

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 DOA nr. 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 DOA nr. 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 DOA nr. EASA.21J.140 (C547)
4	List of Effective Pages updated, Section 1: General applicability updated, Lindstrand added, Section 2.3.3.2, 16 was 8 in error, Section 3: Guidance on frame repairs added, Section 4: 4.6.3.1: cross reference corrected, Section 6. Maintenance programme ref added, Section included for other manufacturers data added, following pages renumbered, Hose part marking information added, Grab Test information and cylinder inspection guidance updated. Overheat inspection updated, Heavy landing/Transport accident inspection added.	i-iii, i-v, i-vii, i-viii, i-xi to i-xiv, 1-1 to 1-4, 2-6, 2-15, 3-3, 4-6, 4-23, 4-32, 6-1 to 6-5, 6-7, 6-10 to 6-24	19/10/17	The technical content of this document is approved under the authority of DOA nr. EASA.21J.140 (C720)

**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.

Intentionally Blank Page

Section	Page	Date of Issue	Section	Page	Date of Issue	Section	Page	Date of Issue
0	i-i	21 December 2011	4 (cont.)	4-5	10 April 2006	6 (cont.)	6-18	19 October 2017
	i-ii	10 April 2006		4-6	19 October 2017			
	i-iii	19 October 2017					6-19	19 October 2017
	i-iv	21 December 2011		4-7	10 April 2006		6-20	19 October 2017
	i-v	19 October 2017		4-8	10 April 2006		6-21	19 October 2017
	i-vi	10 April 2006		4-9	21 December 2011		6-22	19 October 2017
	i-vii	19 October 2017		4-10	10 April 2006		6-23	19 October 2017
	i-viii	19 October 2017		4-11	10 April 2006		6-24	19 October 2017
	i-ix	21 December 2011		4-12	10 April 2006			
	i-x	21 December 2011		4-13	10 April 2006	7	7-1	21 December 2011
	i-xi	19 October 2017		4-14	10 April 2006		7-2	21 December 2011
	i-xii	19 October 2017		4-15	10 April 2006			
	i-xiii	19 October 2017		4-16	10 April 2006	8	8-1	10 April 2006
	i-xiv	19 October 2017		4-17	21 December 2011		8-2	21 December 2011
				4-18	10 April 2006		8-3	21 December 2011
1	1-1	19 October 2017		4-19	10 April 2006		8-4	10 April 2006
	1-2	19 October 2017		4-20	10 April 2006		8-5	21 December 2011
	1-3	19 October 2017		4-21	10 April 2006		8-6	21 December 2011
	1-4	19 October 2017		4-22	10 April 2006		8-7	21 December 2011
				4-23	19 October 2017		8-8	21 December 2011
2	2-1	21 December 2011		4-24	10 April 2006			
	2-2	21 December 2011		4-25	10 April 2006	A	A1-1	21 December 2011
	2-3	21 December 2011		4-26	10 April 2006		A1-2	21 December 2011
	2-4	21 December 2011		4-27	10 April 2006		A2-1	10 April 2006
	2-5	21 December 2011		4-28	21 December 2011		A2-2	21 December 2011
	2-6	19 October 2017		4-29	10 April 2006		A2-3	10 April 2006
	2-7	21 December 2011		4-30	21 December 2011		A2-4	21 December 2011
	2-8	21 December 2011		4-31	21 December 2011		A3-1	21 December 2011
	2-9	21 December 2011		4-32	19 October 2017		A3-2	21 December 2011
	2-10	21 December 2011					A4-1	05 October 2007
	2-11	21 December 2011	5	5-1	10 April 2006		A4-2	21 December 2011
	2-12	21 December 2011		5-2	10 April 2006		A4-3	05 October 2007
	2-13	21 December 2011					A4-4	10 April 2006
	2-14	21 December 2011	6	6-1	19 October 2017		A5-1	21 December 2011
	2-15	19 October 2017		6-2	19 October 2017		A5-2	21 December 2011
	2-16	21 December 2011		6-3	19 October 2017			
	2-17	Deleted		6-4	19 October 2017			
	2-18	Deleted		6-5	19 October 2017			
	2-19	Deleted		6-6	21 December 2011			
	2-20	Deleted		6-7	19 October 2017			
				6-8	21 December 2011			
3	3-1	10 April 2006		6-9	21 December 2011			
	3-2	10 April 2006		6-10	19 October 2017			
	3-3	19 October 2017		6-11	19 October 2017			
	3-4	10 April 2006		6-12	19 October 2017			
				6-13	19 October 2017			
4	4-1	10 April 2006		6-14	19 October 2017			
	4-2	05 October 2007		6-15	19 October 2017			
	4-3	21 December 2011		6-16	19 October 2017			
	4-4	10 April 2006		6-17	19 October 2017			

