 1 to 4 from Section 2.3.9.1.
2. Cut the tape at the level of the bottom tape and heat seal the raw end.
3. Cut a length of replacement tape which is 1070 mm long.
4. Thread this tape through the eye of the cable.
5. Make a turnback by sandwiching the original tape between the replacement tape leaving a 30 mm loop
6. Complete the repair as steps 7 to 9 from Section 2.3.9.1.

2.3.10 Vertical Load Tape to Flying Cable Turnback: 12 mm tape

The vertical tape through the eye of the cable is protected with by a ‘loop protector’ (refer to section 2.3.8).

1. Unpick the protector and any scoop D-rings.
2. Unpick the base tape from the Nomex for 100mm either side of the vertical tape.

3. Unpick the 1st horizontal tape at the top of the Nomex from the envelope for 100mm either side of the vertical tape.

4. Unpick the vertical tape from the envelope to a point 600mm into the first nylon envelope panel.

5. Cut the tape leaving a 400mm tail hanging free from the envelope and heat seal the raw end.

6. Join a 1500mm length of vertical load tape to the free end with a vertical tape joint.

7. Thread the tape between the 1st Horizontal tape and the Nomex and sew to the envelope with two rows of stitching. Stop sewing 300 mm from the bottom of the Nomex.

8. Re-sew the 1st Horizontal to the Nomex back-tack across the junction with 6 rows of single needle stitching

9. Measure the free end of the tape against the Nomex and add on 335 mm, then cut and heat seal the raw end.

10. Mark the vertical load tape 275 mm and 375 mm from the free end.

11. Cut a 100 mm length of 14 mm tubular webbing for the ‘loop protector’. Thread the ‘loop protector’ onto the vertical load tape, then slide it up the tape so it sits between the two marks and pin in position.

12. Thread the replacement tape through the eye of the cable. Place the two ends of the ‘loop protector’ together and then sew a vertical tape turnback.

13. Thread the cable and vertical tape between the Nomex and bottom tape and sew the vertical tape to the Nomex with two rows of stitching.

14. Re-sew the base tape make sure that the vertical tape is secured to the base tape by 6 rows of single needle stitching.

15. Re-sew the protector and any scoop D-rings.

2.4 CONTROL LINES

2.4.1 General

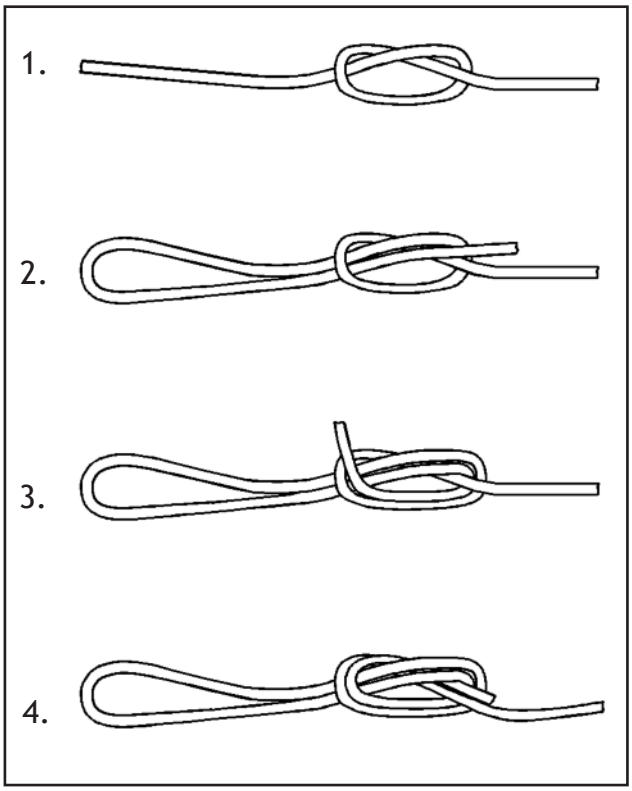
All control lines must be replaced with line identical to the original.

The overall length of the control lines must not be reduced. In cases of doubt contact Cameron Balloons Limited.

All control lines are installed using the 'Cameron' knot. When two lines are to be joined, the interlocking loops at the end of each line should be made using the 'Cameron' knot.

The free ends of polyester line should be cut with a hot knife or heat sealed with a flame.

The ends of Kevlar-cored lines should be finished off by pulling the outer covering back by 20 or 30 mm, cutting off the protruding Kevlar core and heat sealing the outer cover over the end.



Tying The 'Cameron' Knot

The free ends of Kevlar line should be taped or knotted and covered in heat-shrinkable tubing (heat-shrink) to prevent fraying.

The following control line knots should have 14 mm heat-shrink fitted over the 'tail' of the knot to prevent entanglement with other control lines-

RDS And Smart Vent Deflation Systems:

i. Crown line: Upper end of the crown line adjacent to the Crown Ring.
ii. Ripline (red): Upper end of the Ripline adjacent to the centre of the parachute or at the joint with the centre-pull lines.

Lock Top Deflation System:

i. Arming Line (black and yellow): At the joint of the lower Section and the 3 mm line.

If any of these knots have become loose or have been undone, the heat-shrink must be replaced. If the heat-shrink has become damaged, the knot 'tail' can be wrapped with 3M-365 tape until the damaged heat-shrink can be replaced.

2.4.2 Replacement (complete)

Replacement control lines should be installed whilst removing the original line. Tie the replacement line to one end of the original control line. Pull the other end of the original line through the envelope, untying and retying the knot between the replacement and original line at each pulley, allowing the rope ends to pass through. This will ensure that the replacement line follows the routing of the original control line.

Crown lines are attached to the crown ring by a tape strap and a karabiner.

2.4.3 Repair

Where possible ,the length of the repaired line should be checked against an adjacent line.

2.4.3.1 Crown Line

The crown line may be repaired by knotting. Knots should not be put in the first 7 m of the line adjacent to the crown ring as the knot may interfere with the normal working of the deflation system. The crown line should be long enough to attach to the burner frame when the balloon is inflated.

2.4.3.2 Parachute Centralising and shroud lines

If damaged, the line may either be replaced or the damaged section may be cut out and a new section knotted in.

2.4.3.3 RDS and Smart Vent shroud / centralising lines

If the line is damaged within 600 mm of the bottom pulley, the damaged section can be cut out and a replacement knotted in. If the line is damaged elsewhere the line must be replaced. Pre-shrunk line should be used for the replacement lines.

2.4.3.4 Turning Vent Lines

The 3 mm polyester lines between the vent and the control line may be replaced or repaired by knotting in a replacement section.

The Kevlar-cored control line consists of two Sections of different diameter line knotted together. This knot is protected by a nylon bullet. If the upper line is damaged within 3 m of either end of the line then a new Section may be knotted into the vent end of the line. If the lower Section is damaged then it should be replaced.

To replace the lower section:

1. Unscrew the protective nylon bullet.
2. Untie the lower line from the upper line.
3. Thread the new line through the bullet.
4. Knot in the new Section of line.
5. Screw the nylon bullet together and tighten.

Older envelopes (pre-Mod C421) are fitted with a continuous line. If this line is damaged near one end a new Section of line may be knotted in, allowing the damaged Section to be removed. Any knots must be within 3 m of either end of the control line.

2.4.3.5 Parachute Operating Lines and RDS / Smart Vent venting lines

These are installed with a reserve length stored in a long loop at the fixed end. If burn damage occurs close to the free end of the line then the damaged section may be cut off and the correct length restored by feeding rope from the loop at the fixed end into the line. If more length is needed additional rope may be tied in, but any knots must be within 3 m of either end of the control line.

2.4.3.6 RDS, Smart Vent Riplines

Envelopes ≤ 105,000 cu.ft: If the ripline is damaged then additional rope may be tied in, but any knots must be within 3m of free end of the control line.

Envelopes >105,000 cu.ft: The rip-line has two sections. If the upper section (attached to the parachute) is damaged it should be replaced. If the lower section is damaged additional rope may be tied in but any knots must be within 3m of free end of the control line.

2.4.4 Control Line Pulleys and Internal Loops

When replacing loops, pulleys etc., copy the attachment method from an original feature, noting especially the position of any heavy back-tacks on the tape. If a pulley is being replaced then it should be replaced by one of an identical type.

An alternative method of pulley replacement which does not require sewing is given in Supplement 7.53.

Warning: Pulleys not supplied by Cameron Balloons must not be used.

2.4.5 Control Line Specifications and Usage

2.4.5.1 Specifications

Envelope control line specifications are listed in Appendix 5

2.4.5.2 Usage

Envelope control line usage is listed in Appendix 5

2.5 FLYING CABLES

2.5.1 Stainless Steel Flying Cables

Warning: Replacement flying cables may only be supplied by Cameron Balloons Ltd.

Damaged flying cables should be replaced by unpicking and re-sewing the Vertical load tape to flying cable turnback as detailed in Section 2.6.5.

Alternatively, a special short cable may be ordered from Cameron Balloons and attached to the load tape loop(s) using a 'Quick-link' link. The screw gate of the Quick-link must be fixed in the closed position using Loctite 270 Studlock.

Note: Some flying cables are arranged as a pair of cables connected to a single thimble. If one of the pair of cables is damaged then the entire assembly must be replaced.

Some envelopes have a single flying cable attached to two adjacent loops of load tape. It is essential that any replacement is threaded through both loops in the same configuration.

Cameron and Thunder & Colt envelopes with a CN greater than 3000 use “standard length” flying cables, nominal length of 2557 mm, with the following exceptions;

- Envelopes with volumes of less than 56,000 cu.ft may use cables with a nominal length of 2020 mm.

- Envelopes with a CN greater than 10210 and with a volume greater than 250,000 cu.ft, excluding the Cameron A-450 and Z-600, may use cables of two different lengths, nominally 2557 mm and 2280 mm.

- The Cameron A-450 uses five different lengths of cables, nominally between 3120 mm and 3520 mm.

- The Cameron Z-600 uses eight different lengths of cables, nominally between 2930 mm and 3690 mm.

Thunder & Colt envelopes CN 001 to CN 3000 use cables “sets” where the cables are of differing lengths. When replacing cables on these envelopes, the length of the replacement cable must be compared with the original. In the case of an assembly with a pair of cables connected to a single thimble, both cable lengths must be verified. If the 'Quick link' method is being used, the replacement cable is nominally 37 mm shorter than the original cable.

2.6 PARACHUTE REPLACEMENT

Parachutes may only be replaced by Cameron Balloons Ltd. or at approved repair facilities. For further information please contact the manufacturer.

2.7 ENVELOPE CLEANING

The envelope may be cleaned by hand with warm water (40^0C max.). For heavy soiling a pure soap or a mild non-biological detergent solution may be used. It is important that any cleaners used do not contain bleaching agents.

The envelope should be rinsed with plenty of water after washing. Avoid vigorous rubbing or scrubbing as this may damage the fabric coating.

Do not attempt to wash the balloon in any type of washing machine.

When cleaning is complete the envelope should be allowed to dry naturally out of direct sunlight, then once the fabric is dry the balloon should be hot inflated to dry out the load tapes.

Caution: Drying the envelope fabric by hot inflation may damage the fabric coating.

2.8 VELCRO CLEANING

The performance of Velcro joints is improved by regular cleaning. Carefully remove all trapped materials and debris (e.g. grass, thread etc.) trapped in both halves of the Velcro joint.

Balloons with Velcro rip panels are best packed with the Velcro closed, as the 'hook' side of the Velcro is abrasive and may damage adjacent stitching etc.

2.9 VELCRO REPLACEMENT

When replacing Velcro, copy the size, sense (hook or loop) and tab colour from the original.

Carefully unpick the old Velcro and re-sew a new piece copying the original features.

Note: It is permissible to sew new Velcro over old Velcro without removing the original but it must be ensured that the patch does not become too stiff. If the old Velcro is not removed, it should be noted in the aircraft logbook.

2.10 TEST INFLATION AFTER REPAIR

If any repair has required the alteration or re-rigging of any of the envelope control systems, the envelope should be test inflated (refer to Section 6.9.4).

Burner hoses with parallel BSP fittings (Stratus burner) should be fitted with the appropriate sized 'Dowty' type bonded sealing washers.

4.2.6.1 Torque Settings

The maximum recommended torque values should not be exceeded when replacing the following components. Tapered threads (NPT) may be assembled without using a torque wrench using the procedure detailed in 4.2.6.2.

BURNER FUEL HOSES

Fitting	Thread Form	Max. Torque (Nm)
Shadow/Stealth Burner Liquid Hose	1/4 NPT	20
Shadow/Stealth Burner Vapour Hose	1/4 NPT	20
Sirocco Burner Liquid Hose	1/4 NPT	20
Stratus Burner Liquid Hose	3/8 BSP (G3/8)	20
Stratus Burner Vapour Hose	1/4 NPT	15

Note: 1 Nm = 0.737 lb ft = 8.85 lb in.

4.2.6.2 Assembly Taper threads

The NPT standard specifies the length of hand tight engagement (the distance the pipe thread can be screwed in by hand) and the effective thread (the length of the thread which makes the seal). In practical terms these distances can be translated into how many turns to make by hand and how many with a spanner.

A simple method of installing the hoses is to screw the hose into the manifold block until it is hand tight and then tighten with a spanner for an additional 1-2 turns.

The table below shows the distances and number of turns called for in the standard. A tolerance of plus or minus one turn is allowed.

Caution: Only use flat jaw spanners. Stilsons/pipe wrenches must not be used.

Nominal Size	Actual OD in (mm)	Threads per Inch	Length of engagement (tighten by hand) in (mm)	Length of effective thread in (mm)
1/4"	0.546 (13.87)	18	0.172 (4.37)=3.1turns	0.401(10.19)

4.3 CONSUMABLE ITEMS

Consumable items required to complete the fuel system maintenance actions described in this manual are listed in Section 8.4.2

Use only the lubricants specified in each operation and referenced above. In general KSP125 (which is a specially formulated PFPE lubricant) is specified for applications where the components are actually immersed in liquid propane, and silicone based lubricants are specified for all other areas.

WARNING: Graphite based 'dry film' lubricants must not be used to lubricate any part of the fuel system.

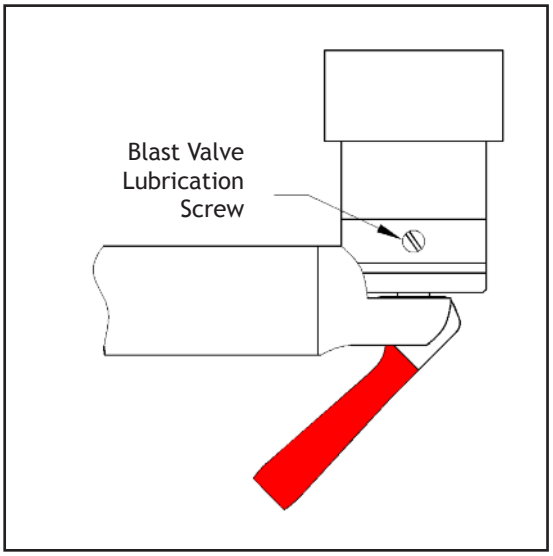
4.5 STEALTH / SHADOW BURNER

4.5.1 Regular Maintenance

Regular lubrication of the blast valve and whisper valve with Cameron KSP125 grease will improve the life of the valve seals.

4.5.1.1 Lubrication of Main Blast Valve

1. Remove the blast valve lubrication port blanking screw.
2. Fill the lubrication reservoir with 0.5 ml of Cameron KSP125 grease.
3. Replace the lubrication port blanking screw, ensuring that the 'O'-ring is still present. This will push the grease onto the blast valve 'O'-rings.
4. Clean off excess grease.



