

# Maintenance Manual for Experimental Hang Balloons

VH-ESN – Eyestrain-2  
VH-IBA – Itty Bitty-1



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## **1. List of Effective Pages**

All pages in this edition are dated 30<sup>th</sup> April 2003.

## **2. Amendment List**

As this is the initial issue there are no amendments. Future editions of this manual will have amendments incorporated in a complete re-issue of the document.

## **3. Qualification of the person conducting maintenance**

All maintenance must be carried out by persons authorized as appropriate to the extent of the maintenance requirement in each case.

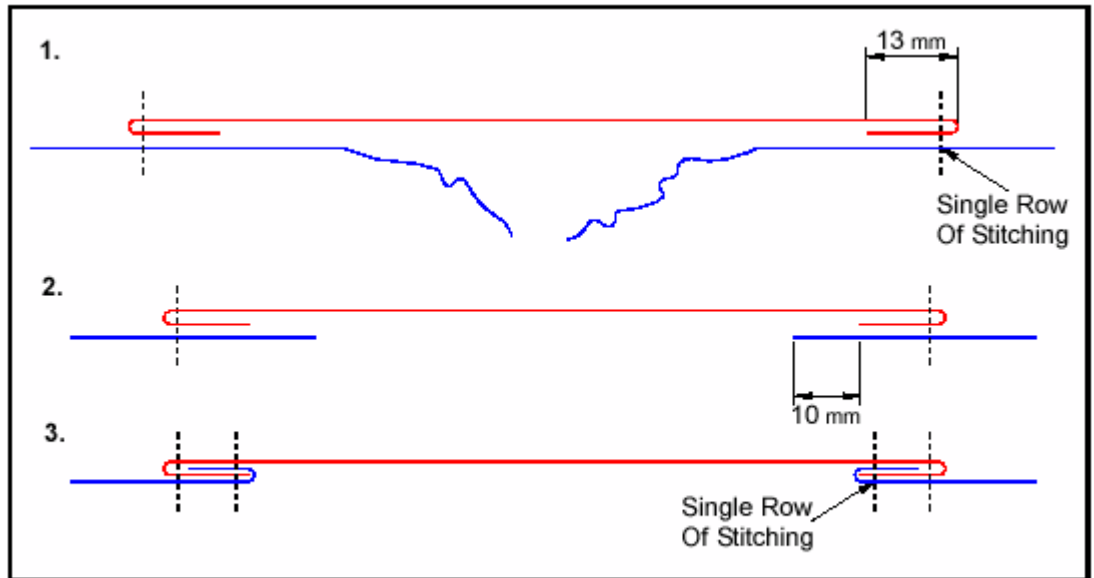
## 4. Envelope Fabric Repairs

### 4.1. *Repairs to Uncoated / Urethane coated fabric*

Repairs in the parts of the envelope which are made from uncoated or urethane coated fabric and which are more than 50 mm from a panel seam may be made using adhesive backed sail repair tape. If the repair is to a tear of greater than 50mm in any direction then the tape must be stitched on using two rows stitching. The adhesive patch must extend at least 25mm beyond the tear in all directions.

### 4.2. *Other partial panel fabric repairs*

Patches may be used to make repairs to panels and must be made using one of the methods described below.