Intentionally Blank Page

APPROVAL

RECORD OF AMENDMENTS

LIST OF EFFECTIVE PAGES

CONTENTS

SECTION 1 : GENERAL

1.1 INTRODUCTION

1.2 REPAIR PARTS AND MATERIALS

1.3 APPLICABILITY

1.4 PROPANE CYLINDERS

1.5 PILOT OWNER MAINTENANCE

1.5.1 Envelope

1.5.2 Burner

1.5.3 Fuel Cylinders

1.5.4 Basket

1.5.5 Flight Instruments

SECTION 2 : ENVELOPE REPAIRS

2.1 GENERAL

2.1.1 Stitching

2.1.2 Envelope Thread

2.1.3 Balloon Seam

2.1.4 Fabric Repair Limitations

2.2 FABRIC REPAIRS

2.2.1 Panel Replacement

2.2.2 Sewn Patch repairs

2.2.2.1 *Seamed Method*

2.2.2.2 *Hot Cut and Overlay Method*

2.2.3 Adhesive Patch Repairs

2.2.4 Adhesive strip repairs with Stitching

2.3 LOAD TAPE REPAIRS

2.3.1 General

2.3.2 Horizontal Load Tapes

2.3.3 Vertical Load Tapes

2.3.3.1 *Standard Joint*

2.3.3.2 *Parallel Stitch Joint*

2.3.3.3 *Intersection Joint 12 mm Load Tape*

2.3.3.4 *Single and Twin Needle Box Joint*

2.3.4 Base Tape Joints

2.3.5 Parachute Aperture Edge Tapes

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

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

- 2.3.8 Repairs to Crown Tapes:12 mm tape
  - 2.3.9 Vertical Load Tape to Flying Cable Turnback: 20,25 and 45 mm tape
    - 2.3.9.1 *Replacing Flying Cables*
  - 2.3.10 Vertical Load Tape to Flying Cable Turnback: 12 mm tape
  - 2.4 CONTROL LINES
    - 2.4.1 General
    - 2.4.2 Replacement (complete)
    - 2.4.3 Repair
      - 2.4.3.1 *Crown Line*
      - 2.4.3.2 *Parachute Centralising and shroud lines*
      - 2.4.3.3 *RDS and Smart Vent shroud / centralising lines*
      - 2.4.3.4 *Turning Vent Lines*
      - 2.4.3.5 *Parachute Operating Lines and RDS / Smart Vent venting lines*
      - 2.4.3.6 *RDS, Smart Vent Riplines*
    - 2.4.4 Control Line Pulleys and Internal Loops
    - 2.4.5 Control Line Specifications and Usage
      - 2.4.5.1 *Specifications*
      - 2.4.5.2 *Usage*
  - 2.5 FLYING CABLES
    - 2.5.1 Stainless Steel Flying Cables
  - 2.6 PARACHUTE REPLACEMENT
  - 2.7 ENVELOPE CLEANING
  - 2.8 VELCRO CLEANING
  - 2.9 VELCRO REPLACEMENT
  - 2.10 TEST INFLATION AFTER REPAIR
- SECTION 3 : BASKET REPAIRS
- 3.1 ROUTINE MAINTENANCE
  - 3.2 WICKERWORK
  - 3.3 LEATHER, SUEDE AND FABRIC TRIM
  - 3.4 RAWHIDE
  - 3.5 BASKET RUNNERS (WOVEN FLOOR BASKETS)
  - 3.6 BASKET FLOORS AND RUNNERS (SOLID FLOOR BASKETS)
  - 3.7 BASKET FRAMES
  - 3.8 SUPPORT RODS
  - 3.9 SWAGING OF WIRE ROPES
  - 3.10 BASKET FRAME REPAIRS

SECTION 5 : INSTRUMENT REPAIRS

5.1 FLYTEC ENVELOPE TEMPERATURE SENSOR

5.1.1 Installation

5.1.2 Replacement of Batteries

SECTION 6 : MAINTENANCE SCHEDULE

6.1 GENERAL

6.2 SCHEDULED INSPECTIONS AND COMPONENT LIFE

6.2.1 Scheduled Inspections

6.2.2 Component Lives

6.3 UNSCHEDULED INSPECTIONS

6.4 DOCUMENTATION

6.5 INSPECTION SCHEDULE

6.5.1 Envelope Structure

6.5.2 Deflation System

6.5.3 Turning Vents/Side Dump

6.5.4 Envelope Temperature Measurement

6.5.5 Test Inflation (if required)

6.5.6 Grab Test Results

6.5.6.1 *Grab Test Results-Envelope*

6.5.6.2 *Grab Test Results-Deflation System*

6.5.7 Burner System

6.5.8 Basket

6.5.8.1 *Basket Ancillary Equipment*

6.5.9 Fuel Cylinders

6.5.10 Other Manufacturers Component Data

6.5.10.1 *Basket*

6.5.10.2 *Burner*

6.5.10.3 *Cylinders*

6.6 INSPECTION CRITERIA/ TECHNIQUES

6.6.1 Envelope Structure

6.6.2 Deflation System

6.6.3 Turning Vents/Side Dump

6.6.4 Burner System

6.6.5 Basket

6.6.6 Ancillary Equipment (If fitted)

6.6.7 Fuel Cylinders

6.6.7.1 *External Visual Inspection*

6.6.7.2 *Pressure Relief Valve (PRV)*

6.6.7.3 *Functional Check*

6.6.7.4 *Periodic Inspection*

6.6.7.5 *Lindstrand T30 Fuel Cylinders*

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

**6.7 GRAB TEST**

- 6.7.1 General
- 6.7.2 Requirements
- 6.7.3 Procedure
- 6.7.4 Envelope
- 6.7.5 Parachute
- 6.7.6 Turning vents
- 6.7.7 Downgraded Fabric Limitations