▲ Shadow / Stealth Blast Valve Lubrication Port Location

4.5.1.2 Lubrication of Whisper Valve

1. Use a 2.5 mm Allen key to remove the lubrication port blanking screw in the centre of the whisper valve stem.
2. Fill the lubrication reservoir with 0.5 ml of Cameron KSP125 grease.
3. Replace the lubrication port blanking screw. This pushes the grease onto the whisper valve 'O'-rings.
4. Clean off excess grease.

4.5.1.3 Adjustment of Whisper Valve

If the whisper valve fails to shut off it can be adjusted as follows:

1. Turn the whisper valve to the **open** position.

Note: Adjusting the valve action with the valve in the closed position may damage the valve.

2. Loosen but do not undo the socket set screw on the side of the black lower cam (3 mm Allen key). The threaded stem has four flats.

3. Using a large screwdriver (8 mm blade) turn the stem of the whisper valve ¼ turn clockwise to adjust the action of the valve. One of the flats in the valve stem should now be lined up with the socket set screw threaded bore.

4. Tighten the socket set screw.

5. Check action of the whisper valve and repeat the procedure if necessary.

Note: The whisper handle should move through approximately 15° before the valve opens.

4.5.1.4 Adjustment of Pilot Light Valve

If the pilot light valve fails to shut off it can be adjusted as follows:

1. Turn the pilot light valve to the **open** position.

Note: Adjusting the valve action with the valve in the closed position may damage the valve.

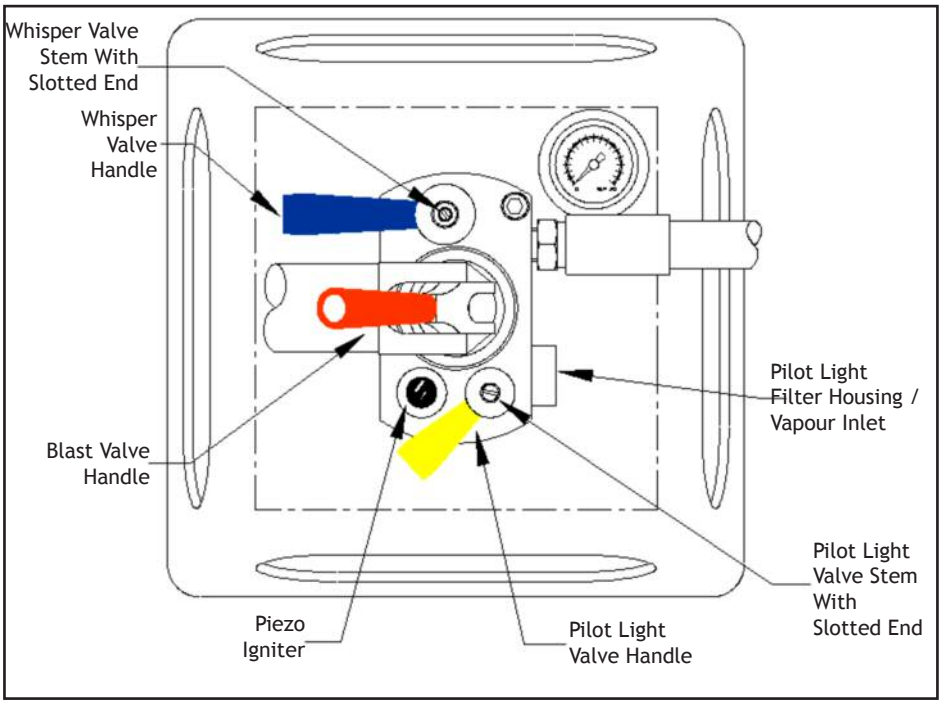
2. Loosen the valve handle (5 mm Allen key).

3. Using a large screwdriver (8 mm blade) turn the stem of the valve ½ turn clockwise to adjust the action of the valve.

4. One of the flats in the valve stem should now be lined up with the valve handle.

5. Tighten the valve handle.

6. Check the action of the pilot light valve and repeat the procedure if necessary.

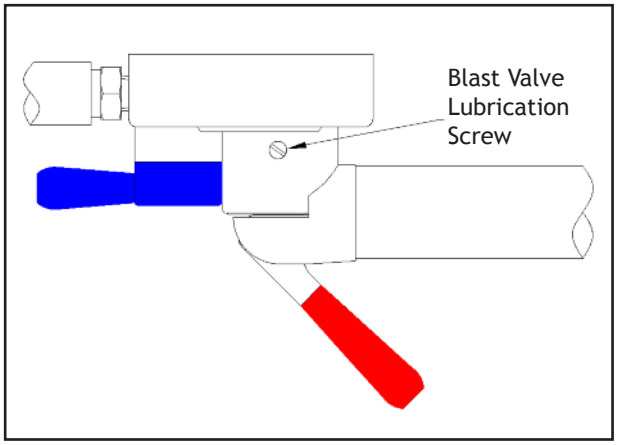


▲ Shadow / Stealth Manifold Block

4.6 SIROCCO BURNER

4.6.1 Regular Maintenance

4.6.1.1 Lubrication of Main Blast Valve



▲ Sirocco Blast Valve Lubrication Port Location

1. Using a flat blade screwdriver, undo the lubrication port blanking screw and remove.
2. Fill the lubrication reservoir with 0.5 ml of Cameron KSP125 grease.
3. Ensure that the 'O'-ring is still present and replace the lubrication port blanking screw.
4. Clean off excess grease.
5. Check valve for correct operation.

4.6.1.2 Adjustment of Whisper Valve

If the whisper valve fails to shut off it can be adjusted as follows-

1. Turn the whisper valve to the **open** position.
2. Loosen (but do not undo) the whisper valve handle using a 5 mm Allen key. The threaded valve stem has two flats, parallel with the screwdriver slot, visible at the centre of the handle body.
3. Using a flat blade screwdriver (5 mm blade) turn the stem of the whisper valve ½ turn clockwise to adjust the action of the valve.
4. One of the flats in the valve stem should now be in line with the base of the handle.
5. Re-tighten the valve handle.
6. Check the action of the whisper valve and repeat the procedure if necessary.

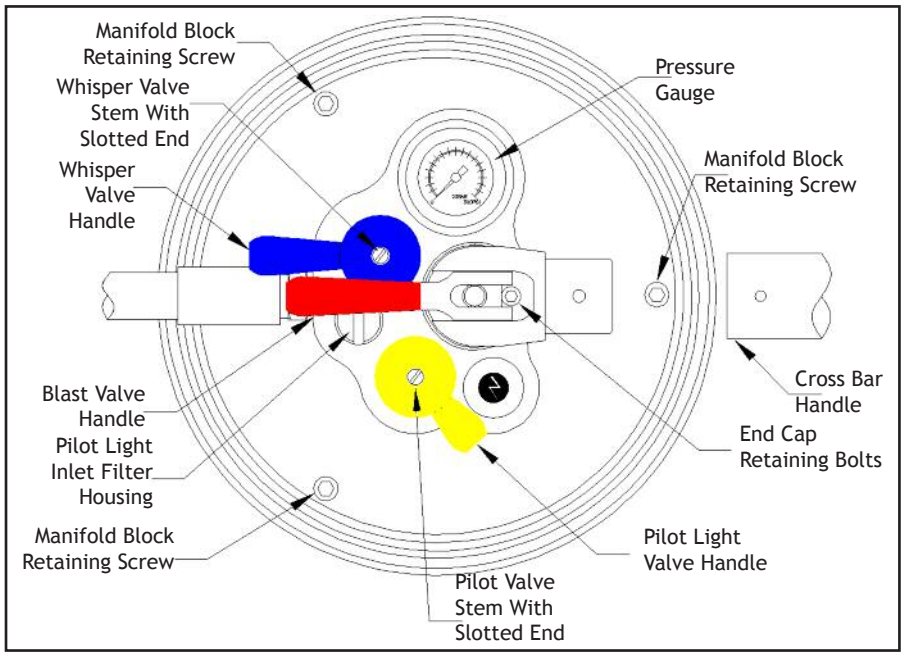
Note: The valve handle should have approximately 15° to 20° of free movement before the valve begins to open.

4.6.1.3 Adjustment of Pilot Light Valve

If the pilot light valve fails to shut off satisfactorily then it can be adjusted as follows-

1. Turn the pilot valve to the **open** position.

2. Loosen (but do not undo) the pilot valve handle using a 5 mm Allen key. The threaded valve stem has two flats, parallel with the screwdriver slot, visible at the centre of the handle body.



Sirocco Manifold Block Cross Bar Handle

3. Using a flat blade screwdriver (5 mm blade) turn the stem of the pilot valve ½ turn clockwise (in) to adjust the action of the valve.

4. One of the flats in the valve stem should now be in line with the base of the handle.

5. Tighten the valve handle.

6. Check the action of the pilot valve and repeat the procedure if necessary.

Note: The valve handle should have approximately 15° to 20° of free movement before the valve begins to open.

4.6.2 Liquid Pilot Light

4.6.2.1 Introduction

The regulated liquid pilot light incorporates two filters to prevent the ingress of foreign matter into the vaporiser and jet.

Inlet Filter: A sintered filter located at the inlet of the vaporiser.

Outlet Filter: A sintered filter located at the outlet of the vaporiser before the jet.

9. Refit the pilot light flame tube onto the regulator ensuring that the parts are tightly screwed together, and that the air regulator (4) is covering only one of the two intake holes.

10. Refit the pilot light assembly into the valve block ensuring that the static sealing ring (11) is correctly in position.

11. Tighten the pilot light flame cup (1) until it is possible to set the tip of the igniter electrode such that a spark of 4-6 mm jumps to the edge of one of the holes in the flame cup.

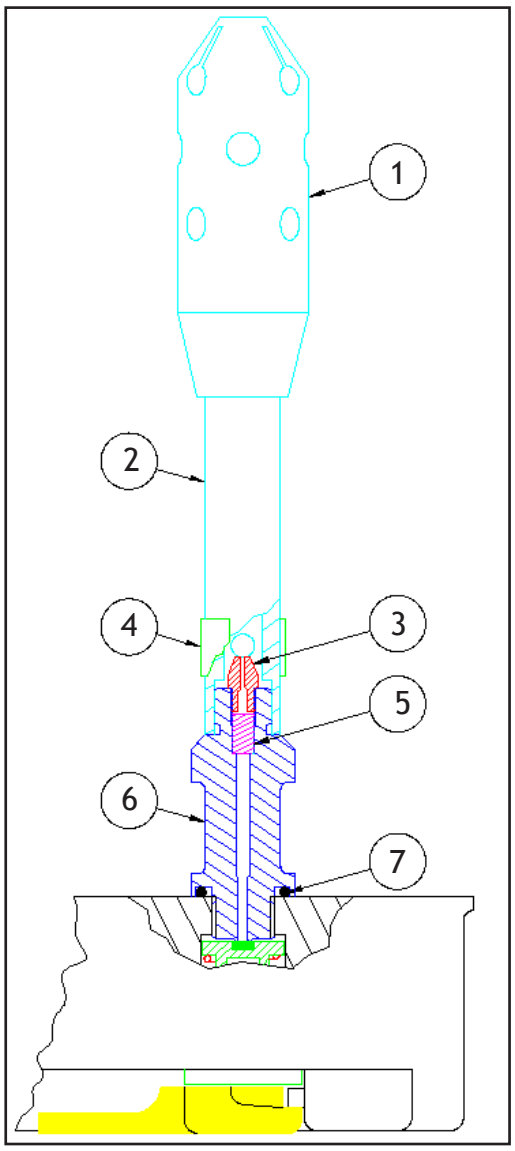
12. Test run the pilot light system when completed, checking for any external leaks (which must be rectified), reliable ignition from the piezo igniter and normal flame size and appearance.

4.7.3 Vapour Pilot Light

4.7.3.1 General Description

The vapour pilot light consists of a flame tube mounted on a fitting containing the jet filter which is in turn mounted on top of the manifold valve block. The vapour fuel is supplied through a pressure regulator (installed on the fuel cylinder) which automatically maintains a constant pilot light flame size regardless of fuel pressure and altitude.

Any contamination of the vapour pilot light system usually manifests itself as a sudden reduction in pilot flame size. If this occurs then the pilot light jet and filter should be dismantled and cleaned before the next flight.



Stratus Vapour Pilot Light

4.7.3.2 Removal and Cleaning of Vapour Pilot Jet and Filter

1. Unscrew the pilot light flame tube (2) from the jet holder fitting (6) to reveal the jet (3).

2. Unscrew the pilot light jet.

3. Tilt the burner to remove the filter element (5).

4. Fit a new filter and jet or thoroughly clean using a hydrocarbon solvent before being refitted.

5. Refit the pilot light flame tube ensuring that the parts are tightly screwed together and that the air regulator (4) is covering only one of the two intake holes.

6. Tighten the flame cup (1) until it is possible to get the tip of the igniter electrode such that a spark of 4-6 mm jumps to the edge of one of the holes in the flame cup.

7. Test the pilot light system.

4.7.4 Replacement of Piezo Igniter

In the event of failure of the piezo igniter the whole igniter assembly should be removed from the burner for repair-

1. Move the pilot light valve handle to the 'on' position to reveal the piezo igniter housing.

2. Using the tube tool supplied with the burner, engage the slots in the igniter housing (6) and maintaining firm pressure on the tool, unscrew the housing.

3. With the housing removed from the burner, mark the position of the electrode tip (1) onto the outside of the housing (this is an important aid to reassembly).

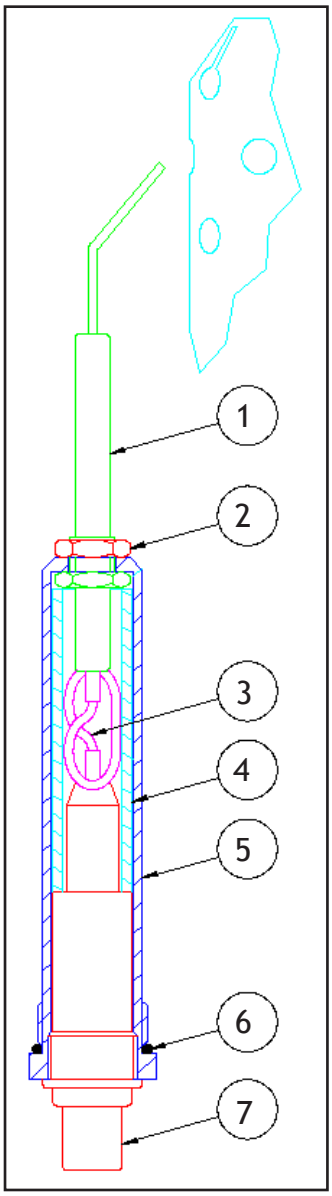
4. Unscrew the lock nut (2) on the electrode and then unscrew the piezo push-button unit (7). This will remove all the internal parts of the igniter.

5. Replace any defective items in the assembly and then carefully re-insert the parts into the housing, ensuring that both ends of the lead remain firmly plugged onto the terminals.

CAUTION: The igniter electrode ceramic insulation (1) is very brittle, using excessive force may cause it to shatter.

6. Tighten the push-button igniter unit into the housing and then adjust the electrode to be in line with the mark made in step **3**. Tighten the electrode lock nut.

7. Check the 'O'-ring (6) is in good condition, and then re-fit the assembly into the burner and tighten.



▲ Stratus Piezo Igniter

8. Ensure the spark gap is 4-6 mm and the spark jumps to the edge of one of the flame cup holes.

NOTE: Later assemblies are fitted with a spring replacing item 3

4.7.5 Stratus Main Burner Jets

Burner jets may be removed for cleaning, inspection or replacement using a socket spanner with a long extension. On replacement, Loctite 572 sealant should be applied to the screw thread of each jet. The jets should be tightened to a maximum torque of 9 Nm (6.5 lb.ft).

