R-TYPE 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

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STATEMENT OF INITIAL CERTIFICATION

This manual provides the maintenance instructions and inspection schedule for all types and variants detailed in EASA.BA.028 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.23 March 2016.....

For and on behalf of Cameron Balloons Ltd.

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Amendment Number	Description	Pages Affected	Date	Approval

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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1.1 INTRODUCTION

This manual sets out the procedures for the maintenance and repair of Cameron R-Type balloons. The schedule for inspections, inspection criteria and acceptance standards are detailed in Section 6.

This document was originally approved a part of CBL/TN/DAC/19

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 R-Type envelopes. Also covered are the maintenance and repair of burners, gondolas and cylinders specific to R-Type balloons. For baskets, burners and fuel cylinders originally approved for use with hot-air balloons Refer to Cameron Balloons Hot Air Balloon Maintenance Manual issue 10 or later EASA approved revision.

The Maintenance Schedule, Section 6, applies to all R-Type Envelopes and dedicated components 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.

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2.1 GENERAL

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

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

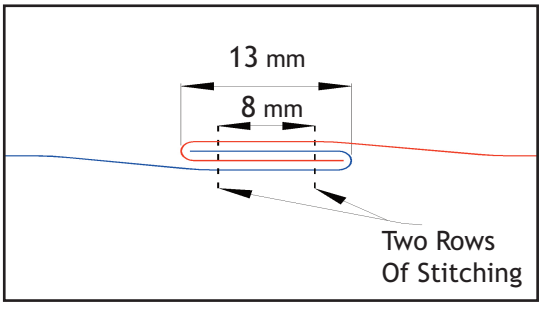
Nylon bonded three-strand metric 40 thread (Tkt No. 40 M) must be used, ideally of a contrasting colour to the fabric. Comparable specifications are VT-295E size E, Dtex 233/3 or Type 69E, T-70. The scoop or skirt is manufactured using a similar thread made from Nomex.

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.

The treatment of fabric damage must be considered in two parts. The cone below the first horizontal load tape can be treated more casually than the fabric higher in the envelope.

2.1.4.1 Fabric below the first horizontal load tape

It is possible for the fabric in this region to be damaged by the flame during inflation, alt-hough this is infrequent with experienced pilots.

Provided that no damage has been done to the load tapes it is perfectly safe to fly the bal-loon with holes in this lower area of fabric.

Repairs can be carried out by any convenient method; this may be sewing, sticking, by adhesive tape - or by the more thorough methods below.

2.1.4.2 Fabric above the first horizontal load tape

The fabric above the first horizontal load tape is an essential part of the balloon struc-ture, and, if it is damaged, the balloon is not airworthy, and must be repaired according to the standards set out below.

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

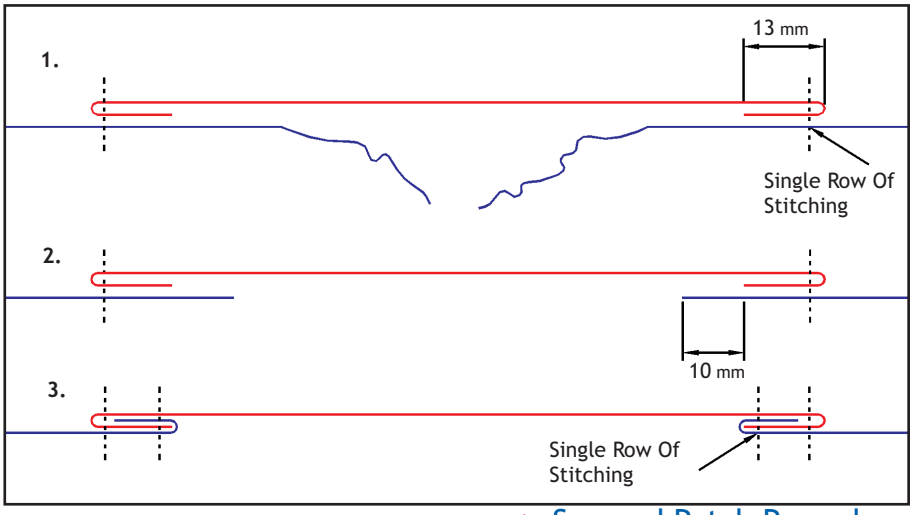
Patches may be used to make repairs to panels and should be made as follows:

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.