**6.8 FLIGHT TEST****6.9 UNSCHEDULED INSPECTIONS**

- 6.9.1 Pre-Flight Inspections
- 6.9.2 Envelope Overheat Inspections
- 6.9.3 Powerline Contact Inspections
- 6.9.4 Test Inflation After Repair
- 6.9.5 Inspection after Heavy Landing / Transport accident

**SECTION 7 : SUPPLEMENTS****7.1 INTRODUCTION****7.2 LIST OF SUPPLEMENTS INSERTED****7.3 ADDITIONAL DATA****SECTION 8 : REPAIR PARTS AND MATERIALS****8.1 GENERAL****8.2 ENVELOPE**

- 8.2.1 General
- 8.2.2 Consumable Items
- 8.2.3 Envelope Fabric
- 8.2.4 Envelope Load Tape
- 8.2.5 Envelope Hardware
- 8.2.6 Envelope Control and Rigging Lines
- 8.2.7 Envelope Flying Cables

**8.3 BASKET**

- 8.3.1 General
- 8.3.2 Basket Materials

**8.4 FUEL SYSTEM**

- 8.4.1 General
- 8.4.2 Consumable Items
- 8.4.3 Fuel Cylinders
- 8.4.4 Stealth / Shadow Burner
- 8.4.5 Sirocco Burner
- 8.4.6 Stratus Burner
- 8.4.7 Burner Frames
- 8.4.8 TEMA 3800 Coupling
- 8.4.9 Hose Assemblies, Liquid 3/8" Bore
- 8.4.10 Hose Assemblies, Liquid 1/2" Bore
- 8.4.11 Hose Assemblies, Vapour 1/4" Bore



APPENDIX 1 : RESERVED

APPENDIX 2 : SWAGING PROCEDURE

APPENDIX 3 : PRESSURE RELIEF VALVE DATE MARKING

APPENDIX 4 : ENVELOPE LOAD TAPE SPECIFICATION

APPENDIX 5 : CONTROL LINE SPECIFICATION AND USAGE

Intentionally Blank Page

## 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.

**Note:** Throughout this document the term “Lindstrand” refers to Lindstrand Hot Air Balloons Limited.

## 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 Cameron, Colt and Thunder & Colt envelopes, burners baskets and fuel cylinders.

For maintenance and repair instructions for all Sky envelopes, burners and baskets, reference should be made to Sky Flight & Maintenance Manual Issue 1.6 or later.

For maintenance and repair instructions for all Lindstrand envelopes, burners and baskets, reference should be made to Lindstrand Flight & Maintenance Manual Issue 1.10 or later and referenced supplements.

All fuel cylinders (Cameron, Colt, Lindstrand, Sky and Thunder & Colt) should be maintained and inspected in accordance with this manual and referenced supplements (Supplement 7.52).

The Maintenance Schedule, Section 6, should be used for all balloons manufactured by Cameron, Colt, Lindstrand, Sky and Thunder & Colt regardless of date of manufacture and supersedes all previous inspection schedules applicable to these balloons.

For historical products where the application of this manual is not practicable the original data should be used (unless modified by Service Bulletin).

## 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.

## **1.5 PILOT OWNER MAINTENANCE**

The following tasks are considered eligible for Pilot-Owner Maintenance in accordance with EASA Part M.

The details of all Pilot-Owner Maintenance tasks performed must be recorded in the aircraft log book and the CRS signed by the person carrying out the maintenance with their pilot's licence number.

### **1.5.1 Envelope**

- Cleaning of fabric
- Fabric repairs in "Area A" of the envelope (2.1.4) excluding complete panels and repair or replacement of load tapes.
- Adhesive patch repairs anywhere in the envelope.
- Fitting or removing or repair of banners (record the change of mass in the log-book).
- Replacement of temperature streamer.
- Installation or removal of envelope temperature sensor.
- Crown line replacement.
- Removal, replacement or repair of scoops, skirts and their attachments or fasteners.
- Replacement of karabiners.

### **1.5.2 Burner**

- Cleaning not requiring disassembly.
- Lubrication not requiring disassembly other than removal of lubrication port screws or control valve handles (Safire whisper valve).
- Removal and replacement of burner jets.
- Removal and replacement of pilot light burner jets and filters.
- Replacement or adjustment of Piezo igniters.
- Replacement or reinstallation of burner frame corner buffers.
- Adjustment of valve closing for:
  - Shadow whisper & pilot light valves
  - Sirocco whisper & pilot light valves
  - Safire whisper valve
  - Mk IV super pilot light valve

- Replacement and lubrication of O-rings in Tema couplings.

### 1.5.3 Fuel Cylinders

- Cleaning not requiring disassembly.
- Lubrication not requiring disassembly.
- Removal and replacement of padded top rings.
- Removal, repair and replacement of padded jackets.
- Replacement and lubrication of seal rings in Rego outlets.

### 1.5.4 Basket

- Cleaning and re-varnishing or re-oiling of wicker and wooden basket floors.
- Repair of basket top trim and padding.
- Repair of leather or hide around basket base.
- Removal, repair or replacement of basket sidewall trim, cushion floors, passenger positioning blocks, fire extinguisher pouches and brackets, first aid kits and other pockets and accessories.
- Removal or replacement of pilot or passenger restraint harnesses.
- Removal or replacement of basket towing strops.