Regular inspection will reveal any loose or missing jets. Any jets which are loose should be removed and refitted using thread sealant.

4.7.6 Crossflow Valve (Triple And Quad Burners Only)

Minor leaks from the handle of the valve may be cured by tightening the stem-

1. Remove and discard the 'Nyloc' nut that retains the handle.

2. Apply Loctite 270 Studlock to the threads of the spindle.

3. Using a new 'Nyloc' nut, tighten the nut onto the spindle, checking the ease of rotation of the handle. The handle should move easily, but with noticeable friction. Over tightening the nut will make the valve stiff to operate and will cause premature wear of the seals.

Other failures will require replacement of the valve.

4.8 MK. 4 MINI BURNER

The MK IV Mini burner uses a single Shadow manifold mated with a mini coil / can assembly.

Maintenance is identical to the single Shadow burner with the exception of the burner jets which should be bonded in place with Loctite 572.

Note: The jets are not fitted with a copper washers.

4.9 BURNER FRAME

4.9.1 Replacement of Corner Buffers

If the corner buffers become damaged, they should be replaced.

1. Undo the bolt retaining the corner buffers (10 mm spanner).

2. Lubricate the replacement corner buffers. Rubber buffers should be lubricated with silicone spray. Nylon corner buffers should be lubricated with Molycote 33 grease,

3. Refit the bolt through the corner socket and buffers. The bolt should be rotated during assembly to prevent damage to the inner diameter of the new buffers.

4. Tighten retaining bolt and domed nut. Lock using Loctite 270 Studlock.

4.9.2 Aluminium Heat Shields

Aluminium heatshields are fitted using 4 mm Allen screws and domed nuts, which should be locked using Loctite 270 Studlock.

4.9.3 Gimbal Mounted Burner Removal

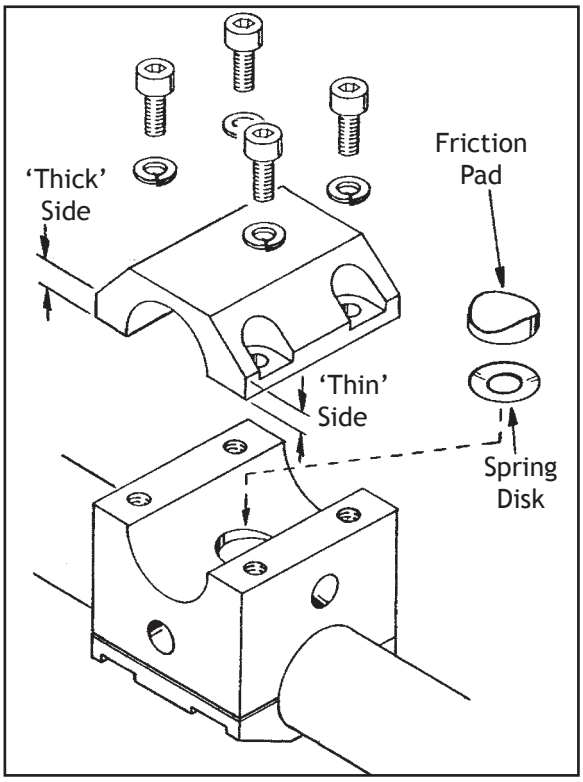
To remove the burner from the frame, remove the four bolts or aerotight nuts (Mod. C512) securing the gimbal block cap and remove the burner. The orientation of the burner in the frame should be noted prior to removal.

4.9.4 Gimbal Mounted Burner Refitting

4.9.4.1 Gimbal Block (CB2556)

To refit the burner into the gimbal block:

1. Place the spring disk and friction pad into the gimbal block.
2. Lightly coat the burner mounting bracket with Molycote 33 grease
3. Locate the burner in the gimbal block, ensuring it is correctly orientated.
4. Apply Loctite 222 to the bolts on the 'thick' side of the cap and fit them into the block with the spring washers. Fully tighten the bolts (4 mm Allen key).
5. Apply Loctite 222 to the bolts on the 'thin' side of the cap and fit them into the block with the spring washers. Tighten the bolts (4 mm Allen key) until the burner moves with the correct resistance.

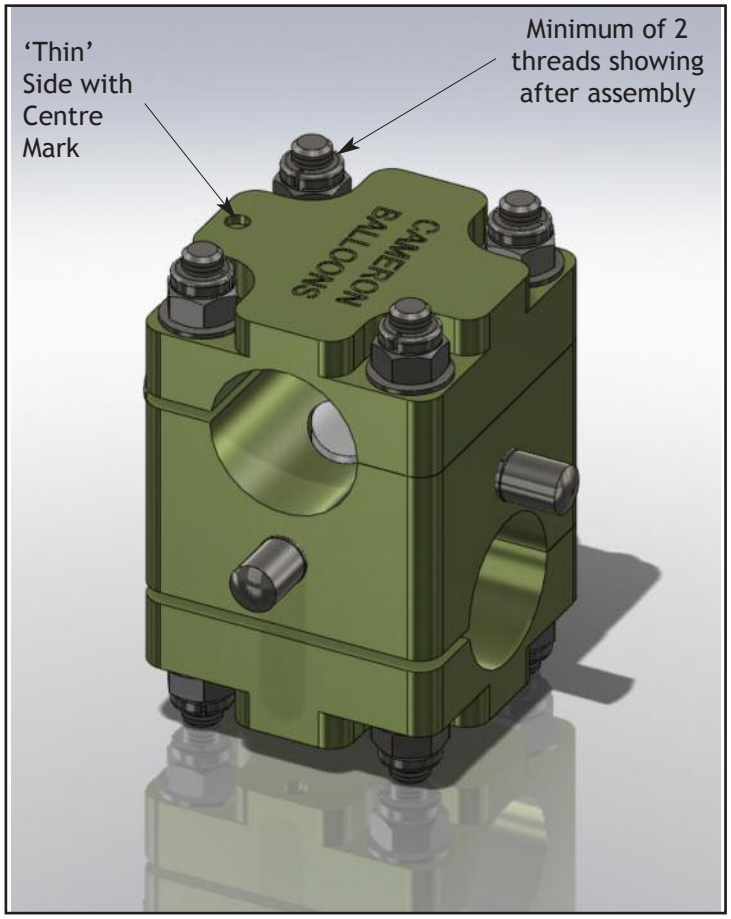


▲ Gimbal Block Assembly

4.9.4.2 Gimbal Block (CB2950-Mod C512)

Assembly of the heavy duty gimbal block is similar to the standard gimbal block but the bolts are replaced by interference studs and Aerotight nuts.

There must be two complete threads showing following assembly.



Heavy Duty Gimbal Block Assembly

4.10 ADJUSTING GIMBAL FRICTION

4.10.1 Double / Triple / Quad Burner

To adjust the friction of the standard gimbal block, remove the two bolts on the 'thin' side of the cap and proceed as per Section 4.9.4 step 5.

To adjust the friction of the heavy duty gimbal block, loosen or tighten the two nuts on the thin side as required.

4.10.2 Single Burner

To adjust the friction of the gimbal action:

1. Using two 13 mm spanners, hold the inner adjusting nut and remove the domed locknut, followed by the adjusting nut.

2. Apply Loctite 270 to the bolt, then refit and tighten the retaining nut until the burner moves with the desired resistance.

3. Apply Loctite 270 to the bolt threads and refit the domed locknut, holding the adjusting nut with a 13 mm spanner.

Note: This procedure should be performed for each of the pivots. Care should be taken to adjust each pivot equally.

4.11 HOSE END FITTINGS

There are two types of fittings used on the ends of the burner fuel hoses.

4.11.1 Tema 3800 Coupling

The 'O'-rings may be replaced if defective. Lubricate the new 'O'-rings with silicone spray prior to fitting.

4.11.2 1¼" ACME Coupling

There are no repairable items in the 1¼" ACME coupling, and it must be replaced if defective.

6.1 GENERAL

This is the manufacturer's recommended Maintenance Schedule for all Cameron, Colt, Thunder, Thunder & Colt and Sky hot air balloons.

The following pages can be copied and used as a check list/record of inspection for complete balloons or components inserting the details in the boxes provided. Where a section is not applicable, N/A should be entered in the box.

6.2 SCHEDULED INSPECTIONS AND COMPONENT LIFE

6.2.1 Scheduled Inspections

Component/ Inspection	Frequency			
	Calender	Permitted Variation	Hours	Permitted Variation
Envelope				
Annual/100hr	Annual	one month	100 hr	10 hr
Burner				
Annual/100hr	Annual	one month	100 hr	10 hr
Basket				
Annual/100hr	Annual	one month	100 hr	10 hr
Cylinder				
Annual	Annual	one month	None	None
Periodic	10 years	three months	None	None

Notes:

1. The inspections must be performed at the prescribed intervals at whichever limit occurs soonest (calender or hours).

2. Permitted variations for tasks controlled by flying hours should not be understood to be a maintenance planning tool, but as an exceptional means to allow the operator to fly for a limited period of time until the required maintenance is performed.

3. Permitted variations may **not** be applied to applicable airworthiness life limitations, airworthiness directives or Generic requirements.

4. Permitted variations are not required to be deducted from the next scheduled check.

5. Any applications of a permitted variation to the maintenance check cycle period must be recorded in the log book together with the reason for the variation by a person who is authorised to sign the log book entry for that particular check. Details of the permitted variation must be made visible to the pilot.

6.2.2 Component Lives

Component	Life Limit			
	Calender	Permitted Variation	Hours	Permitted Variation
Envelope: Velcro, Rip Panel edge Velcro (triangular and rectangular panels)	None	None	100 hr	None
Basket: None	-	-	-	-
Burner: None	-	-	-	-
Cylinder: Pressure Relief Valve	10 years*	None	-	None

Note: * Pressure relief valves have a maximum storage life (prior to installation) of 5 years. Where the date of installation is not known the maximum service life is ten years from the date marked on the valve.

6.3 UNSCHEDULED INSPECTIONS

Unscheduled inspections are those inspections, other then the Scheduled Inspections prescribed in Section 6.2, which must be performed as conditions dictate. They are:

1. Pre-flight Inspections (Section 6.9.1)
2. Envelope Overheat Inspections (Section 6.9.2)
3. Powerline Contact Inspections (Section 6.9.3)
4. Test Inflation After Repair (Section 6.9.4)

6.4 DOCUMENTATION

Check the serial numbers of all the equipment listed in the logbook (baskets, cylinders, burners, envelopes etc.) against those to be inspected.

If any equipment is missing or additional to the original list, then note the addition or deletion of equipment in the logbook.

Check the logbook for the balloon's age and hours flown. This will provide a general idea of the condition to be expected and will indicate whether a grab test of the envelope fabric is necessary.

Examine the logbook with particular attention to maintenance, repairs, modifications and flights/hours since the previous inspection. Parts of the balloon that have been repaired or serviced should have extra attention paid to them during the inspection. During the inspection be particularly vigilant for non-approved modifications and non-approved repairs.

A list of outstanding Service Bulletins which may apply to a balloon is on the Cameron Balloons website.

If there is no mention in the logbook of the Service Bulletin having been completed, either refer to the Cameron Balloons website or contact Cameron Balloons, for details of the relevant Service Bulletin.

6.5 ENVELOPE

Envelope Hours at inspection date:	
Envelope hours at end of preceding calender year	
Applicable AD or SB:	
Document Check:	

6.5.1 Envelope Structure

Component	Check / Inspect / Record	Pass/Fail (✓)/(x)
Crown Line	Inspect condition	
Crown Ring	Inspect for damage and Corrosion	
Vertical Load Tapes	Inspect turnbacks at crown ring	
	Inspect joints between vertical tapes and any tapes overlying the parachute or rip panel	
	Inspect joints between vertical tapes and the top edge of the envelope	
	Inspect tapes	
	Inspect joints between load tapes and flying cables	
	Inspect load tape protectors	
Horizontal Load Tapes	Inspect parachute edge tape	
	Inspect horizontal load tapes	
	Inspect base tape	
Fabric Panels	Inspect for damage, porosity, overheating or weakness	
	Inspect joints and stitching	
Flying Cables	Inspect for damage, annealing, maillon links for security (if fitted)	
Grab Test	Check and Record, All colours tested (Repeat each annual inspection >250hr or at inspectors discretion). Minimum Strength= 30lb (13.6kg). Refer to Section 6.7	

Workpack No.	CN	Inspection Date	Inspectors Signature/No.

6.5.2 Deflation System

Component	Check / Inspect / Record	Pass/Fail (✓)/(x)
Fabric Panels	Inspect for damage, porosity, overheating or weakness (especially edges)	
	Inspect joints and stitching	
Sewn Loops	Inspect for damage, wear, security (both on the deflation panel and envelope)	
Centralising Lines	Inspect for damage wear, security of knots	
Shroud Lines	Inspect for damage wear, security of knots	
Top strings	Inspect for damage wear, security of knots	
Control Lines	Inspect for damage wear, security of knots	
Control Line Attachments	Inspect for damage, wear, security (both on the deflation panel and envelope)	
Control Line Pulleys	Inspect for wear, free running, contamination, security of attachment	
Maillon Links	Inspect for Security, damage, heatshrink complete and undamaged	
RDS Pulleys	Inspect for wear, free running, contamination, security of attachment	
Transparent Panels	Inspect the window material for tears or cracking	
	Inspect the adhesive tape fitted to the edge of the window	
Guide Rings	Inspect for damage, wear, security of attachment	
Riplocks/ Capewells	Inspect Riplocks/Capewells and check installation/function	
Arming Shackle	Inspect the condition of the quick release shackle and check that it operates smoothly (Lock Top only)	
Grab Test	Check and Record, All colours tested (Repeat each annual inspection >250hr or at inspectors discretion). Minimum Strength= 30lb (13.6kg). Refer to Section 6.7	
Parachute Edge grab Test	Check and Record, All colours tested (>250hr or at inspectors discretion) between the edge of the panel and the Velcro tabs. Minimum Strength= 21lb (9.5Kg)	

Workpack No.	CN	Inspection Date	Inspectors Signature/No.

6.5.3 Turning Vents/Side Dump

Component	Check / Inspect / Record	Pass/Fail (✓)/(x)
Fabric Panels	Inspect for damage, porosity, overheating or weakness (especially inside the envelope)	
	Inspect joints and stitching	
Free Tapes	Inspect condition of stitching at ends of tapes	
Pulling Triangles	Inspect condition of stitching	
Control Lines	Inspect for damage wear, security of knots	
Control Line Attachments	Inspect for damage, wear, security (both on the deflation panel and envelope	
Control Line Pulleys	Inspect for wear, free running, contamination, security of attachments	
Shock Cord	Inspect condition, check operation	
Vent Line Stop	Inspect condition, correctly fitted.	

6.5.4 Envelope Temperature Measurement

Component	Check / Inspect / Record	Pass/Fail (✓)/(x)
Temperature Flag	Check temperature streamer and melting link are securely attached	
Tempilabel	Inspect the Tempilabel. Record the Max. Temperature indicated in the logbook. If >121C Perform overheat inspection	

6.5.5 Test Inflation (if required)

A test inflation is required for Special Shape Balloons but optional for conventionally shaped balloons.

System	Check / Inspect / Record	Pass/Fail (✓)/(x)
Deflation System	Inspect Seals, Functional Check	
Turning Vents	Inspect Seals, Functional Check	
Dumps	Inspect Seals, Functional Check	

Workpack No.	CN	Inspection Date	Inspectors Signature/No.