2.2.3 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.

2.2.5 Gas Containing Fabric

It is important that the integrity of the gas containing membrane is maintained at all times. If any part of it is repaired, the correct replacement fabric must be used and all seams must be sealed using the correct sealant. (If necessary refer to Cameron Balloons Ltd, stating constructor's number).

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 available from Cameron Balloons Limited 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.

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)
20	610	600
25	610	600

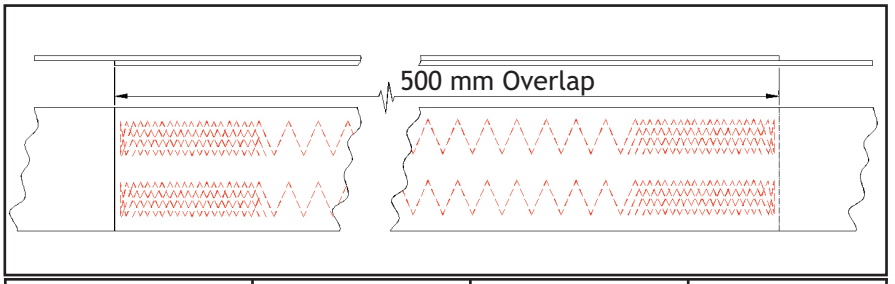
▲ Horizontal Load Tape Joints

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.



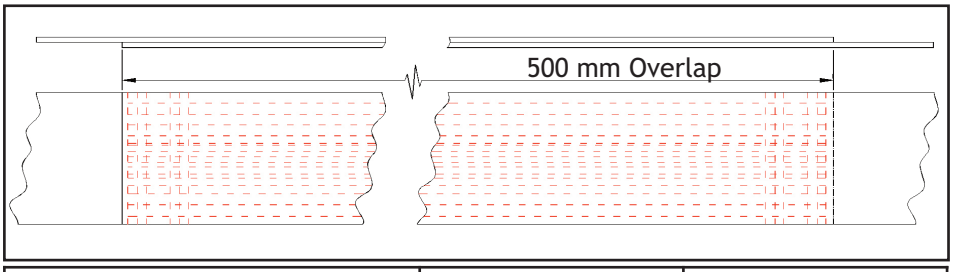
Tape Width (mm) \ Joint Length	Measured length (mm)	Finished length (mm)	No. of Rows
20	500	470	2
25	500	470	2

▲ Standard Zig-Zag Stitched Tape Joint Detail

2.3.3.2 Parallel Stitch Joint

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 Tubular (Polyester)	8	3
25 mm Flat (Nylon)	8	3
25 mm Tubular (Polyester)	14	3

▲ Alternative Parallel Stitched Tape Joint Detail

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 Vertical Load Tape to Flying Cable Turnback

2.3.5.1 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.

2.3.5.2 Damage to the Tape Loop Holding the Flying Cable

1. The unpicking is the same as steps 1 to 4 from Section 2.3.5.1.

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 2.3.5.1.

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.

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-

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 (where fitted)

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.

2.4.4 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 available from Cameron Balloons Limited

2.4.5.2 Usage

Envelope control line usage is from Cameron Balloons Limited.

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.

2.6 ENVELOPE CLEANING

The envelope may be cleaned by hand with warm water (40°C 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.

2.7 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.

2.8 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.

2.9 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).

3.1 HOT AIR BALLOON BASKETS

Refer to Cameron Balloons Hot Air Balloon Maintenance Manual issue 10 or later EASA approved revision.