### 1.5.5 Flight Instruments

- Replacement of batteries for self-contained flight instruments.
- Removal and replacement of self-contained flight instruments.

Intentionally Blank Page

## 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

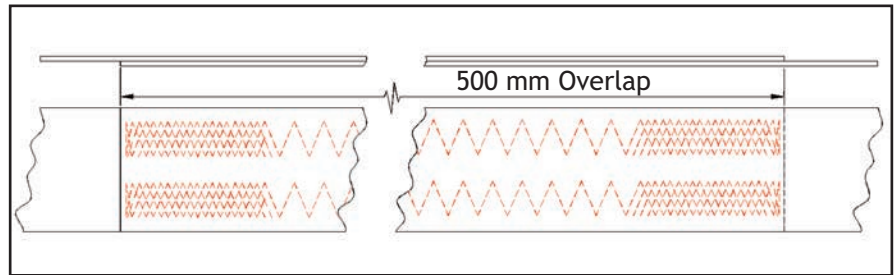
▲ Horizontal Load Tape Joints

**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

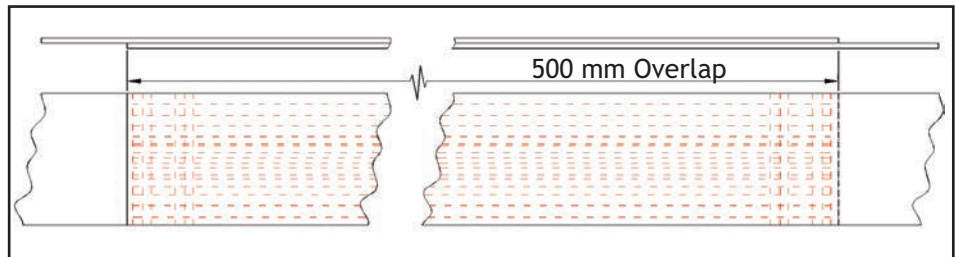
▲ Standard Zig-Zag Stitched Tape Joint Detail

**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)	16	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)



## 2.5 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 fitted to 8-pole baskets and Thunder and Colt Envelopes CN001 to CN3000 use cable “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°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.

## **2.8 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).

### 3.7 BASKET FRAMES

Cameron Balloons Ltd. should be contacted for advice if basket frames are cracked or the tubing is distorted.

### 3.8 SUPPORT RODS

Support Rods must be replaced if cracked or broken.

### 3.9 SWAGING OF WIRE ROPES

For the wire rope swaging procedure, see Appendix 2.

### 3.10 BASKET FRAME REPAIRS

Basket frames may be repaired by manual straightening if the tubing is not locally distorted, or replacing damaged sections.

Cracks in basket frames may be repaired by welding. Contact CBL for advice.

Where damage is suspected, the trim or hide should be removed to allow a thorough assessment to be made.

Intentionally Blank Page

## 4.4 FUEL CYLINDERS

### 4.4.1 Liquid Offtake Valve - Handwheel Type

**Note:** This type of valve is supplied by several different manufacturers and spare parts are not interchangeable between valves from different manufacturers.

Handwheel type valves are fitted with a 1¼” ACME threaded outlet.

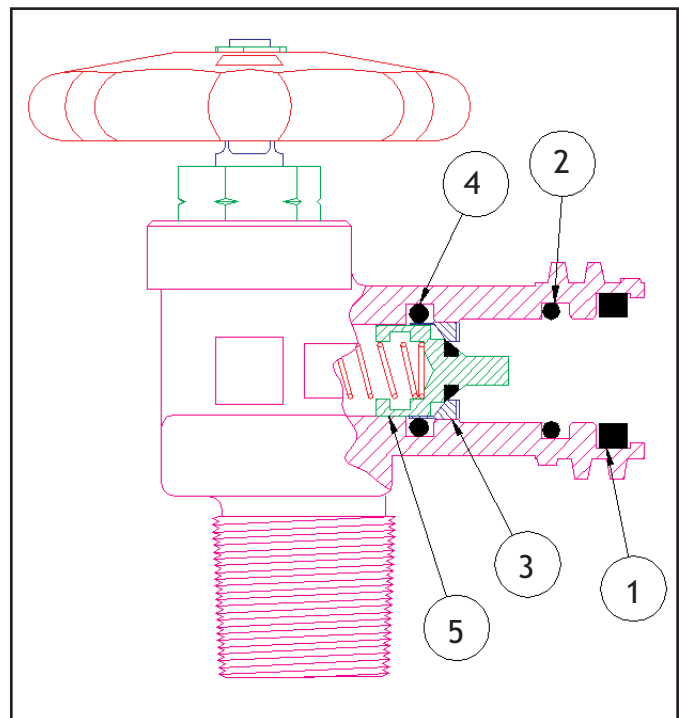
The threads and outlet of the valve should be lubricated occasionally with silicone spray.

If the valve outlet fails to seal against the hose end connector, the Inner ‘O’-ring (2) and square Section outer ‘O’-ring (1) should be replaced. Lubricate the new ‘O’-rings with silicone spray prior to fitting.

If the valve leaks through the self seal, the self seal must be replaced as follows-

1. Ensure the valve is closed, and ‘pop’ the self-seal
2. Unscrew the retaining ring (3) (a special tool is available).
3. Replace the ‘O’-ring seal (4).
4. Reassemble using the self-seal cartridge, which replaces items (3) and (5).