6.5.6 Grab Test Results

6.5.6.1 Grab Test Results-Envelope

Colour	Result	Colour	Result

6.5.6.2 Grab Test Results-Deflation System

Colour	Result (panel/edge)	Colour	Result (panel/edge)

Notes:

Workpack No.	CN	Inspection Date	Inspectors Signature/No.

6.5.7 Burner System

Burner Type:			Part No.:	
Burner Serial No.:			Frame Part No:	
Serialised Parts	1	2	3	4
Coil				
Block				

Component	Check / Inspect / Record	Pass/Fail (✓)/(x)
Burner Frame	Inspect welds for cracking	
	Inspect tubes for distortion/deformation/cuts/gouges	
	Inspect frame for security of fasteners (heat shields,flexi corners)	
	Inspect frame lugs for wear, cracking.	
	Inspect general condition (corrosion, heatshields)	
Gimballing	Check stiffness, security of fittings	
Height adjustment	Check Function, Leaks. Check SB19	
Karabiners	Inspect for wear, corrosion, correct function, correct type	
Burner System	Leak Check (including manifolds)	
Hoses	Inspect all Hoses, check dates (if applicable)	
Pressure Gauges	Check Pressure Gauge reads zero when no pressure applied, lens present	
Pilot Valves	Check Shut off, free movement, Correct Function, lubricate if necessary*	
Whisper Valves	Check Shut off, free movement, Correct Function, lubricate if necessary*	
Main Valves	Check Shut off, free movement, Correct Function, lubricate if necessary*	
Crossflow Valve	Check Shut-off, correct operation, leakage	
Jets	Check Security of Jets, Tighten or Replace as necessary	
Coils	Check for damage, distortion, security of fasteners	
Fuel Manifolds	Check Correct Type, Inspect condition, check dates (if applicable)	

* Refer to Section 4

Workpack No.	CN	Inspection Date	Inspectors Signature/No.

6.5.8 Basket

Basket Type:			
Part No.:		**Serial No.:**	

Component	Check / Inspect / Record	Pass/Fail (✓)/(x)
Basket wires	Inspect for damage	
Basket Frames	Inspect welds for cracking	
	Inspect tubes for distortion/deformation	
Weave	Inspect for damage, deterioration, completeness	
Rawhide	Inspect for damage, deterioration, completeness	
Floor	Inspect for damage	
Runners	Inspect for damage, wear, security of attachment	
Rope Handles	Inspect for damage security of attachment	
Cylinder Straps	Inspect for damage, deterioration, correct specification, No. of Straps ( )	
Pilot Restraint Anchor	Inspect for damage, wear, security of attachment	
Support Rods	Inspect for damage, wear, cracking	
Trim	Inspect for damage, deterioration, completeness	

6.5.8.1 Basket Ancillary Equipment

Component	Check / Inspect / Record	Pass/Fail (✓)/(x)
Fire Extinguisher	Check Type, maintained in accordance with manufacturers instructions	
Launch Restraint	Inspect for damage, deterioration, security of fittings, correct operation	
Pilot Restraints	Inspect for damage, deterioration, security of fittings, correct operation	
Instruments	Functional Check (if fitted)	

Workpack No.	CN	Inspection Date	Inspectors Signature/No.

6.5.9 Fuel Cylinders

No.	Man./Part no.	Serial No.	Initial Test date (Manufacture Date)	Current Test Date	PRV Date
1					
2					
3					
4					
5					
6					

Component	Check / Inspect / Record	Pass/Fail (✓)/(x)					
		1	2	3	4	5	6
Cylinder	Check, Periodic inspection for each cylinder is valid (date)						
	Inspect for damage, corrosion						
Liquid Valve	Inspect for damage, corrosion, correct operation						
	Inspect self seal for correct operation,Lubricate/replace as required. SB16/SB17						
	Inspect O-ring seals, Lubricate/replace as required						
Pressure relief valve	Check, Date does not exceed life limit, single PRV fitted						
	Inspect for contamination, corrosion						
Fixed Liquid Level Gauge	Inspect for damage, corrosion, correct operation						
	Inspect Fuelsafe for correct operation/leakage (if fitted)						
Contents Gauge	Inspect for damage, corrosion, freedom of movement						
Vapour Valve	Inspect for damage, corrosion, correct operation (including regulator)						
	Inspect Quick Release Coupling for correct operation,sealing						
Padded Cover	Inspect for damage						
Assembly	Inspect, Leak test all pressure holding joints using leak detector						
Assembly	Functional Test						

Workpack No.	CN	Inspection Date	Inspectors Signature/No.

6.6 INSPECTION CRITERIA/ TECHNIQUES

6.6.1 Envelope Structure

Crown ring: Light surface corrosion or minor surface damage that could abrade the load tapes may be removed or smoothed over with a Scotchbrite pad. Note the size of damage/corrosion and the face of the ring on which it occurs in the log book. Excessive damage or corrosion will require replacement of the crown ring. If the ring shows any indications of expansion (change in section) it should be rejected as this is a sign of internal corrosion.

Load tapes: Inspect for wear and heat damage. Ensure that the stitching of turnbacks is secure and that the stitching has not been heat damaged.

Fabric Panels: All fabric repairs, other than permitted damage (Refer to Flight Manual Section 2), must be within the specified limitations and have been made using approved methods. Indications for a grab test 'at inspectors discretion' include fabric porosity, fading, fungal attack or a suspicion that the logbook does not accurately reflect the hours flown. If substantial porosity is suspected a flight test should be performed but only after a grab test has demonstrated that the balloon is airworthy.

Envelope seams: The seams adjacent to the parachute edge tape on all envelopes fitted with parachutes or lock-tops must be carefully inspected. Seams adjacent to damaged panels must be fully inspected. Damage to the stitching which is less than 50mm long is acceptable below the first horizontal tape above the Nomex (Cameron envelopes) or within 4m of the Nomex (T&C envelopes). In all other areas no damage to the seam stitching is permitted.

The junctions of the vertical load tape to the parachute edge tape and the vertical load tape to the overlying tapes are sewn either with 'flag boxes' or reversed zig-zag stitching. If more than 25% of this stitching is broken the joint must be resewn.

Flying Cables- stainless steel: Cables should have no more than two broken strands, and their thimbles and ferrules should be in good condition. Check the wires for annealing- If the wire has a brown or discoloured appearance then the wires should be checked for loss of springiness. Discolouration of the wires is acceptable provided that the wires have not lost their springiness.

To test a flying cable for acceptable springiness, take hold of a 300mm section of flying wire between finger and thumb at each end of the section. Bend the wire so that the sections you are holding touch each other. Release the wire, and hold the section vertically. If the wire does not hang straight and has taken up a permanent bend in this section after the test, the wire should be replaced and scrapped.

6.6.2 Deflation System

Fabric Panels: Refer to Section 6.6.1, the fabric that hangs inside the balloon on the parachute edge is especially susceptible to heat damage.

Parachute Edge Tape: Wear or abrasion of the tape is permissible providing the stitching remains intact and the longitudinal yarns have not come away from the main body of the tape.

Control line pulleys: Pulleys should be in good condition, free to rotate and be securely attached to the envelope. Check the pulley for axle wear by attempting to move the pulley sheave within the body of the pulley. Excessive movement indicates a worn axle. Where pulleys are attached with a twisted shackle (Mod.C514) ensure that the cable tie is present and the shackle pin is secure.

Control line condition: Stiffening of the outer cover is acceptable provided that the Kevlar core is not exposed. If a wire-cored lower ripline is used ensure that the red tubular tape cover is securely stitched, especially at the upper end.

RDS: The sliding rings may be either a stainless steel ring or a pear-shaped Maillon link. The rings must not be damaged, distorted or have rough edges, and if a Maillon link, the link screw must be tight and the rubber string retainer in place . The tapes along which the sliding rings run must be smooth, with no nicks or flaws which would prevent the smooth running of the rings. These tapes must not be worn to less than 75% of the width or thickness of an adjacent unworn tape.

Transparent Panels: Any damage that penetrates the transparent material is not acceptable. The adhesive tape must not be peeling from the window material, the stitching should be undamaged and the stitch holes must not be elongated.

6.6.3 Turning Vents/Side Dump

Fabric Panels: The fabric that hangs inside the balloon in the turning vent is especially susceptible to heat damage.

Control line pulleys: Refer to Section 6.6.2

Control line condition: Refer to Section 6.6.2

Side vent: Check that a line stop is fitted to the opening line adjacent to the vent flap. This stop is to prevent the knot in the opening line from becoming jammed in the vent pulley.

6.6.4 Burner System

Karabiners: These must be Stubai 2.5 tonne, 3tonne (steel and marked ‘Stubai 2500’ or ‘Stubai 3000’) or 4 tonne (marked ‘SYM OVAL 4000 UIAA’). Refer to Flight Manual for correct applications. There must be no damage, distortion or significant corrosion. Check the hinges for free movement and lubrication. Check the screwgates are working correctly.

Burner frame: Inspect the frame carefully, paying particular attention to the condition of the welds. Check for any indications of fracture or unauthorised repairs, particularly if the frame shows signs of distortion. Check for correct gimbal (pivot) friction on the burner. Check for missing parts (especially lock nuts on burner pivots, split pins, frame limiters).

Corner shackles: If corner shackles are fitted (older burners only) the shackles must be free of distortion or corrosion, and the shackle pin must be fitted with a lock nut.

Corner buffers: (flexible corner frames) Check for wear or damage.

Note: Damaged worn or missing corner buffers are not an inspection failure, but replacement is recommended as missing buffers will increase wear and the risk of damage to other parts of the flexible corner system.

Adjustable height burners: Check function and condition of adjustable height system. Check for lateral movement between inner and outer frame. Check the damper for any sign of leaking (if fitted).

Hoses: Check hose is to the correct specification (SAE 100 R1AT) with pricked outer cover. Flex and bend the hose along its entire length to check for damage e.g. bulging, cuts, abrasions, kinks, dents, cracking (visible ageing). No steel braiding should be visible during and the hose must still be flexible. Check condition of end fittings (corrosion/damage), threads undamaged, no damage to swaging.

Burner physical inspection: Inspect the physical condition of the burner. Reject any burner showing excessive distortion, bending of the crossflow pipes or erosion of the coil straps to the point where the coils are no longer restrained. Check for missing parts.

Main Jets: Check for tightness of the burner jets and that the disks on multi-hole burner jets are secure. Up to two burner jets or jet disks may be missing per burner unit. Missing jets or disks should be replaced as soon as possible.

Valves: Check all valves for free movement and smooth operation. Lubricate if required.

Fuel Manifolds: Fuel manifolds (if fitted) must be included in the burner inspection and functional check. Check all joints for leaks and check condition of hoses in accordance with the burner hose inspection criteria.

Burner functional check:

Note: All checks should be carried out with fuel pressure in the normal operating pressure range of the burner (normally the green sector of the pressure gauge).

All leak checks specified in this Section are visual checks using leak detector.

Connect one liquid hose and check that the pressure gauge reading is commensurate with the ambient temperature (Cameron Balloons Flight Manual Iss. 10 Appendix 1). Check the pressure gauge fittings for leaks.

Check all hose connections, manifold joints and valves for leaks. Connect one vapour hose (if fitted). Check all connections, joints and valves for leaks.

Open one pilot light valve and ignite the pilot light. Repeat the operation three times to ensure repeatable operation. The pilot light valve should have between 15^0 and 20^0 movement before it opens (does not apply to Mk4 burners). The pilot light flame should remain constant once lit. Check for leaks around the pilot valve stem.

Operate the main blast valve. Check for leaks around the valve stem, valve body, lubrication duct (if fitted), coil gland nut and the blast valve leak duct (if fitted). Check the crossflow valve for leakage and correct operation (the crossflow valve is not pressurised unless the main blast valve is operated). Check the blast valve latch (Stratus Burner) for correct operation. The blast valve handle should have free movement before the valve begins to open, 3-5 mm (measured in the vertical plane at the end of the blast valve handle) minimum.

Operate the whisper (liquid fire) valve. Check for leaks around the valve stem. The whisper valve on Shadow, Stealth and Sirocco burners should have between 15^0 and 20^0 movement before it opens. The whisper jet must not impinge directly on the coil. During this test the valve must be operated over its whole range.

Repeat the functional check for each burner or valve system in the burner assembly.

6.6.5 Basket

Basket wires: Check for broken strands and condition of thimbles and ferrules. Inspect particularly at the top of the basket and the swaged end joint. Where wire passes through the top frame, pull back the trim to inspect the area where the wire passes through the guide. Be especially vigilant if performing a powerline contact inspection, as it is possible for the wires to be annealed or eroded near both the entry and exit points of the spark. Damage must not exceed 5% of the wire cross section (6 strands). The hide wire protection on the underside of solid floor baskets must have no damage that exposes the wire.

Basket frames: Inspect the frame carefully, paying particular attention to the condition of the welds. Check for any indications of fracture or unauthorised repairs, particularly if the frame shows signs of distortion. If there are any doubts about the integrity of the top frame, the trim must be removed.

Basket weave: There should be no damage to the wickerwork that will allow an object 50 mm (2 in) diameter to pass through. There must be no sharp protrusions inside the basket that might cause injury. The weave should be free of rot, fungal attack (especially in the base of woven floor baskets) or infestation (e.g. woodworm) and not so dry as to make the cane brittle.

Basket wall weave: In the basket wall no more than 2 adjacent upright stakes may be broken, provided that the next three uprights on either side of the damaged area are intact. There should be no large areas in which the weave is worn below ½ of its original thickness.

Basket rawhide: The lacing must be intact and secure. Minor abrasion is acceptable. Any defects in the rawhide which allow the ingress of foreign matter must be repaired (Section 3.4).

Woven basket floors: In the floor weave no major lateral stakes should be broken. No more than two adjacent longitudinal canes may be broken or worn below 2/3 of their original thickness. There must be a minimum of three undamaged longitudinal canes on either side of any two broken canes. Basket runners should be unbroken and free of major cracks. An acceptable crack will not cross more than 10 mm of runner width, and will not extend more than 150 mm along the runner.

Check that the basket runners are secure, tighten and trim the runner bolts if necessary (refer to Section 3.4)Trapped mud and debris should be removed from underneath the skids and hidden areas as this will cause the basket to rot.

Solid basket floors: Check the integrity of the wooden floor and runners. Runner damage should be assessed as for a woven floor basket. Solid basket floors may not have any split which exceeds 75 mm (3 in) in length, and is visible on both sides of the floor. Check the condition of the weave where it joins to the basket floor. If longitudinal strips are fitted to protect the basket wires during side-loading for transportation, check the retaining bolts for tightness and the strips for wear or damage.

Cylinder straps: Check the straps for any wear or damage. Buckles and rivets should be free from corrosion. Check leather straps for excessive mould or dryness. The leather must not crack when flexed, especially near buckle holes. Check webbing straps for UV degradation (UV degradation usually manifests itself as fading of the webbing).

Restraint harness anchors: Check load tape anchors for wear or damage. Check the basket stakes that the anchor is attached to for security and freedom from fracture. For U-bolt anchors, check the U-bolt for deformation check the condition and security of the nuts and the condition of the floor around the fitting. On under batten anchors check the condition of the batten and the D-ring.

Burner support rods: The support rods must not be cracked or broken. The support rods should be checked for length relative to basket wires. Rig the burner frame to the basket, and check that the basket wires do not allow the burner frame to lift more than 50 mm (2 in) on the support rods. Check the condition of the support rod sockets.