3.2 COMPOSITE GONDOLAS

For information on repairing composite gondolas refer to Cameron Balloons Limited.

3.3 SUPPORT RODS

Support Rods must be replaced if cracked or broken.

3.4 SWAGING OF WIRE ROPES

For the wire rope swaging procedure, see Appendix 2.

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4.1 GENERAL

WARNING: It is essential that any fuel system or burner maintenance is carried out in clean conditions as the presence of dirt may impair the function of seals or cause blockage of the jets. Burners must be disconnected from all fuel supplies and vented of pressure prior to any maintenance/repair work.

Any maintenance/repair work carried out on the fuel system/burner(s) must be followed by a complete functional check (Section 6.17.3) before the item is returned to service.

4.1.1 Spare Parts

Use only genuine Cameron Balloons spare parts when maintaining or repairing fuel system and burner components. Commercially available equivalents, although appearing similar, may have been manufactured to different specifications.

Descriptions of spare parts can be found in Section 8.4 of this Manual.

4.2 STANDARD PRACTICES

Refer to Cameron Balloons Hot Air Balloon Maintenance Manual issue 10 or later EASA approved revision.

4.3 CONSUMABLE ITEMS

Refer to Cameron Balloons Hot Air Balloon Maintenance Manual issue 10 or later EASA approved revision.

4.4 FUEL CYLINDERS

Refer to Cameron Balloons Hot Air Balloon Maintenance Manual issue 10 or later EASA approved revision.

Note: Auxiliary fuel cylinders have identical fittings to standard/master fuel cylinders

4.5 BURNERS

4.5.1 Regular Maintenance

Regular maintenance of Rozière Burner manifold blocks is similar to the maintenance of the hot-air balloon burner manifold blocks from which they are derived.

For regular maintenance and servicing of burners CB215 and CB2060 refer to Cameron Ballons Flight and Maintenance Manual issue 6 (MKIV Burner)

For regular maintenance and servicing of burners CB6420 and CB6541 refer to Cameron Ballons Flight and Maintenance Manual issue 10 (Shadow/Stealth Burner)

4.5.2 Rozière Burner Coil Assembly

After a period of use dirt or products of combustion may partially block the foil jets of the Rozière coil assembly, causing a reduction of burner power. The coil assembly may be dismantled for cleaning:

1. Undo the upper section of the coil assembly by unscrewing counter-clockwise.

2. Lift the coil and upper foil retaining plate subassembly away from the lower stem section.

3. Remove the jet foil from the housing and clean as required.

4. Check that the five screw-in jets fitted in the upper foil retaining plate are not blocked or loose. Clean or replace as required. Apply a small amount of Loctite 572 sealant to the male thread of the jets prior to tightening if they are removed.

5. Check the O-Ring seal on the central spigot of the coil subassembly for damage, replace if necessary.

6. Re-fit the jet foil into the housing of the lower stem section.

7. Re-fit the upper section of the coil assembly and screw in clockwise, ensuring the jet foil remains at an even level all round. Tighten to a torque of 60-65 Nm.

4.5.3 Ball Valve

A Waverley ball valve is used to control some burner functions, e.g. to isolate solenoid valves.

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.

4.6 BURNER FRAME

4.6.1 Replacement of Corner Buffers

Refer to Cameron Balloons Hot Air Balloon Maintenance Manual issue 10 or later EASA approved revision.

4.6.2 Gimbal Mounted Burner Removal

Refer to Cameron Balloons Hot Air Balloon Maintenance Manual issue 10 or later EASA approved revision.

4.6.3 Gimbal Mounted Burner Refitting

Refer to Cameron Balloons Hot Air Balloon Maintenance Manual issue 10 or later EASA approved revision.

4.7 HOSE END FITTINGS

Refer to Cameron Balloons Hot Air Balloon Maintenance Manual issue 10 or later EASA approved revision.