Any other repair actions should be performed in a workshop environment.



▲ Handwheel Type Liquid Valve

### 4.4.2 Liquid Offtake Valve - Quick Shut Off (QSO) Type

The Liquid Offtake Valve is a Worcester ‘Type 44’ ball valve mated to either a 1¼ inch ACME threaded outlet or Tema 3800 outlet.

The threads and outlet of the coupling should be lubricated occasionally with silicone spray.

Minor leaks from the valve handle can often be cured by tightening the stem nut-

1. Remove the nut that holds the handle onto the stem.
2. Remove the handle.

3. Tighten the nut below the handle fractionally while preventing the valve stem from rotating either with a second spanner or the handle.
4. Slot the handle back onto the stem and check the operation of the valve. When the nut is correctly tightened the handle should rotate easily but with noticeable friction. Over-tightening of the nut will make the valve stiff to operate, and cause premature wear of the seals.
5. Apply Loctite 270 Studlock to the threads on the end of the stem.
6. Replace the handle. Tighten the handle retaining nut while holding the handle to prevent the valve from rotating.

If the valve continues to leak or fails to shut off, the valve seals or valve must be replaced.

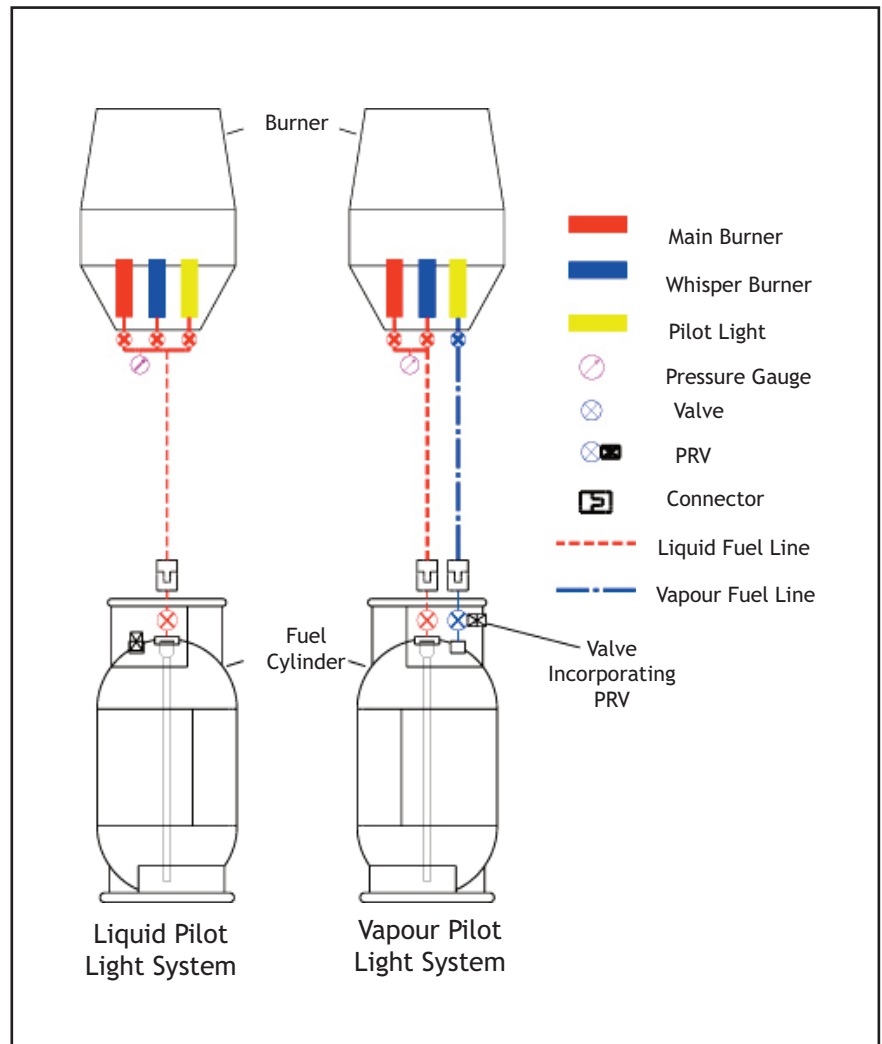
**4.4.2.1 Tema 3800 Outlet**

There are no repairable items in the Tema 3800 outlet, and it must be replaced if defective.

**4.4.2.2 1¼” ACME Outlet**

The inner ‘O’-ring and square Section outer ‘O’-ring in the ACME threaded outlet may be replaced if defective (Section 4.4.1), but the self-sealing valve cannot be replaced and the outlet must be replaced if the self-sealing valve is defective.

The threads and O-rings of the coupling should be lubricated occasionally with silicone spray.



▲ Fuel System Schematic Diagrams

If the float can be heard moving but the contents gauge does not register then the dial gauge should be replaced.

**7. Reassemble regulator piston**

- a. Fit a new stem 'O'-ring (11). lubricate the 'O'-ring lightly with Cameron KSP125 grease prior to assembly.

**8. Reassemble the regulator**

- a. Carefully refit the piston (9) to the regulator upper body assembly (6).
- b. Refit the regulator spring (10).
- c. Reassemble the regulator to the lower regulator body (12).