Basket Trim: Any damage to the trim which exposes sharp edges that could injure the occupants must be repaired

6.6.6 Ancillary Equipment (If fitted)

Launch restraint: Check the physical condition of the latch mechanism. Inspect for signs of distortion or wear. Check the operation of the latch. Inspect the webbing strap (if fitted) for signs of wear, cuts, heat damage and UV degradation (UV degradation usually manifests itself as fading of the webbing). If the webbing has any defects it should be replaced. Check the condition of the restraint rope for wear or damage.

Restraint harness: Check the condition and function of buckles and fittings. Check the condition of the webbing as for a launch restraint.

Instruments: Check altimeter against reference altitude (e.g. site elevation). Check Variometer for initial needle deflection when switched on/off.

6.6.7 Fuel Cylinders

If there is any doubt over the nature of any defects found during the inspection of fuel cylinders, the cylinders must be referred to Cameron Balloons for further inspection.

If a cylinder has been deemed unsuitable for further service, it is deemed unsuitable for use in balloons AND unsuitable for the safe storage of liquefied gases.

Note: These requirements do not exempt the owner from any other regulations or legal obligations regarding transportable cylinders.

Annual: Functional test & external visual inspection.

Periodic: 10 years from the date of manufacture and every 10 years thereafter. (Annual inspection, internal inspection and proof pressure test)

6.6.7.1 External Visual Inspection

Remove the cylinder cover and inspect the cylinder body for external damage or corrosion. Give special attention to areas where water can be trapped (e.g. the junction between the cylindrical shell and the footring). Check the integrity of all permanent attachments including the data plate.

Section 6.6.7.5 gives definitions of cylinder damage and guidance on rejection limits.

All cylinders must be fitted with a padded cover.

Offtake bosses: The offtake bosses may become damaged by an impact on the valves or by careless valve replacement. Ensure that the valves are vertical, that the bosses do not appear to have been pushed into the cylinders and that the welds around the bosses are undamaged.

6.6.7.2 Pressure Relief Valve (PRV)

CAUTION: Always wear eye protection when examining relief valves under pressure. Never look directly into a relief valve under pressure.

Where the PRV is separate, remove the pipeaway (if fitted) and dust cover and inspect the valve for contamination or corrosion. If the PRV is integral in the vapour valve, check that the seal has not been broken. Wear eye protection while inspecting the valve.

If there is any evidence of leakage, corrosion or contamination the valve must be replaced.

Cylinders should only be fitted with a single PRV.

6.6.7.3 Functional Check

Note: All leak checks specified in this Section are visual checks using leak detector.

Vapour Valve (if fitted): Open the vapour valve and check function of the self-seal (with the valve open and no coupling connected no vapour should escape). Check for leaks around the valve base and the valve stem.

Connect a vapour hose and ignite the pilot light. Check the joint at the quick connect coupling for leaks. If the regulator is of the adjustable type, check the regulator adjustment over a range of pressures. Turn off the vapour valve with the pilot light valve open to check that the vapour valve shuts off fully.

Liquid Valve: Remove the liquid valve dust cover (if fitted). Open the cylinder valve and check the function of the self-seal (with the valve open and no coupling connected no liquid or vapour should escape - do not look directly into the outlet). Check for leaks around the valve base and the valve stem. Shut the liquid valve and connect to a burner. Open the cylinder valve and check leaks at the coupling.

Check that the fuel pressure is in the normal operating range of the burner (normally the green sector of the pressure gauge).

Operate the main burner for a minimum of 10 seconds and ensure the fuel pressure does not drop once the blast valve has been opened. Shut off the cylinder valve and open the blast valve to ensure the valve shuts off completely (it may take some time for the residual flame to die away). Disconnect the hose and recheck the function of the self-seal valve.

Fixed level liquid gauge (FLLG or Bleed Valve): Check for leaks around the base of the valve and the valve outlet. Open and close the valve to check for correct operation.

In addition, if the FLLG is fitted with a “Fuelsafe” system, check for leaks at the quick release coupling with the vent hose connected.

Contents Gauge: The freedom of movement of the contents gauge may be checked by leaning the cylinder forwards and backwards relative to the orientation of the gauge. This should cause the reading on the cylinder gauge to change.

Leak check: check all pressure holding joints with leak detector. This includes all threads into the cylinder, all joints between valves / regulators / connectors, valve stems (open & close the valve during this test), the seal around contents gauges and the welds around the bosses.

6.6.7.4 Periodic Inspection

Periodic inspection is detailed in Supplement 7.52. to this manual.

6.6.7.5 Annual Inspection of Fuel Cylinders- Definition of Cylinder Damage and Guidance on Rejection Limits

Note:

1. Consideration of appearance, location and number of defects also play a part in the evaluation of damage. See especially Section 6.6.7.1, 'Offtake bosses'.

2. Stainless steel and Titanium cylinders vary in thickness from 1.4 - 2 mm. The most highly stressed part of the cylinder is in the cylindrical wrapper section. Particular care should be taken when inspecting this area. The thinnest wall sections are in the hemispherical ends. Aluminium cylinders have a minimum wall thickness of 3.5 mm.

3. As a general rule, if the cut or gouge can be felt with a thumbnail, its depth is in excess of 0.1 mm to 0.2 mm (approximately 10% of the wall thickness at the thinnest point).

4. Damage to the upper and lower guard ring is acceptable providing that the distortion has not affected the cylinder body, and that the guard rings continue provide protection to the cylinder body and fittings.

Corrosion: Any cylinder exhibiting corrosion should be referred to the manufacturer. Corrosion can be identified as areas of discolouration (rust colour), isolated pits or chains of pits (which are normally black in colour). Particular attention should be paid to the areas around the welds and to the bottom centre of the cylinder base.

Table 6.1: Guidance on Rejection Limits relating to Physical and Material Defects in the cylinder shell.

Defect	Definition	Rejection Limits
Bulge	Visible Local Swelling of the Cylinder	All
Dent	A depression in the cylinder that has neither penetrated or removed metal, and its width at any point is greater than either: (a) 4% of the external cylinder diameter for st. steel /titanium cylinders or (b) 2% for aluminium cylinders	When the depth of the dent exceeds either: (a) one third of its width at any point for st. steel /titanium cylinders or (b) 25% of its width at any point for aluminium cylinders. See Note 1
Visible damage on welds	Any combination of dent, cut, gouge or other damage on welded joints	All
Cut or Gouge (Cylinders where the wall thickness is known)	A sharp impression where metal has been removed or redistributed	When the depth of penetration exceeds 5% of the original minimum wall thickness. See Note 2
Cut or Gouge (Cylinders where the wall thickness is not known)	A sharp impression where metal has been removed or redistributed	All
Dent Containing Cut or Gouge	A depression in the cylinder within which there is a cut or gouge	Where the size of the dent or gouge approaches the dimension for rejection on an individual defect
Crack	A split or rift in the cylinder shell	All

6.7 GRAB TEST

The grab test should be performed on each colour of fabric in the envelope. For each colour the fabric should be tested in the highest panel in which it occurs in the envelope. If the envelope is partially manufactured with a long-life fabric (e.g. Hyperlast) then both the long-life fabric and the standard fabric should be tested.

Fabric colours / types that only occur below the first Horizontal load tape above the Nomex (Cameron) or within 4m of the Nomex (T&C) need not be tested.
If turning vents are fitted then a grab test should be performed on the part of the vent that lies inside the envelope.

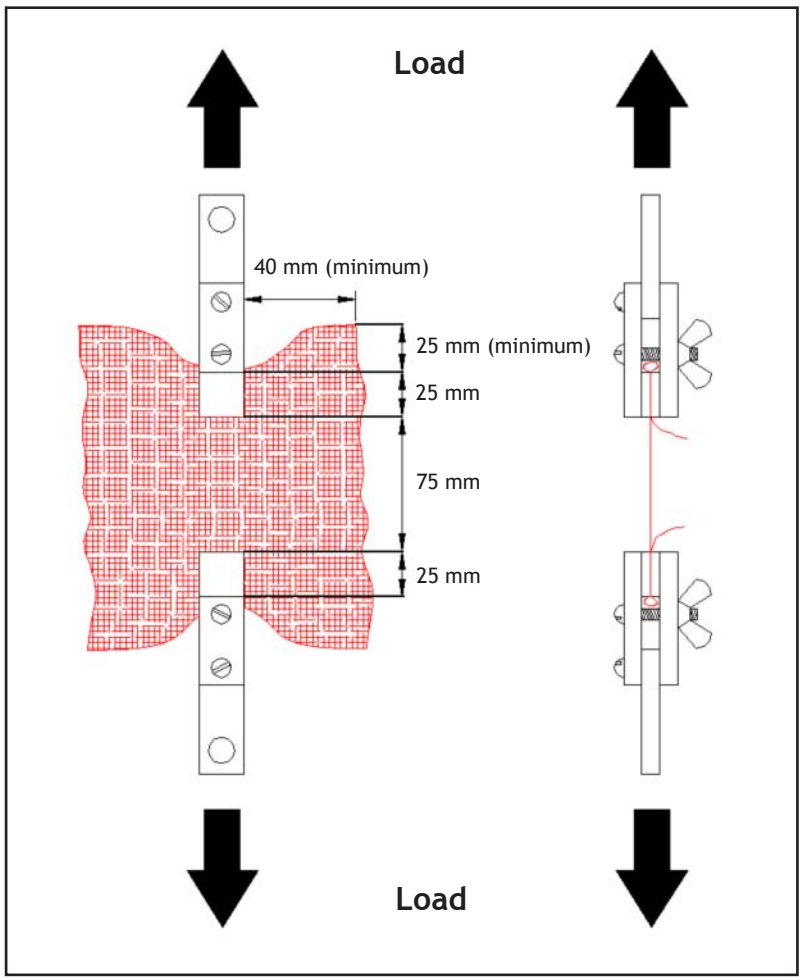
For Cameron Balloons and Bristol Built T&C balloons (CN3445 and subsequent) the outer area of the parachute panel between the panel edge & the Velcro tabs needs only to be grab tested to 21lb (9.5 kg) for the parachute to be fully airworthy.

The fabric must be gripped with the jaw edges carefully aligned so that the same fibres are being pulled from each end.

The clamp edges must be parallel so that the fibres are loaded evenly. The clamp should be tightened so that the fabric does not move in the jaws.

If the fabric withstands a 30 lb (13.6 kg) pull it is fully airworthy

If the fabric fails between 21 lb and 30 lb (9.5 and 13.6 kg) fabric may be passed as airworthy with the following limitations:-



Grab Test Procedure

1. Balloon size not to exceed 105,000 cu.ft (3000 cu.m).

2. Balloon not to be used for the carriage of fare paying passengers.

3. Max loading 14 lb/1000 cu.ft.

4. Grab test to be repeated annually or every 50 flying hours, whichever is more frequent.

If the fabric fails below 21 lb (9.5 kg) then all the weak fabric must be replaced and the envelope reinspected.

6.8 FLIGHT TEST

Flight tests must be conducted only with careful measurement. Fuel consumption varies widely with temperature, loading and altitude, so a subjective impression of the balloon's performance is of little use.

A flight test must be made in stable air conditions at a precisely known weight near the maximum take off mass (MTOM). Inflation and all preheating should be performed using an external cylinder. The balloon should be flown up to a known pressure altitude (with the altimeter set to 1013 hPa) without delay and level flight established.

Once level flight is established, note the start time and commence using the test cylinder. The test should be performed using the main burner, and should be continued until the cylinder is empty. Note the end time of the test, disconnect the test cylinder and continue flight on other cylinders.
The following data is required-

1. Balloon constructor's number.
2. Basket serial and drawing number.
3. All-up weight of balloon at lift-off (weigh passengers and all ancillary equipment).
4. Weight of test cylinder (full).
5. Weight of test cylinder (empty).
6. Time taken to use the contents of the test cylinder.
7. Pressure altitude.
8. Ambient temperature at test altitude.
9. Weather conditions (full sunshine, hazy sunshine, overcast or dark). Flight tests must not be conducted in rain.

These figures should be sent to Cameron Balloons Ltd. for analysis.

6.9 UNSCHEDULED INSPECTIONS

6.9.1 Pre-Flight Inspections

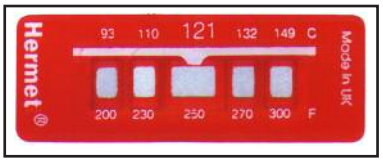
Pre-flight inspections are covered in the Cameron Balloons Flight Manual Iss. 9, Section 4

6.9.2 Envelope Overheat Inspections

The envelope is fitted with a melting link attached to a streamer. The link will separate at 127°C allowing the streamer to fall. If this occurs, the tempilabel in the top of the balloon (load tape 3 near the top of the envelope) should be inspected.

The label has 5 silver coloured windows marked from 93°C to 149°C which will turn black once their respective temperatures are reached.

If the maximum temperature indicated on the tempilabel is less than 121°C then no further inspection is required. Replace the streamer in the balloon using a new link (do not attempt to re-solder the old link).



▲ Tempilabel

The warning streamer is attached to the link with a bent wire hook. To attach, open up the hook using a pair of pliers, attach the streamer and bend the hook firmly closed again. The link is attached to the envelope in the same way.

If the maximum temperature indicated is 121°C or greater then the fabric and tapes in the top of the balloon must be inspected for signs of overheating-

1. Look for parts with undue stiffness or changes in colour, especially on the edges of the parachute fabric.

2. Add a new tempilabel alongside the original label.

3. Perform a grab test (Section 6.7) and enter the result of the test and the maximum temperature reached in the logbook.

6.9.3 Powerline Contact Inspections

If the balloon has been in contact with an electrical powerline, a full annual / 100 hour inspection should be carried out. Particular attention should be paid to metallic parts, especially fuel cylinders and basket / envelope suspension wires. Check for electrical damage.

6.9.4 Test Inflation After Repair

The test inflation should include a full hot inflation and cycling of all envelope controls to confirm that they function correctly.

The balloon should be loaded to a minimum of 50% of the Maximum Take-Off Mass for this test.

During cold inflation an internal inspection of the envelope must be performed to ensure no entanglement of the control systems.

7.1 INTRODUCTION

This Section contains the appropriate supplements and additional approved data necessary to maintain continued airworthiness of the balloon the balloon when equipped with various optional systems and equipment not included in the main manual.

The balloon shall be operated in accordance with the applicable supplement and/or additional approved data when appropriate, but the content of the base Flight Manual will also apply.

Where a conflict arises between the information given in a Supplement and/or additional approved data and the information given in the base Flight Manual, the information given in a supplement takes precedence.

A complete list of Supplements is available on the Cameron Balloons Limited website.

Note: Supplements are updated independently of the base flight manual. It is not necessary to update supplements issued with a specific balloon unless notified by Service Bulletin.

7.2 LIST OF SUPPLEMENTS INSERTED

Date of Insertion	Doc. Ref	Description

Signed _____ Name _____ Date _____

Authority _____

7.3 ADDITIONAL DATA

When the envelope detailed in the approval section is being used in conjuction with

.....
(insert details of basket/burner)

the following approved data must be used.

.....
(insert document title, section and paragraph reference)

8.1 GENERAL

This Section provides a list of design definitions of the replacement parts and materials used in the maintenance of the balloon and its ancillary equipment.

All parts and materials are available from Cameron Balloons Ltd. or approved suppliers.

8.2 ENVELOPE

8.2.1 General

When ordering replacement envelope parts it is essential to state the Brand (e.g. Cameron or Thunder & Colt), the type / variant (e.g. O-160), the constructors number and approximate date of manufacture.