5.1 FLYTEC ENVELOPE TEMPERATURE SENSOR

5.1.1 Installation

An attachment point for the Flytec temperature sensor is located on a load tape approximately 2 m below the top of the hot air cone.

To fit the temperature sender:

1. Locate the attachment point.

2. Remove the adhesive fabric patch from the small hole in the envelope.

3. Peel back the Velcro from the load tape.

4. Pass the Velcro strip through the slot at the end of the sender unit, under the body of the unit, and through the slot at the other end of the unit.

5. Press the Velcro strip and sender unit down firmly onto the Velcro attached to the load tape.

6. Ensure that the probe and wire is at the end of the sender unit nearest the hole in the envelope, and that the sender unit has its ridged surface next to the balloon fabric.

7. Pass the temperature probe through the hole in the envelope, and attach it inside the envelope using the small Velcro tab.

5.1.2 Replacement of Batteries

When the temperature sender battery requires replacement the main instrument will indicate a loss of temperature signal. Note that the temperature sender will not start transmitting until there is a temperature difference of 10ºC between the inside of the envelope and the sender unit.

To replace the battery:

1. Remove the temperature sender from the envelope using the reverse of the procedure given in Section 5.1.1)

2. Remove the two screws from the underside of the sender unit.

3. Replace the battery with a new Duracell MN1604, ENERGIZER E522 or equivalent.

4. Reassemble the unit and replace on the envelope as per Section 5.1.1.

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6.1 GENERAL

This is the manufacturer's recommended Maintenance Schedule for all Cameron R-Type 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				
Before each flight*	None	None	None	None
Burner				
Before each flight*	None	None	None	None
Basket				
Before each flight*	None	None	None	None
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. *"Before each flight" does not apply to a new balloon.

6.2.2 Component Lives

Component	Life Limit			
	Calender	Permitted Variation	Hours	Permitted Variation
Envelope: None	None	None	None	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 INSPECTION SCHEDULE

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

NOTES:

Workpack No.	CN	Inspection Date	Inspectors Signature/No.

6.5.1 Envelope Structure (external)

Component	Check / Inspect / Record	Pass/Fail (✓)/(x)
Crown Line (if fitted)	Inspect condition	
Crown Ring(s)	Inspect for damage and Corrosion	
Rip Panel(s)	Inspect Rip Panels, collar and rigging	
Appendix Tear-out Panels	Inspect Rip Panels and external rigging	
Vertical Load Tapes	Inspect turnbacks at crown ring(s)	
	Inspect attachments for insulation layer (if fitted)	
	Inspect joints between gas cell and hot air cone	
	Inspect tapes	
	Inspect joints between load tapes and flying cables	
	Inspect load tape protectors	
Horizontal Load Tapes	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 at each inspection). Minimum Strength= 30lb (13.6kg). Refer to Section 6.7	
karabiners/ hardware	Check condition and correct type	

Workpack No.	CN	Inspection Date	Inspectors Signature/No.

6.5.2 Envelope Structure (internal)

WARNING: While a crew member is inside the balloon it is important that another crew member is outside the balloon ensuring the safety of the person inside. Working inside the balloon can be disorienting, and there is a small risk of suffocation. The person outside the balloon should have a knife and be prepared to cut the balloon open if the person inside should lose consciousness. An additional precaution would be to place another person at the crown patch hole or appendix end with a hot-air balloon inflator fan ready to blow air into the envelope if needed.

Component	Check / Inspect / Record	Pass/Fail (✓)/(x)
Control Lines	Check condition of the internal section of the valve and tricing lines, especially at their points of attachment to the lower part of the envelope and the tricing-line pulley.	
Fabric	Inspect the envelope for pin holes (revealed by light spots)	

6.5.3 Gas Valve

Component	Check / Inspect / Record	Pass/Fail (✓)/(x)
Valve Plates	Check condition of sealing surfaces	
Fasteners/ Springs	Check fasteners and springs for condition and completeness	
Operation	Check function (by hand)	

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	

Workpack No.	CN	Inspection Date	Inspectors Signature/No.