**9. Reassemble the liquid pilot light heater**

- a. Fit the liquid pilot light heater to the regulator upper body. Do not tighten the Allen bolt.

**10. Reassemble the pilot light flame tube**

- a. Refer to Section 4.6.2.3 part 4, step b.

**11. Reassemble the burner**

- a. Refer to Section 4.6.2.3 part 4, step c onwards.

**12. Test Burner for correct operation****4.6.3 Cleaning / Adjusting Jet Ring**

The Sirocco burner relies on an even mixture of fuel and air to ensure correct operation. Should the flame pattern become uneven, the following maintenance actions should be carried out.

**4.6.3.1 Checking Jet Ring Retention Bolt Torque**

Tighten the jet ring retaining bolts to 6 Nm (see Section 4.5.6 for tightening sequence).

**4.6.3.2 Cleaning Inner Jet Ring**

If the inner surface of the annular jet ring becomes contaminated with oil / deposits from the fuel it should be cleaned using a lint free cloth. This can be achieved by either reaching inside the burner coil or by removing the manifold block (Section 4.6.2.3, steps 1 and 2).

#### 4.6.4 Replacement of Piezo Igniter

The piezo igniter has no user serviceable parts. If any part is defective it should be replaced.

##### 1. Remove the piezo igniter

- a. Using the key spanner (special tool CB 2748-9000) undo and remove the piezo igniter.
- b. The electrode spring and insulating collar can now be removed.

##### 2. Inspect / test components

- a. The operation of the piezo igniter unit can be checked by operating the unit adjacent to any metal surface to see if a spark is produced.
- b. The electrode and insulating collar should be checked for damage.

##### 3. Reassemble the piezo igniter

- a. Reassembly is the reverse of removal.

**Note:** For ease of assembly it is recommended that the burner is held in the vertical position with the coil pointing upwards. The components can then be balanced on top of the igniter unit before insertion.

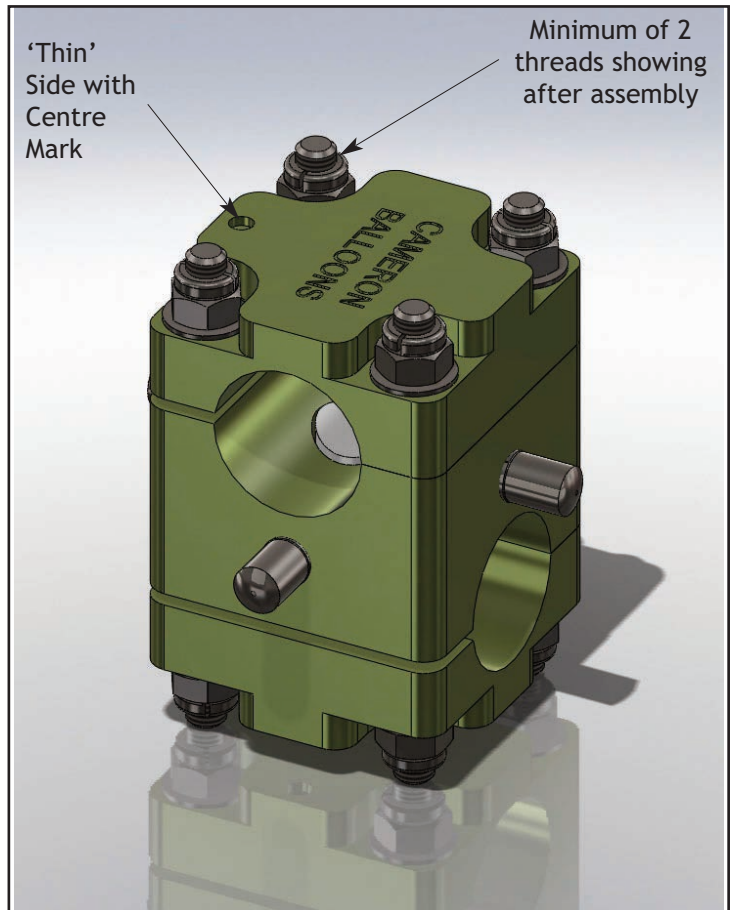
##### 4. Test for correct operation



#### 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.

The O-rings and inside the coupling should be lubricated occasionally with silicone spray.

##### **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, Lindstrand, 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			
	Calendar	Permitted Variation	Hours	Permitted Variation
<b>Envelope</b>				
Annual/100hr	Annual	one month	100 hr	10 hr
<b>Burner</b>				
Annual/100hr	Annual	one month	100 hr	10 hr
<b>Basket</b>				
Annual/100hr	Annual	one month	100 hr	10 hr
<b>Cylinder</b>				
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 (calendar 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

<i>Component</i>	Life Limit			
	Calender	Permitted Variation	Hours	Permitted Variation
<i>Envelope:</i> Velcro, Rip Panel edge Velcro (triangular and rectangular panels only)	None	None	100 hr	None
<i>Basket:</i> None	-	-	-	-
<i>Burner:</i> None	-	-	-	-
<i>Cylinder:</i> 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 than 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)
5. Inspection after heavy landing / transport accident (Section 6.9.5)