8.2.2 Consumable Items

Part Number	Description
CE-1000-0000	Repair Tape, Adhesive Backed
CE-4300-0001	Envelope Thread, Metric 40 (210 Denier) ('usual' or 'unusual' wound) - Reel
CE-4300-0002	Envelope Thread, Metric 40 (210 Denier) - Barbobs G Bobbins
CE-4300-0003	Envelope Thread, Metric 40 (210 Denier) - Nomex
CE-4300-1001	Envelope Thread, Metric 40 (210 Denier) - Oxley universally bonded
CE-3020-0001	Velcro, 20 mm (twin metre)
CE-3025-1000	Velcro, 25mm, Super Hook
CE-3025-2000	Velcro, 25mm, Loop
CE-3050-0002	Velcro, 50 mm (twin metre)

8.2.3 Envelope Fabric

Part Number	Description
CE-5133-XXXX*	Ripstop Nylon Envelope Fabric
CE-5134-XXXX*	Ripstop Nylon Envelope Fabric (Alternative)
CE-3390-XXXX*	Hyperlast Envelope Fabric
CE-2389-XXXX*	Hyperlast Envelope Fabric (Alternative)
CE-1123-XXXX*	Nomex Envelope Fabric

For details of lightweight fabrics and special fabrics (e.g. gold and silver), contact Cameron Balloons Limited.

Note: * The last four digits of fabric part numbers denote the fabric colour, e.g. CE-5133-5198 = Ripstop Nylon Envelope Fabric-Royal Blue.

8.2.4 Envelope Load Tape

Part Number	Description
CE-2013-1000	12mm polyester, minimum strength 300kg (661lbs), white
CE-2013-1001	12mm polyester, minimum strength 300kg (661lbs), black
CE-2020-2101	20mm polyester, minimum strength 1021kg (2250 lbs), black
CE-2020-1101	20mm polyester, minimum strength 1021kg (2250 lbs), white
CE-2020-5001	20mm polyester, minimum strength 680 kg (1500 lbs), white
CE-2020-5011	20mm polyester, minimum strength 680 kg (1500 lbs), black
CE-2025-1001	25mm nylon, minimum strength 680 kg (1500 lbs), white
CE-2025-2001	25mm nylon, minimum strength 680 kg (1500 lbs), black
CE-2025-1101	25mm polyester, minimum strength 1814 kg (4000 lbs), white
CE-2025-2103	25mm polyester, minimum strength 1814 kg (4000 lbs), black
CE-2025-3001	25mm polyester, minimum strength 3000 kg (6614 lbs), white
CE-2025-3002	25mm polyester, minimum strength 3000 kg (6614 lbs), black
CE-2045-1001	45mm polyester, minimum strength 2722 kg (6000 lbs), white
CE-2045-1002	45mm polyester, minimum strength 2722 kg (6000 lbs), black
CE-2100-1001	100mm Protector Tape, White
CE-2100-2001	100mm Protector Tape, Black

8.2.5 Envelope Hardware

Part Number	Description
CB-0734-0001	Turnback Protector
CE-4000-0001	Tempilabel (121^{0}C)
CE-4000-0002	Pulley Block, Single, Tufnol (8mm max. diameter rope)
CE-4000-0003	Pulley Block, Single, Tufnol, With Becket (8mm max. diameter rope)
CE-4000-0004	Pulley Block, Double, Tufnol, With Becket (8mm max. diameter rope)
CE-4103-0002	Heat Shrink Caps, Parachute Line
CE-4103-0005	Maillon Rapide Quick Link, 5mm, Oval
CE-4260-0001	Temperature Flag with Solder Link
CE-4260-0002	Temperature Flag Solder Link
CE-4260-0003	Temperature Flag
CE-4300-0007	Spring Hook (Control Line lower end)
CE-4300-0008	Scoop Shackle, Standard
CE-4300-0009	‘D’ Ring, Aluminium (25mm)
CE-4300-0010	Riplock Hook
CE-4300-0023	Flying Cable Vee Ring, Large
CE-4300-0024	Karabiner, Crown Line (Top)
CE-4300-0025	Karabiner, Crown Line (Bottom)
CE-4300-0026	‘D’ Ring, Stainless Steel (22mm wide)
CE-4300-0027	Scoop Shackle, Large
CE-4300-0100	Pulley Swivel
CG-1000-1021	Scoop Hook (Fixed Eye Boat Snap), 82mm
CG-1000-1022	Scoop Hook (Fixed Eye Boat Snap), 98mm

8.2.6 Envelope Control and Rigging Lines

Part Number	Description
CB-1474-0001	3.5 mm Line, Kevlar Cored, Polyester overbraid, white
CB-1504-0003	3 mm Line, Polyester, Parachute Line (white)
CE-4103-0001	3 mm Line, Kevlar, Parachute Line(yellow)
CE-4106-0001	6 mm Line, Kevlar Cored Line, Polyester overbraid, black
CE-4106-0002	6 mm Line, Kevlar Cored Line, Polyester overbraid, green
CE-4106-0004	6 mm Line, Polyester, Braid on Braid, white
CE-4108-0001	8 mm Line, Kevlar, Red
CE-4108-0005	8 mm Line, Kevlar, Red/White (Candy Stripe)
CE-4108-0006	8 mm Line, Kevlar, Black/Yellow (Candy Stripe)
CE-4108-0007	8 mm Line, Kevlar, White
CE-4110-0001	10 mm Line, Polyester, Black (Crown Line)
CE-4110-0002	10 mm Line, Polyester, White (Crown Line)
CE-4135-0002	3.5mm Line, Kevlar Cored, Polyester overbraid, green

8.2.7 Envelope Flying Cables

Part Number	Description
CB-0367-0005	Heatshrink, 4mm, 4cm long
CB-0741-1000	Flying Cable, 3mm, Hopper, Single
CB-0741-2000	Flying Cable, 3mm, Hopper, Double
CB-1026-0001	Flying Cable, Kevlar, Standard Length, Single
CB-1085-1001	Flying Cable, 4mm, Standard Length, Single, Black Heatshrink
CB-1085-1002	Flying Cable, 4mm, Standard Length, Single, Blue Heatshrink
CB-1085-1003	Flying Cable, 4mm, Standard Length, Single, Red Heatshrink
CB-1085-2001	Flying Cable, 3mm, Standard Length, Single, Black Heatshrink
CB-1085-2002	Flying Cable, 3mm, Standard Length, Single, Blue Heatshrink
CB-1085-3001	Flying Cable, 4mm, Standard Length, Double, Black Heatshrink
CB-1085-3002	Flying Cable, 4mm, Standard Length, Double, Blue Heatshrink
CB-1085-4001	Flying Cable, 3mm, Standard Length, Double, Black Heatshrink
CB-1085-4002	Flying Cable, 3mm, Standard Length, Double, Blue Heatshrink
CB-1085-5001	Flying Cable, 4mm, 2.28M Length, Single, Black Heatshrink
CB-1085-5003	Flying Cable, 4mm, 2.28M Length, Single, Red Heatshrink
CB-1372-0000	Flying Cable, 4mm, Standard Length, Single on large Vee ring to suit 45mm load tape
CB-1430-0000	Flying Cable, 4mm, Standard Length, Single on small Vee ring to suit 19 and 25mm load tape
CB-1440-1001	Flying Cable, 4mm, Replacement Cable, Single, Black Heatshrink*
CB-1440-1002	Flying Cable, 4mm, Replacement Cable, Single, Blue Heatshrink*
CB-1440-1003	Flying Cable, 4mm, Replacement Cable, Single, Red Heatshrink*
CB-1482-XXXX**	Multiple Flying Cable Assemblies with Forged rings / Vee Rings
CB-1528-XXXX**	Flying Cable, 3 and 4mm, Replacement Cable for T&C Envelopes CN 0-3000**
CB-1570-XXXX**	Flying Cable, 4mm, Standard Length, Z-600 cable set
CB-1571-XXXX**	Flying Cable, 4mm, Replacement Cable, Z-600 cable set*
CB-1627-XXXX**	Flying Cable, 4mm, Standard Length, A-450 cable set
CB-1628-XXXX**	Flying Cable, 4mm, Replacement Cable, A-450 cable set*

Note: * Designed for use with 5mm Maillon Rapide Quick Link, CE-1403-0005

** For details of available combinations and options, please contact Cameron Balloons Ltd.

8.3 BASKET

8.3.1 General

When ordering replacement basket parts and materials it is essential to state the Brand (e.g. Cameron or Thunder & Colt), the part number / serial no., the constructors number with which the basket was originally supplied (if known) and approximate date of manufacture.

8.3.2 Basket Materials

Part Number	Description
CB-0532-00XX**	Support Rods
CG-1000-0001	Basket Limed Hide (Rawhide)
CG-1000-0017	Anti-Slip Tape
CG-2000-0003	Basket Suede (per sq.ft.)
CG-2000-1001	Basket Leather (per sq.ft.)
CG-2100-000X*	3 mm Basket Braid

Note: * The last digit of the basket braid part numbers denote the colour, e.g. CG-2100-0002 = 3mm Basket Braid-Red.

** For details of available lengths and options, please contact Cameron Balloons Ltd.

8.4 FUEL SYSTEM

8.4.1 General

When ordering replacement Burner or other fuel system parts, it is essential to state the Brand (e.g. Cameron or Thunder & Colt), the part number / serial no. and the type of burner or cylinder.

8.4.2 Consumable Items

Part Number	Description
CU-0000-0004	Leak Detector Spray (Swagelok 'Snoop' or equivalent)
CU-0000-0005	Silicone Spray
CU-0000-0007	PTFE Tape
CU-0000-0008	PTFE Paste
CU-0000-0010	Cameron KSP125 Lubricant
CU-0000-0011	Molycote 33 Grease
CX-0000-0027	Cleaning Spray
CU-0000-0001	Loctite 222
CU-0000-0002	Loctite 270
CU-0000-0003	Loctite 243
CU-0000-0004	Loctite 572
CH-3800-0003	3/8 Bonded 'Dowty' Sealing Washer
CT-1300-0004	1/4 Bonded 'Dowty' Sealing Washer

8.4.3 Fuel Cylinders

Part Number	Description
CB-2621-0000	Seal Kit, Liquid Valve Outlet (1¼" ACME)
CB-2628-0000	Seal Kit, Liquid Valve Self Seal Kit (BMV)
CB-2551-0001	Dial Indicator, Fuel Contents Gauge
CB-2198-000X*	Top Ring Cover, Padded
CB-2482-0000	Vent Hose Assembly, Fuelsafe 2
CT-8000-2000	Cylinder Cover, Padded

Note: * The last digit of the Padded top ring part numbers denote the brand, e.g. CB-2198-0002 = Thunder & Colt.

8.4.4 Stealth / Shadow Burner

Part Number	Description
CB-2609-0000	'O'-Ring Seals, Lubrication Port blanking Screw
CB-2603-0000	Liquid Pilot Light Jet Service Kit
CB-2604-0000	Liquid Pilot Light Regulator Service Kit
CB-2606-0000	Vapour Pilot Light Jet Service Kit
CB-2011-0001	Piezo Igniter Assembly
CB-0214-0006	Copper Washer
CB-0214-0003	Main Jet, Amal
CB-0923-0001	Main Jet, Multi-Hole

8.4.5 Sirocco Burner

Part Number	Description
CB-2609-0000	'O'-Ring Seals, Lubrication Port blanking Screw
CB-2603-0000	Liquid Pilot Light Jet Service Kit
CB-2683-0000	Pilot Light Inlet Filter Repair Kit
CB-2684-0000	Liquid Pilot Light Regulator Service Kit
CB-2766-0000	Piezo Igniter Unit

8.4.6 Stratus Burner

Part Number	Description
CA-0000-8013	Vapour Pilot Light Jet
CB-8546-0000	Vaporiser Outlet Filter, Liquid Pilot Light
CB-8550-0000	Liquid Pilot Light Jet
CB-8624-1000	Liquid Pilot Light Regulator Service Kit
CB-8506-1000	Igniter Seal Kit
CB-8505-0000	Piezo Igniter Unit
CB-8561-0000	Igniter Electrode
CB-8548-0000	Main Jet, 1.4mm

8.4.7 Burner Frames

Part Number	Description
CB-0211-2000	Nylon Corner Buffers
CB-3142-0001	Heatshield Retaining Screw
CB-3142-0002	Heatshield Special Washer

8.4.8 TEMA 3800 Coupling

Part Number	Description
CB-2631-0000	'O'-Ring Service Kit

8.4.9 Hose Assemblies, Liquid 3/8” Bore

PART NUMBER	DESCRIPTION	USAGE	OLD PART NUMBER
CB-7626-1100	Hose Assembly 3/8"NB, 2.6 m, 1/4NPTM to 1/4NPTM	MKIV, MKIV Super, Shadow, Sirocco, REGO fitting	CB-0379-1008
CB-7626-1400	Hose Assembly 3/8"NB, 2.6 m, 1/4NPTM to 3/8BSPM	T&C Burners, REGO Fitting, Cameron burners TEMA fitting	CB-0379-2008/CB-0379-5008
CB-7640-1100	Hose Assembly 3/8"NB, 4.0 m, 1/4NPTM to 1/4NPTM	MKIV, MKIV Super, Shadow, Sirocco, REGO fitting	CB-0379-1013
CB-7640-1400	Hose Assembly 3/8"NB, 4.0 m, 1/4NPTM to 3/8BSPM	T&C Burners, REGO Fitting, Cameron burners TEMA fitting	CB-0379-2013/CB-0379-5013
CB-7626-4400	Hose Assembly 3/8"NB, 2.6 m, 3/8BSPM to 3/8BSPM	T&C Burners, TEMA Fitting	CB-0379-6008
CB-7640-4400	Hose Assembly 3/8"NB, 4.0 m, 3/8BSPM to 3/8BSPM	T&C Burners, TEMA Fitting	CB-0379-6013
CB-7626-1110	Hose Assembly 3/8"NB, 2.6 m, 1/4NPTM to 1/4NPTM, REGO Fitting x 1	MKIV, MKIV Super, Shadow, Sirocco, REGO fitting	CB-0379-1108
CB-7626-1410	Hose Assembly 3/8"NB, 2.6 m, 1/4NPTM to 3/8BSPM, REGO Fitting x 1	T&C Burners with Rego fitting	CB-0379-5108
CB-7626-1420	Hose Assembly 3/8"NB, 2.6 m, 1/4NPTM to 3/8BSPM, TEMA Fitting x 1	Cameron burners TEMA fitting	CB-0379-2108
CB-7626-4420	Hose Assembly 3/8"NB, 2.6 m, 3/8BSPM to 3/8BSPM, TEMA Fitting x 1	T&C Burners, TEMA Fitting	CB-0379-6108
CB-7640-1110	Hose Assembly 3/8"NB, 4.0 m, 1/4NPTM to 1/4NPTM, REGO Fitting x 1	MKIV, MKIV Super, Shadow, Sirocco, REGO fitting	CB-0379-1113
CB-7640-1410	Hose Assembly 3/8"NB, 4.0 m, 1/4NPTM to 3/8BSPM, REGO Fitting x 1	T&C Burners with Rego fitting	CB-0379-5113
CB-7640-1420	Hose Assembly 3/8"NB, 4.0 m, 1/4NPTM to 3/8BSPM, TEMA Fitting x 1	Cameron burners TEMA fitting	CB-0379-2113
CB-7640-4420	Hose Assembly 3/8"NB, 4.0 m, 3/8BSPM to 3/8BSPM, TEMA Fitting x 1	T&C Burners, TEMA Fitting	CB-0379-6113
CB-7603-1100	Hose Assembly 3/8"NB, 0.3 m, 1/4NPTM to 1/4NPTM	Manifold Hose, REGO	
CB-7605-1100	Hose Assembly 3/8"NB, 0.5 m, 1/4NPTM to 1/4NPTM	Manifold Hose, REGO	
CB-7603-1400	Hose Assembly 3/8"NB, 0.3 m, 1/4NPTM to 3/8BSPM	Manifold Hose, TEMA	
CB-7605-1400	Hose Assembly 3/8"NB, 0.5 m, 1/4NPTM to 3/8BSPM	Manifold Hose, TEMA	
CB-7615-1300	Hose Assembly 3/8"NB, 1.5 m, 1/4NPTM to 3/8NPT	6LB Vapour Cylinder Extension Hose	CB-2254-1500
CB-7618-1300	Hose Assembly 3/8"NB, 1.8 m, 1/4NPTM to 3/8NPT		CB-2254-1206
CB-7603-1300	Hose Assembly 3/8"NB, 0.3 m, 1/4NPTM to 3/8NPT		CB-2254-1210
CB-7618-1500	Hose Assembly 3/8"NB, 1.8 m, 1/4NPTM to 3/8BSP Female		CB-2254-1306