6.5.5 Test Inflation

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

6.5.6 Grab Test Results

Colour	Result	Colour	Result

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

Refer to Cameron Balloons Limited

6.6.2 Burner System

Refer to Cameron Balloons Limited

6.6.3 Basket Gondola

Refer to Cameron Balloons Limited

6.6.4 Ancillary Equipment (If fitted)

Refer to Cameron Balloons Limited

6.6.5 Fuel Cylinders

Refer to Cameron Balloons Limited

Workpack No.	CN	Inspection Date	Inspectors Signature/No.

6.7 GRAB TEST

6.7.1 General

The grab test must be performed before every flight once the envelope has completed its first flight100hr/annual inspection once the envelope has flown 250 hours (including tethered flight).

The grab test must be performed in both the warp and weft directions on each fabric colour and each fabric type (e.g. Hyperlast and Ripstop) of the envelope, parachute and turning vent.

If the envelope or parachute is predominantly one colour, the test panels (minimum 4) should be selected radially.

Note: Consideration should be given to radial location when selecting panels (i.e. if one side of the envelope is more exposed to UV it will give a lower grab test value). The panels with the potential for most UV exposure or displaying any UV degradation (loss of colour) must be tested first.

6.7.2 Requirements

If the fabric of the envelope withstands a 30 lb (13.6 kg) load without failure it is fully airworthy.

6.7.3 Procedure

The grab test should be configured as shown in Figure 6.1.

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

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

The load should be applied at a constant rate until the upper limit is reached.

6.7.4 Envelope

Test panels should be selected at the highest location at which each type/colour occurs.

Fabric types/colours that only occur below the first Horizontal load tape above the Nomex need not be tested.

6.8 FLIGHT TEST

Refer to Cameron Balloons Limited

6.9 UNSCHEDULED INSPECTIONS

6.9.1 Pre-Flight Inspections

Pre-flight inspections are covered in the Cameron Balloons R-Type Flight Manual Iss. D0, 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 127ºC 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 93ºC to 149ºC which will turn black once their respective temperatures are reached.

If the maximum temperature indicated on the tempilabel is less than 121ºC 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).

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 121ºC 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

Refer to Cameron Balloons Limited

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 maintained in accordance with the applicable supplement and/or additional approved data when appropriate, but the content of the base Maintenance 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 Maintenance 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 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 type / variant (e.g. R-150), 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-3050-0002	Velcro, 50 mm (twin metre)
CK-1001-0001	Sealing Tape (gas cell)

8.2.3 Envelope Fabric

Part Number	Description
CK-1000-0003	Gas Cell Fabric (210 Denier)
CB-1720-0001	Super Foil
CB-1720-0002	Super Foil + 2mm Insulation
CE-5131-XXXX*	Ripstop Nylon Envelope Fabric
CE-5193-XXXX*	Ripstop Nylon Envelope Fabric, Silver
CE-3390-XXXX*	Ripstop Nylon Envelope Fabric, White
CE-1123-XXXX*	Nomex Envelope Fabric

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-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-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-4103-0005	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-4300-0024	Karabiner, Crown Line (Top and cone attachment)
CE-4300-0025	Karabiner, Crown Line (Bottom)
CE-4300-0026	‘D’ Ring, Stainless Steel (22mm wide)
CE-4300-0100	Pulley Swivel

8.2.6 Envelope Control and Rigging Lines

Part Number	Description
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-4108-0012	8 mm Line, Kevlar, Red/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)

8.2.7 Envelope Flying Cables

Contact Cameron Balloons Limited

8.3 BASKET

8.3.1 Hot Air Balloon basket

Refer to Cameron Balloons Hot Air Balloon Maintenance Manual issue 10 or later EASA approved revision.

8.3.2 Gondola

Contact Cameron Balloons Limited.