### 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 calendar year	
Applicable AD or SB:	
Maintenance Programme Ref:	
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/Q-Vent 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	Cameron /T&C Envelopes only (Refer to 6.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 $\geq 121^{\circ}\text{C}$ Perform overheat inspection	

6.5.5 Test Inflation (if required)

A test inflation, as described in 6.9.4 Test Inflation After Repair, 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

<b>Burner Type:</b>		<b>Part No.:</b>		
<b>Burner Serial No.:</b>		<b>Frame Part No:</b>		
<b>Serialised Parts</b>	<b>1</b>	<b>2</b>	<b>3</b>	
<b>Coil</b>				
<b>Block</b>				
<b>Component</b>	<b>Check / Inspect / Record</b>			<b>Pass/Fail (✓)/(x)</b>
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)			
Jetstream	Jetstream Burner Mod 650 stem fitted or SB23 inspection carried out			
Workpack No.	CN	Inspection Date	Inspectors Signature/No.	

### 6.5.8 Basket

<b>Basket Type:</b>			
<b>Part No.:</b>		<b>Serial No.:</b>	

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.
--------------	----	-----------------	--------------------------

**6.5.10 Other Manufacturers Component Data**

For details of the correct continued airworthiness data to be used refer to the Maintenance Programme (Refer to Section 6.5)

Append any additional completed inspection data to this report referencing the Workpack Number.

**6.5.10.1 Basket**

Manufacturer:	
Type / Part No.:	
Serial No.:	
SB/AD:	
Inspection complete:	
Notes:	

**6.5.10.2 Burner**

Manufacturer:	
Type / Part No.:	
Serial No.:	
SB/AD:	
Inspection complete:	
Notes:	

**6.5.10.3 Cylinders**

Manufacturer(s):	
Type / Part No.(s):	
Serial No.(s):	
SB/AD:	
Inspection complete:	
Notes:	

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 re sewn.

**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', 4 tonne (marked 'SYM OVAL 4000 UIAA'), 5 tonne (marked 'Lindstrand' and 'MBS 50kN') or 1 tonne (marked 'AustriAlpin Type Oval III). 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 or EN 853-1SN) with a 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.

**Note:** New hoses supplied by Cameron Balloons Limited have the part number and date stamped into the ferrule.

**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° and 20° 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° and 20° 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 of the cylinder body and around the valve bosses.

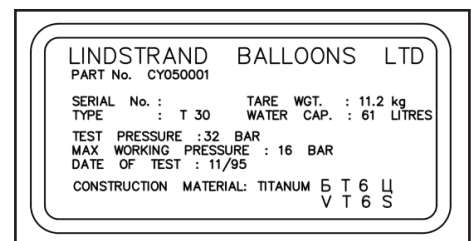
#### 6.6.7.4 Periodic Inspection

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

#### 6.6.7.5 Lindstrand T30 Fuel Cylinders

Check for the presence of Lindstrand label and serial number on the cylinder wall.

Inspect the upper and lower guard ring assemblies for security and freedom from cracking. Minor damage is acceptable (6.6.7.6 Item 3).



▲ Fig. 6.1 Lindstrand Label

If there is any sign of denting or distortion of the guard ring assemblies where they lie adjacent to the cylinder body, or corrosion or damage between the assembly and the cylinder wall, then the assemblies should be removed to allow inspection of the cylinder body.

#### 6.6.7.6 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.
3. 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 to provide protection to the cylinder body and fittings.
4. In cases of doubt refer to the manufacturer.

**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 gives guidance for rejection limits for the different types of cylinder produced by Cameron Balloons.

Table A6.1 Cylinder Rejection Limits

Defect	Definition	Rejection Limits		
		Type A	Type B	C
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 one third of its width at any point.	When the depth of the dent exceeds one third of its width at any point.	When the depth of the dent exceeds 25% of its width at any point
Visible damage on welds	Any combination of dent, cut, gouge or other damage on welded joints	All		
Cut or Gouge	A sharp impression where metal has been removed or redistributed	When the depth of penetration exceeds 0.3 mm	When the depth of penetration exceeds 0.2 mm	When the depth of penetration exceeds 0.3 mm
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		
Type A:	CB2900, CB2901, CB2902, CB2903			
Type B:	CB426, CB497, CB599, CB959, CB2088, CB2380, CB2383, CB2385, CB2387; Colt (Thunder & Colt) : V20, V30, V40, H30, H40; Lindstrand: V20, V30, V40, T30, Sky: V30, V40.			
Type C:	CB250, CB2990			

## 6.7 GRAB TEST

### 6.7.1 General

The grab test must be performed at every 100hr/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.