8.4.10 Hose Assemblies, Liquid 1/2” Bore

PART NUMBER	DESCRIPTION	Usage	OLD PART NUMBER
CB-7806-3300	Hose Assembly 1/2"NB, 0.6 m, 3/8NPTM to 3/8NPTM	Manifolds	
CB-7826-4400	Hose Assembly 1/2"NB, 2.6 m, 3/8BSPM to 3/8BSPM	T&C Triple and Quad Stratus, TEMA Fitting	CB-8586-0001
CB-7830-4400	Hose Assembly 1/2"NB, 3.0 m, 3/8BSPM to 3/8BSPM	T&C Triple and Quad Stratus, TEMA Fitting	CB-8586-0002
CB-7840-4400	Hose Assembly 1/2"NB, 4.0 m, 3/8BSPM to 3/8BSPM	T&C Triple and Quad Stratus, TEMA Fitting	

8.4.11 Hose Assemblies, Vapour 1/4” Bore

PART NUMBER	DESCRIPTION	Usage	OLD PART NUMBER
CB-7418-1800	Hose Assembly, 1/4"NB, 1.8m 1/4 NPT to Dynaquip Male	Shadow, MKIV, MKIV Super	CB-0379-3006
CB-7424-1800	Hose Assembly, 1/4"NB, 2.4m 1/4 NPT to Dynaquip Male	Shadow, MKIV, MKIV Super	CB-0379-3008
CB-7431-1800	Hose Assembly, 1/4"NB, 3.1m 1/4 NPT to Dynaquip Male	Shadow, MKIV, MKIV Super	CB-0379-3010
CB-7406-1800	Hose Assembly, 1/4"NB, 0.6m 1/4 NPT to Dynaquip Male	6LB Vapour cylinder, Dynaquip (CB-0901-5000)	
CB-7406-2700	Hose Assembly, 1/4"NB, 0.6m 1/4 BSP to TEMA Male	6LB Vapour cylinder, TEMA (CB-0901-6000)	
CB-7418-1700	Hose Assembly, 1/4"NB, 1.8m 1/4 NPT to TEMA Male	Shadow, MKIV, MKIV Super	CB-0379-4006
CB-7424-1700	Hose Assembly, 1/4"NB, 2.4m 1/4 NPT to TEMA Male	Shadow, MKIV, MKIV Super	CB-0379-4008
CB-7431-1700	Hose Assembly, 1/4"NB, 3.1m 1/4 NPT to TEMA Male	Shadow, MKIV, MKIV Super	CB-0379-4010
CB-7418-2700	Hose Assembly, 1/4"NB, 1.8m 1/4 BSP to TEMA Male	T&C Burners	CB-0379-9006
CB-7424-2700	Hose Assembly, 1/4"NB, 2.4m 1/4 BSP to TEMA Male	T&C Burners	CB-0379-9008
CB-7431-2700	Hose Assembly, 1/4"NB, 3.1m 1/4 BSP to TEMA Male	T&C Burners	CB-0379-9010
CB-7418-2800	Hose Assembly, 1/4"NB, 1.8m 1/4 BSP to Dynaquip Male	T&C Burners	CB-0379-8006
CB-7424-2800	Hose Assembly, 1/4"NB, 1.8m 1/4 BSP to Dynaquip Male	T&C Burners	CB-0379-8008
CB-7431-2800	Hose Assembly, 1/4"NB, 1.8m 1/4 BSP to Dynaquip Male	T&C Burners	CB-0379-8010

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A2.1 GENERAL

Swage bores should be lubricated periodically with soft mineral grease prior to pressing.

Use only Intal copper ferrules.

Upon completion of the swage, the joint must be proof loaded to 50% of the minimum breaking strain of the wire given in Table A2-2, unless agreed otherwise with the local competent authority.

A2.2 PROCEDURE - FLYING CABLE AND BASKET WIRE LOOP ENDS

1. Gauge the wire with the Talurit wire rope gauge to ascertain code number of ferrule and select appropriate swage from Table A2-1.

2. Secure appropriate swage in press as detailed in CCL Systems Operating and Maintenance Instructions issue A dated March 1995.

3. Position and lightly hold ferrule in swage bore. Insert rope and form eye or loop. Carefully position the return or dead end of the rope as illustrated in Fig. A2-1 below with a protrusion from the end of the ferrule equal to between half and full rope diameter. Position the thimble a distance of between 1 to 1.5 x the rope diameter from the end of ferrule, prior to pressing. Pressing can now be completed. The swage blocks are brought together until they just touch. Release pressure immediately swage faces meet. Remove the ferrule and clean off any flash. DO NOT PRESS FLASH BACK INTO SPLICE.

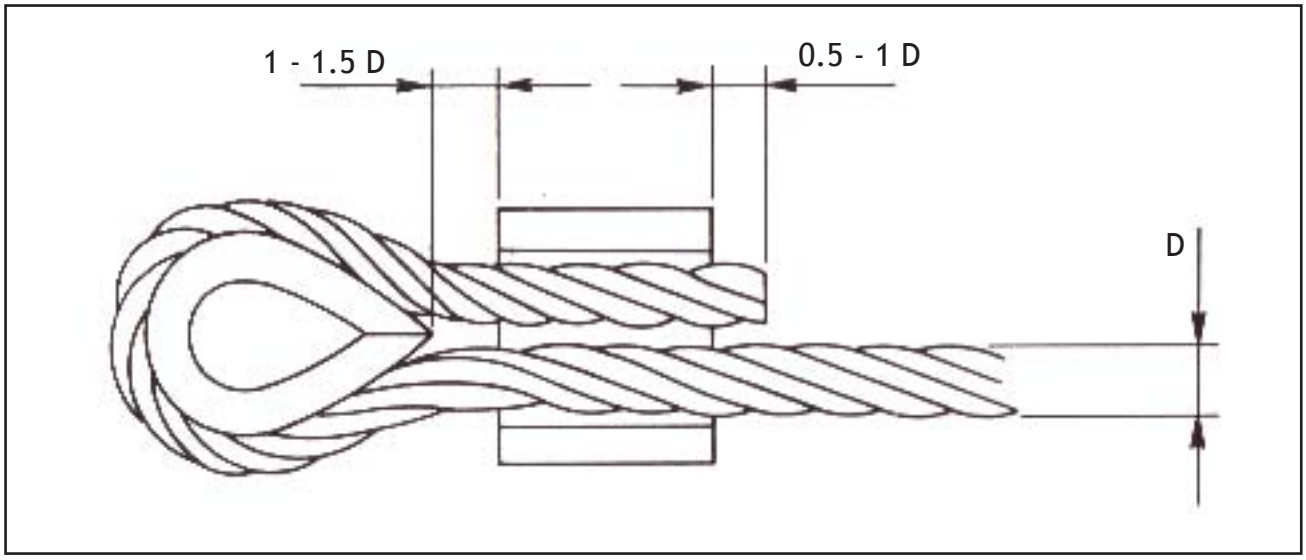

Fig. A2-1 Joint Before Swaging

Fig. A2-2 shows the completed swaged joint.

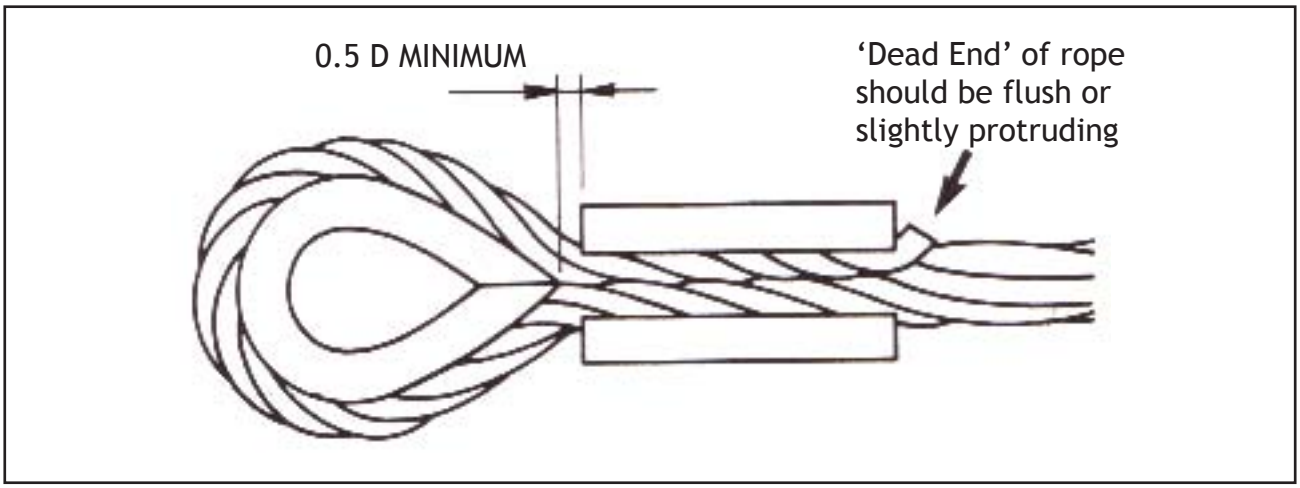

Fig. A2-2 Joint After Swaging

Table A2-1

Intal Ferrule Code	Wire Rope Diameter (mm)				Swage Identification	
	Fibre Core		Solid Core		Intal Swage Code	Diameter Of Bore
	Min.	Max.	Min.	Max.		
3.5	-	-	2.7	3.1	3.5	7
4.5	-	-	3.7	4.2	4.5	9
6	5.2	6.1	-	-	6	12
8	-	-	6.9	7.3	8	16

A2.3 PROCEDURE - BASKET WIRE MOVEMENT LIMITERS

1. Gauge the wire with the Talurit wire rope gauge to ascertain code number of ferrule and select appropriate swage from Table A2-1 (normally this will be code 6 for 6mm fibre core basket wires).

2. Secure appropriate swage in press as detailed in CCL Systems Operating and Maintenance Instructions issue A dated March 1995

3. Position and lightly hold ferrule in swage bore. Insert a short length of rope as illustrated in Fig. A2-3 below with a protrusion from each end of the ferrule equal to between half and full rope diameter.

Pressing can now be completed. Release pressure immediately swage faces meet.

Remove the ferrule and clean off any flash. DO NOT PRESS FLASH BACK INTO SPLICE.

Fig. A2-4 shows the completed swaged joint.

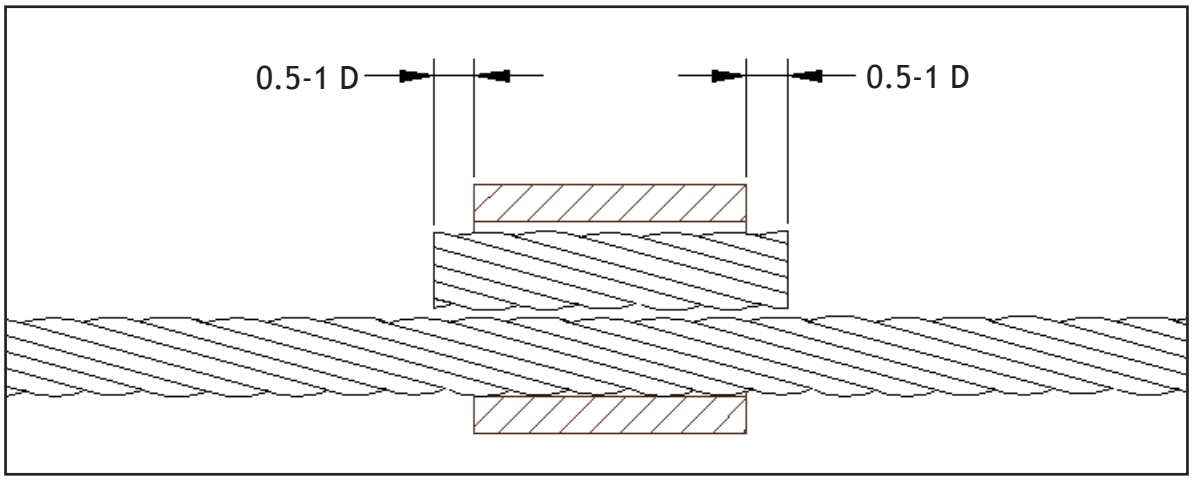

Fig. A2-3 Limiter Before Swaging

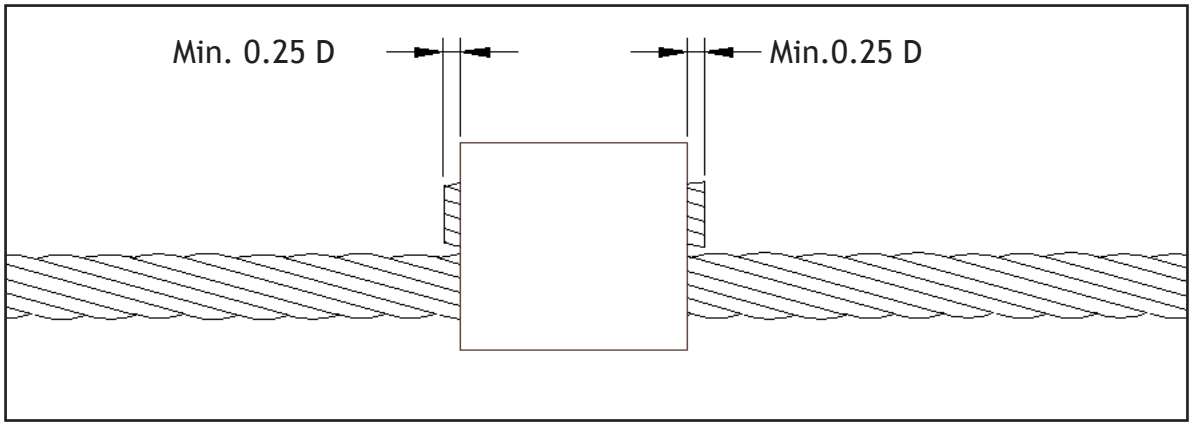

Fig. A2-4 Limiter After Swaging

A2.4 PROCEDURE - BASKET WIRE REPAIRS

This procedure is only to be used for repairing damage to wires between the basket top frame and the loop end.

The length of undamaged wire protruding from the basket top frame must be sufficient to carry out this repair, as shown in Fig A2-5.

The damaged Section of wire should be cut away leaving an undamaged length of wire protruding from the basket.

A new Section of wire should be fitted as detailed below, then a new loop formed in the end as described in the procedure for forming a wire loop.

1. Gauge the wire with the Talurit wire rope gauge to ascertain code number of ferrule and select appropriate swage from Table A2-1.

2. Secure appropriate swage in press as detailed in CCL Systems Operating and Maintenance Instructions issue A dated March 1995.