8.4 FUEL SYSTEM

8.4.1 General

When ordering replacement Burner or other fuel system parts, it is essential to state the part number / serial no. and the type of burner or cylinder.

8.4.2 Consumable Items

Refer to Cameron Balloons Hot Air Balloon Maintenance Manual issue 10 or later EASA approved revision.

8.4.3 Fuel Cylinders

Refer to Cameron Balloons Hot Air Balloon Maintenance Manual issue 10 or later EASA approved revision.

8.4.4 Rozière Burner CB215, CB2060, CB6420, CB6541

Part Number	Description
CB-2607-0000	Blast Valve Seal
CB-2608-0000	O-Rings, Blast Valves
CB-2609-0000	O-Rings, Lubrication Screw

8.4.5 Burner Frames

Refer to Cameron Balloons Hot Air Balloon Maintenance Manual issue 10 or later EASA approved revision.

8.4.6 Hose Assemblies

Contact Cameron Balloons Limited

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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.

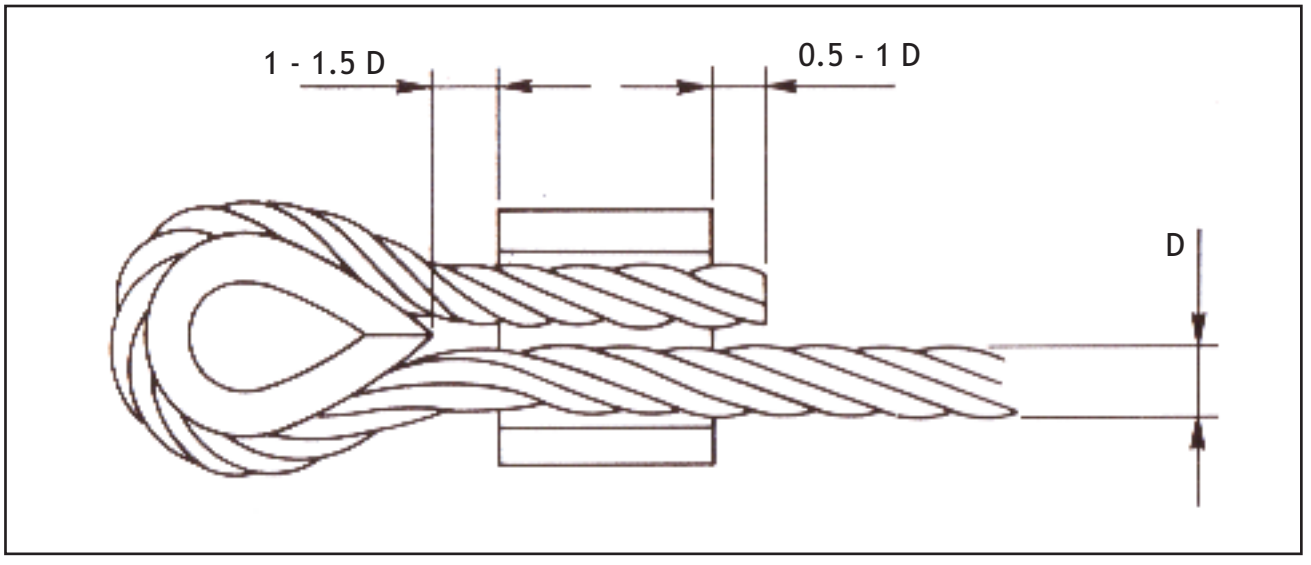

Fig. A2-1 Joint Before Swaging

Fig. A2-2 shows the completed swaged joint.