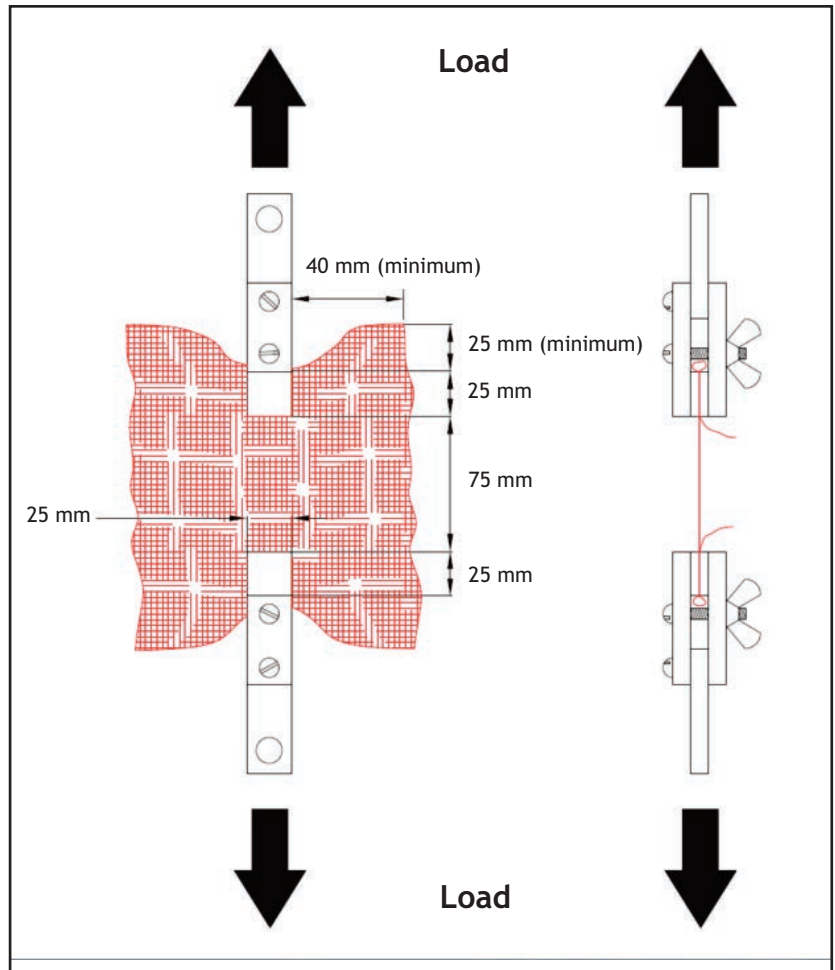
### 6.7.2 Requirements

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

If the fabric fails between 21 lb and 30 lb (9.5 and 13.6 kg), the fabric may be passed as airworthy but downgraded within the limitations of Section 6.7.7.

For Cameron Envelopes (all CN) and T&C envelopes (CN3445 and subsequent), the outer area of the parachute panel between the panel edge & the Velcro tabs needs only to withstand a 21lb (9.5 kg) load without failure for the parachute to be fully airworthy.

If the fabric fails below 21 lb (9.5 kg), all the failed fabric panels must be replaced and the envelope reinspected.



▲ Fig. 6.2 Grab Test Procedure

### 6.7.3 Procedure

The grab test should be configured as shown in Figure 6.2.

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 (Cameron) or within 4m of the Nomex (Lindstrand/T&C/Sky) need not be tested.

On balloons that have had large areas of fabric replaced (e.g. re-tops or replacement parachutes) the areas of new fabric need not be tested until they have reached 250 hours of flight.

### 6.7.5 Parachute

The grab test should be performed on the outer panel between the Velcro tabs and the parachute edge. If the parachute passes the grab test in this location, the test should be repeated on panels inside the Velcro tabs.

### 6.7.6 Turning vents

If turning vents are fitted then a grab test should be performed on the part of the vent that lies inside the envelope (all types/colours).

### 6.7.7 Downgraded Fabric Limitations

The following limitations are only applicable to types listed on Type Certificate Data Sheets EASA.BA.013.

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

1. Envelope Volume must not exceed 105,000 cu.ft. (3000 m<sup>3</sup>).
2. The MTOM must be reduced to 14 lbs/1000 cu.ft. (0.224 kg/cu.m). The reduced MTOM must be entered as an amendment on the front page of the flight manual and used for loading calculations. The MTOM change must be notified to the relevant National Aviation Authority, if their regulations require this.
3. Grab test to be repeated annually or every 50 flying hours, whichever is more frequent.
4. Balloon not to be used for the carriage of fare paying passengers.

## 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

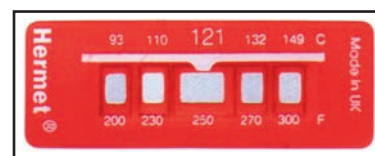
Pre-flight inspections are covered in the Cameron Balloons Flight Manual Iss. 10, Section 4

### 6.9.2 Envelope Overheat Inspections

The envelope is fitted with a melting link attached to a streamer. The link will separate at 128°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).



▲ Fig. 6.3 Tempilabel



The warning streamer is attached to the link with either a bent wire hook or a Maillon Rapide “quick-link” (3mm).

To attach the bent wire hook, open up the hook using a pair of pliers, attach the streamer and bend the hook firmly closed again. The Maillon Rapide link is secured by tightening with a pair of pliers. The link is attached to the envelope by either method.

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.

### 6.9.5 Inspection after Heavy Landing / Transport accident

If the balloon is involved in a heavy landing, it must be subjected to a full 100 hr. /annual inspection.

If the balloon is involved in a transport accident an assessment must be made as to which assemblies require inspection. The affected assemblies must be subjected to a full 100 hr./annual inspection.

Where burner assemblies are subject to impact damage (e.g. hitting a bridge while in the rigged position), in addition to the full 100 hr./annual inspection, the burner mounting bracket (centrally gimbaled burners) must be replaced as a minimum.

Intentionally Blank Page