3. Thread ferrule 2 onto the new Section of rope. Position and lightly hold ferrule 1 in swage bore. Insert the old rope and the new rope into ferrule 1 as illustrated in Fig. A2-5 below with a protrusion of the new rope from the ferrule equal to between half and full rope diameter.

Pressing of ferrule 1 can now be completed. Release pressure immediately swage faces meet. Remove the ferrule and clean off any flash. DO NOT PRESS FLASH BACK INTO SPLICE.

4. Position and lightly hold ferrule 2 in swage bore. Insert the old rope into ferrule 2 as illustrated in Fig. A2-5 below with a protrusion of the old rope from the ferrule equal to between half and full rope diameter.

   Pressing of ferrule 2 can now be completed. Release pressure immediately swage faces meet. Remove the ferrule and clean off any flash. DO NOT PRESS FLASH BACK INTO SPLICE.

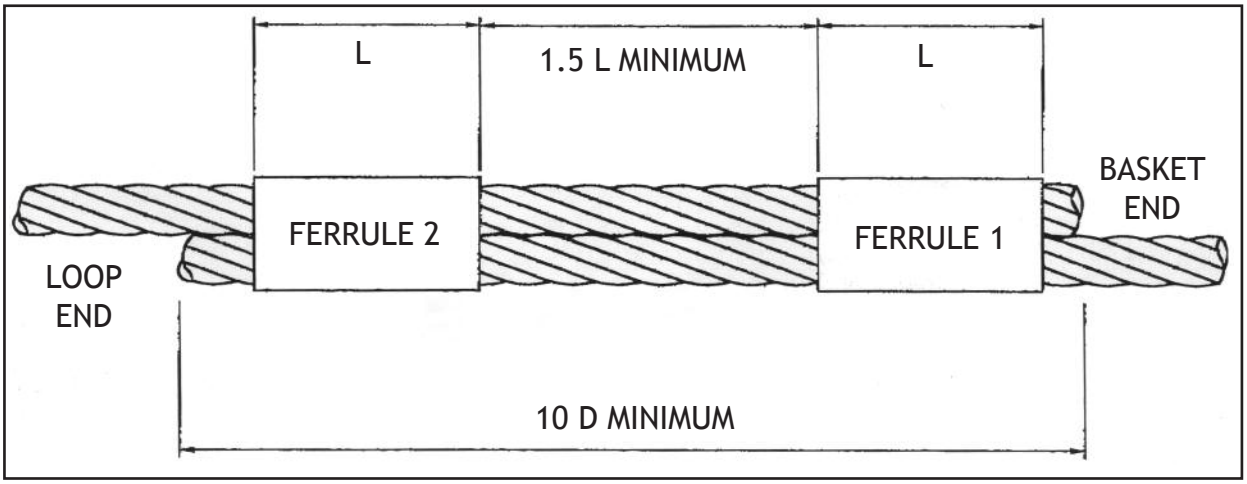

Fig. A2-5 Basket Wire Repair

Table A2-2

Wire Rope Diameter (mm)	Breaking Strain (N)
3	5097
4	9021
6	16122
7	24525

A3.1 Inspection

A graphical representation of the types of PRV used is given in Fig. A3-1 to aid identification

A3.2 Date Marking of Pressure Relief Valves

A3.2.1 CB-8412-0000 Calor 250210 or 25/2

The date is shown as month and year

Example: 03/01 would be March 2001

A3.2.2 CB-8412-1000 Omeca 660248

The date is shown as the year and the week

Example: 01.49 would be 2001 week 49, 3-9 December 2001

A3.2.3 CB-8412-2000 Rego 8545AK

Initially there is a number to indicate the month, 1= January, 2 February, 12 is December; then follows a letter to indicate the week of the month, A is the first week, B is the second week etc. Finally are two digits to indicate the year - 02 would be 2002.

Example: 6A92 would be first week of June 1992

or

Replace by date Month and year- Month (numeric) Year (double digit numeric)

Example: 03/99 would be March 1999

A3.2.4 CB-8412-3000 Ceodeux 071131

Month and year- Month (numeric) Year (double digit numeric)

Example: 03/99 would be March 1999

A3.2.5 CB-8412-4000 Sherwood PV435A

Month (numeric or alphabetic) and year (double digit numeric) of production

Example: 03/99 or C/99 both mean March 1999

A3.2.6 CA-0001-0171 Sherwood PV435L (Thunder & Colt V-Series Cylinders only)

Month and year of production- Week (numeric) Year (double digit numeric)

Example: 41-01 would be October 8-12 2001

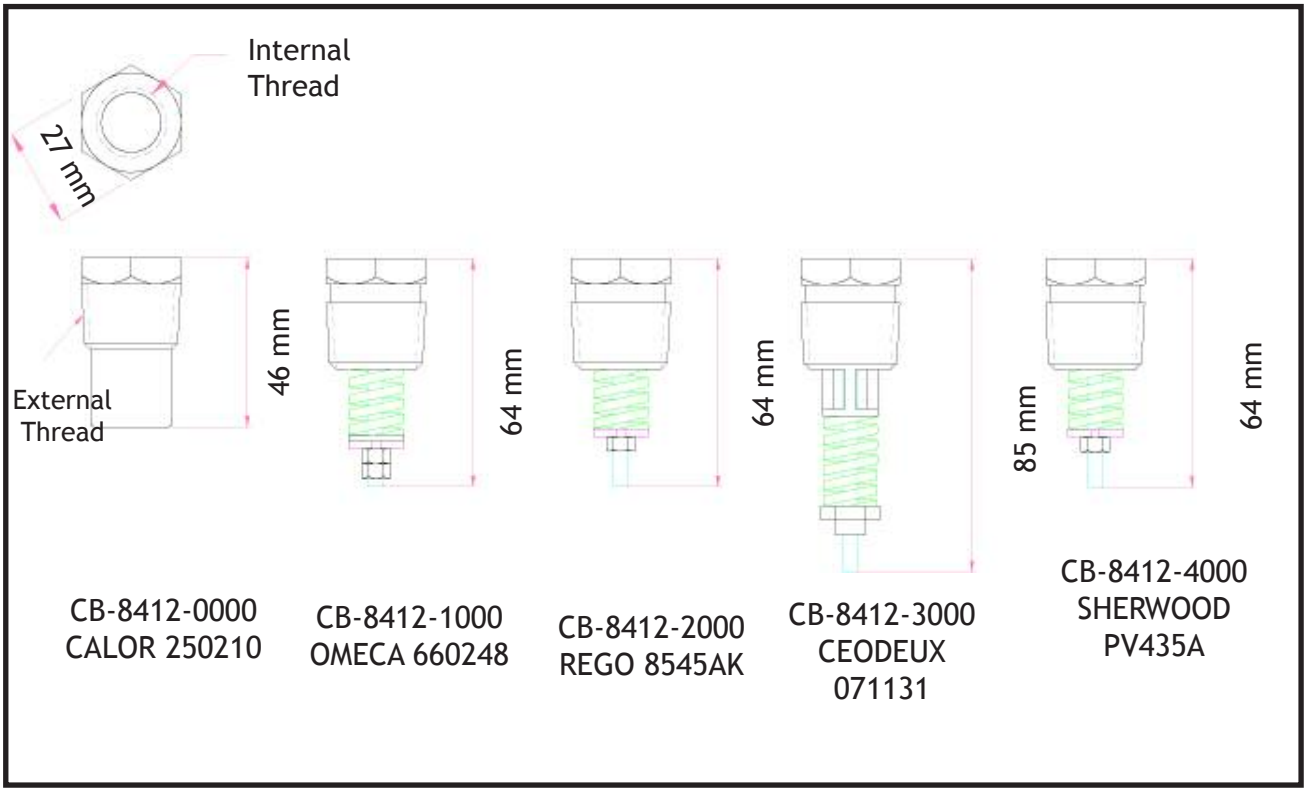

Fig. A 3-1 Pressure Relief Valve Identification

A3.2.7 Vapour Valves with Integral PRV

The date is shown as month and year

Example: 03/01 would be March 2001

A4.1 All Cameron Envelopes and Thunder & Colt Envelopes, CN3001 and Subsequent

The base tape is either 25 mm polyester (Min. strength 1814 kg) or 45mm polyester (Min. strength 2722 kg).

The parachute aperture edge tape for Cameron types is normally of the same specification as the vertical load tape except where the envelope has 12 mm polyester vertical loadtapes where the edge tape is 20 mm polyester (Min. strength 1020kg).

The parachute aperture edge tape for Thunder & Colt types is 25 mm polyester of Min. strength 1815 kg.

All other horizontal tapes are 12 mm polyester (Min. strength 300 kg), 20 mm flat polyester (Min. strength 680 kg) or 25 mm flat nylon (Min. strength 680 kg).

The additional mid-gore crown tapes fitted to RDS or Smart Vent are 20 mm polyester of Min. strength 1020 kg.

For Vertical load tape specifications, refer to Table **A4.1**

A4.2 Thunder & Colt Envelopes CN0001 to CN3000

The base tape is 50 mm polyester of minimum strength 2000kg (4400 lbs). This tape is also used for the rip aperture edge tape on combination rip / parachute deflation systems.

The parachute aperture edge tape is 25 mm polyester of minimum strength 1815 kg (4000 lbs).

All other horizontal tapes are 20 mm polyester of minimum strength 680 kg (1500 lbs)

For Vertical load tape specifications, refer to Table **A4.2**

Note: In both tables, two different load tape specifications have been listed for some envelopes. For these envelopes it is not permitted to mix tape specifications (i.e. All the vertical tapes shall be to the same specification).

Table : A4.1 Vertical Load Tape Specifications-Current

Envelope Type	Envelope Volume	Vertical Load Tape Specification
A-Type	105 to 160	20 mm polyester of minimum strength 1020kg (2250 lbs)
	180 to 340	25 mm polyester of minimum strength 1815 kg (4000 lbs)
	340 HO to 375	45 mm polyester of minimum strength 2722 kg (6000 lbs) or 25 mm polyester of minimum strength 3000 kg (6614 lbs)
	400 to 530	45 mm polyester of minimum strength 2722 kg (6000 lbs)
Concept	60	20 mm polyester of minimum strength 680 kg (1500 lbs) or 25 mm nylon of minimum strength 680 kg (1500 lbs)
	70 to 100	20 mm polyester of minimum strength 1020kg (2250 lbs)
GP-Type	65, 70	Kevron Loadtapes (refer to Cameron Balloons Limited)
H-Type	20 to 34	20 mm polyester of minimum strength 680 kg (1500 lbs) or 25 mm nylon of minimum strength 680 kg (1500 lbs)
N-Type	31 to 210	20 mm polyester of minimum strength 1020 kg (2250 lbs)
O-Type	31 to 90	20 mm polyester of minimum strength 1020 kg (2250 lbs)
	105 to 160	25 mm polyester of minimum strength 1815 kg (4000 lbs)
TR-Type	60 to 84	20 mm polyester of minimum strength 680 kg (1500 lbs)
Viva	31 to 65	20 mm polyester of minimum strength 1020 kg (2250 lbs)
	77 to 90	25 mm polyester of minimum strength 1815 kg (4000 lbs)
Z-Type & Colt A Type	25 to 31	12 mm polyester of minimum strength 300 kg (660 lbs)
	42	20 mm polyester of minimum strength 680 kg (1500 lbs)
	56 to 210	20 mm polyester of minimum strength 1020 kg (2250 lbs)
	225 to 425 LW	25 mm polyester of minimum strength 1815 kg (4000 lbs).
	450 to 600	25 mm polyester of minimum strength 3000 kg (6614 lbs)
Thunder Series S1	AX5-42S1 to AX8-84S1	20 mm polyester of minimum strength 1020 kg (2250 lbs)
	AX8-90S1 to AX10-180S1	25 mm polyester of minimum strength 1815 kg (4000 lbs)
Thunder Series S2	AX8-90S2 to AX9-140S2	20 mm polyester of minimum strength 1020 kg (2250 lbs)
	AX10-160S2 to AX11-250S2	25 mm polyester of minimum strength 1815 kg (4000 lbs)
Colt Bullet	56B to 90B	20 mm polyester of minimum strength 1020 kg (2250 lbs)

A5.1 GENERAL

This Section gives the specification of control lines used on Cameron and Thunder & Colt Balloons.

A5.2 SPECIFICATIONS

Designation	Description	Minimum Tensile Strength	Colours
Kevlar-Cored: Ø8 mm	Aramid core with poly-ester over-braid	1688 kg (3720 lbs)	Red, red/white 50/50 spiral or black/yellow 50/50 spiral.
Kevlar-Cored: Ø6 mm	Aramid core with poly-ester over-braid	1200 kg (2646 lbs)	Green or Black
Kevlar-Cored: Ø3.5 mm	Aramid core with poly-ester over-braid	450 kg (992 lbs)	Green or White
Kevlar-Braided: Ø3 mm	Braided Aramid line	350 kg (772 lbs)	Yellow
Polyester, 8-Plait: Ø6 mm	Pre-stretched plaited polyester	160 kg (353 lbs).	White
Polyester, Plaited, Pre-Stretched: Ø3 mm	Plaited polyester line	400 kg (880 lbs).	White

A5.3 USAGE

Key

* The original operating line may be 6 mm red polyester with a taped wire end. If a red 8 mm Kevlar-cored line is to be fitted, the control line pulleys must be changed.

** The original parachute operating line may be 6 mm white polyester and the original ripline may be 6 mm red polyester, each with a taped wire end. To fit the 8 mm Kevlar-cored lines the control line pulleys must be changed.

*** The original control lines were white and black. The green line replaces the black line.

A5.3 Usage (continued)

Control Line	Cameron / T&C CN3001-4999, CN10000-	T&C CN 0-3000
Parachute		
Shroud Line	Ø3mm Kevlar	Ø3mm Polyester
Centralising Line	Ø3mm Kevlar	Ø3mm Kevlar
Operating Line	Ø8mm Kevlar Red/White or Red (obsolete)	Ø8mm Red*
Lock Top		
Shroud /Centralising Line	Ø3mm Kevlar	-
Vent Line	Ø8mm Kevlar Red/White or Red (obsolete)	-
Arming Line-Upper	Ø3mm Polyester	-
Arming Line-Lower	Ø8mm Kevlar Yellow/Black	-
RDS/Smart Vent		
Shroud /Centralising Line	Ø3mm Polyester	-
All other rigging lines	Ø3mm Polyester	-
Vent Line	Ø8mm Kevlar Red/White	-
Rip Line	Ø8mm Kevlar Red	-
Combination Rip/Parachute		
Shroud Line	Ø3mm Kevlar	Ø3mm Polyester
Centralising Line	Ø3mm Kevlar	Ø3mm Kevlar
Vent Line	Ø8mm Kevlar Red/White	Ø8mm Kevlar Red/White**
Rip Line	Ø8mm Kevlar Red	Ø8mm Kevlar Red**
Velcro Rip		
Rip Line	Ø8mm Kevlar Red	Ø8mm Kevlar Red*
Turning Vents (Mod.C421)		
Rigging Lines	Ø3mm Polyester	
Upper Section: Clockwise	Ø3.5mm Kevlar, Braided,Green	-
Upper Section:Anti-Clockwise	Ø3.5mm Kevlar, Braided,White	-
Lower Section: Clockwise	Ø8mm Kevlar Green	-
Lower Section: Anti-Clockwise	Ø8mm Kevlar Black	-
Turning Vents (Obsolete)		
Rigging Lines	Ø3mm Polyester	Ø3mm Polyester
Clockwise	Ø6mm Kevlar Green	Ø3.5mm Kevlar, Braided,Green
Anti-Clockwise	Ø6mm Kevlar Black	Ø3.5mm Kevlar, Braided,White***