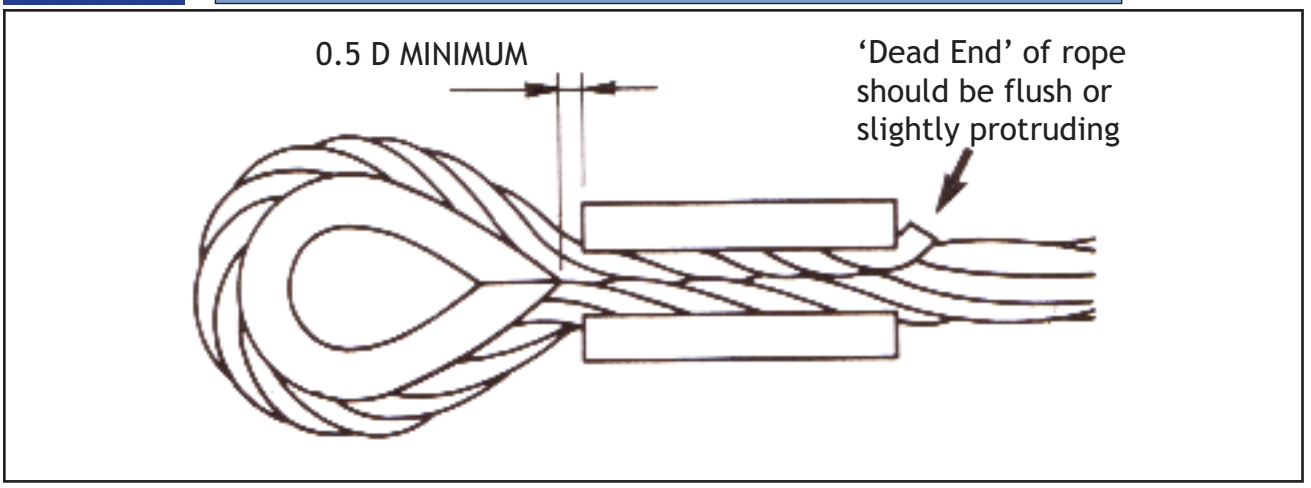

Fig. A2-2 Joint After Swaging

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.

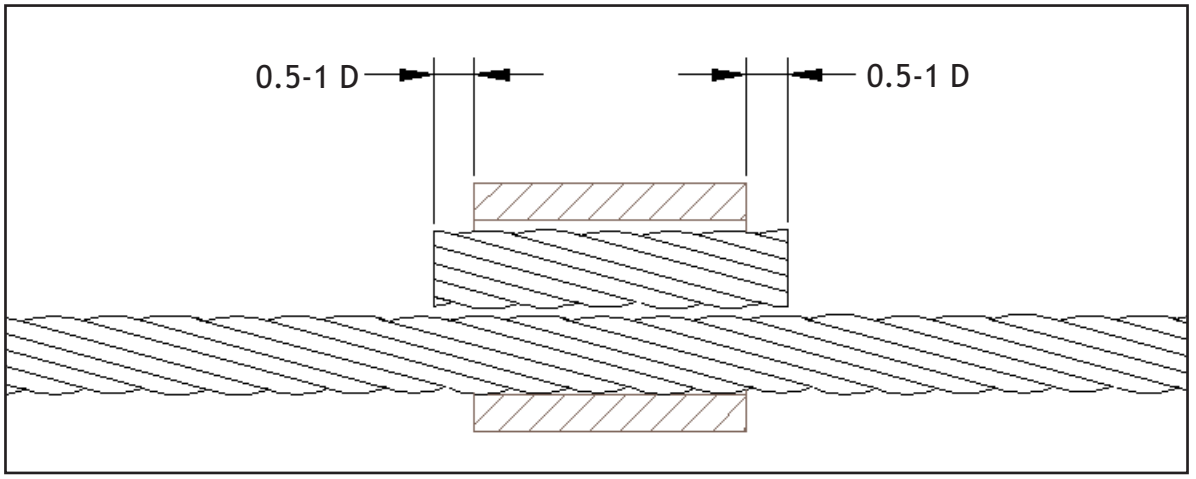

Fig. A2-3 Limiter Before Swaging

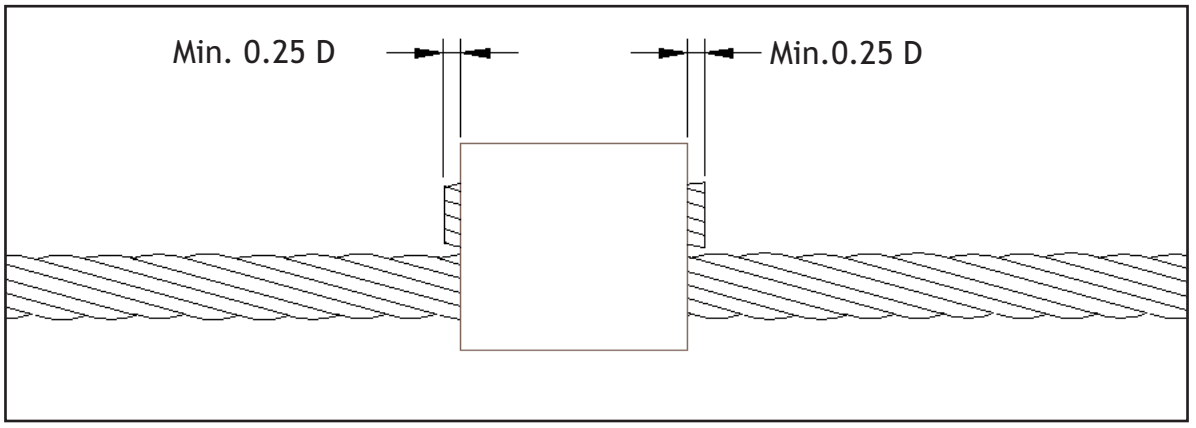

Fig. A2-4 Limiter After Swaging

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.

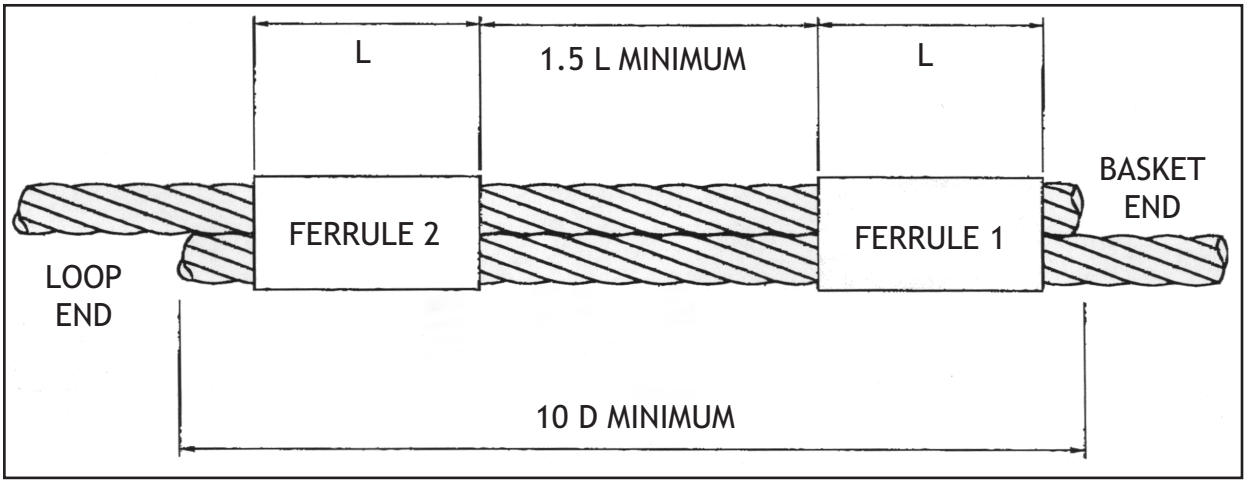

Fig. A2-5 Basket Wire Repair

Table A2-2

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