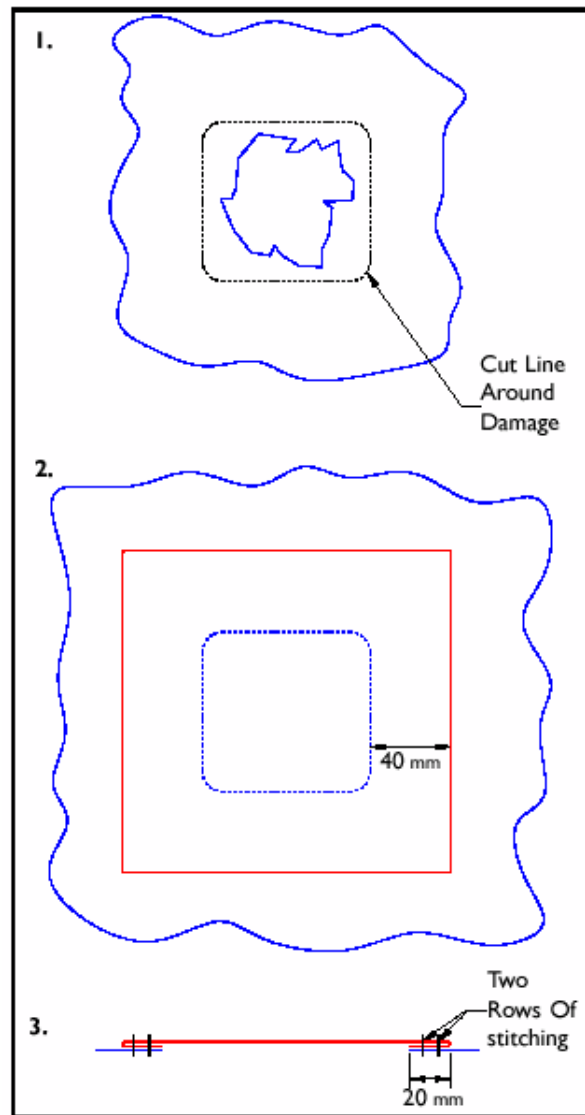
▲ Seamed Patch Procedure

#### 4.2.1. Seamed Method

- Cut patch to shape, fold edges over 13mm and sew to the damaged area of the envelope.
- Cut out the damaged area leaving 10mm excess as shown.
- Fold the excess under and sew as shown.

### 4.2.2. Hot Cut and Overlay Method

- Place a flat piece of wood inside the envelope, under the damaged panel. Remove the damaged area with a hot knife. Cut a rectangular aperture with radiused corners.
- Cut an oversized patch, adding 40mm seam allowance in each direction.
- Sew the patch to the panel with a 20mm folded hem as shown.



▲ 'Hot Cut And Overlay' Procedure

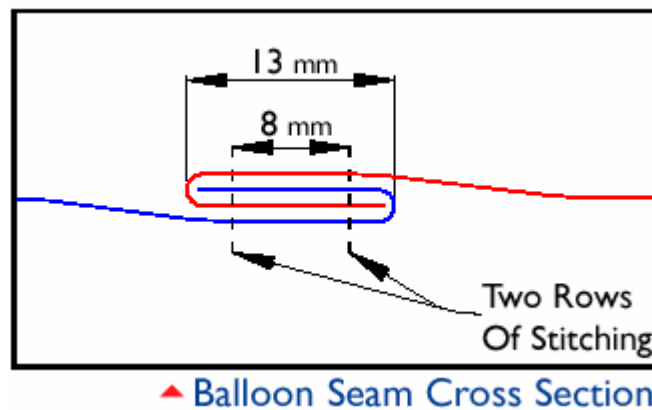
### 4.3. **Full Panel Replacement**

Replacement panels must be cut to the same dimensions as the original plans.

Cut the damaged panel out from the envelope by cutting close to the bordering seams, but taking care not to cut the existing seams.

The new panel must be sewn in on the inside of the envelope with two rows of stitching.

Where multiple panels are to be replaced the seams joining the new panels must be joined using the balloon seam below.



### 4.4. **Vertical Load Tape Repairs**

The vertical load tapes extend only partially along the length of the gore. If a tape is damaged a new section of tape must be sewn over the existing tape for the full length of the affected tape. Do not remove the damaged tape.

For bottom tapes the flying wire attachment loop must be cut off flush with the bottom rim tape and a new loop formed in the new tape.

In the case of a crown tape the damaged tape must be cut at the top rim of the envelope and off the crown ring.

### 4.5. **Top and Bottom Rim Tape Repairs**

Repairs to the top and bottom rim tapes can be made by sewing a new piece of tape over the damaged section and extending 300mm beyond either end of the damaged portion.

#### **4.6. Control Lines**

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

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

Control lines must not be joined within 5 metres of a pulley or guide ring.

The free ends of the lines must be cut and sealed with a hot knife or flame to prevent fraying.

#### **4.7. Parachute Centralising and Shroud Lines**

If damaged, the line must be replaced. The length of the new line must be checked against a similar line.

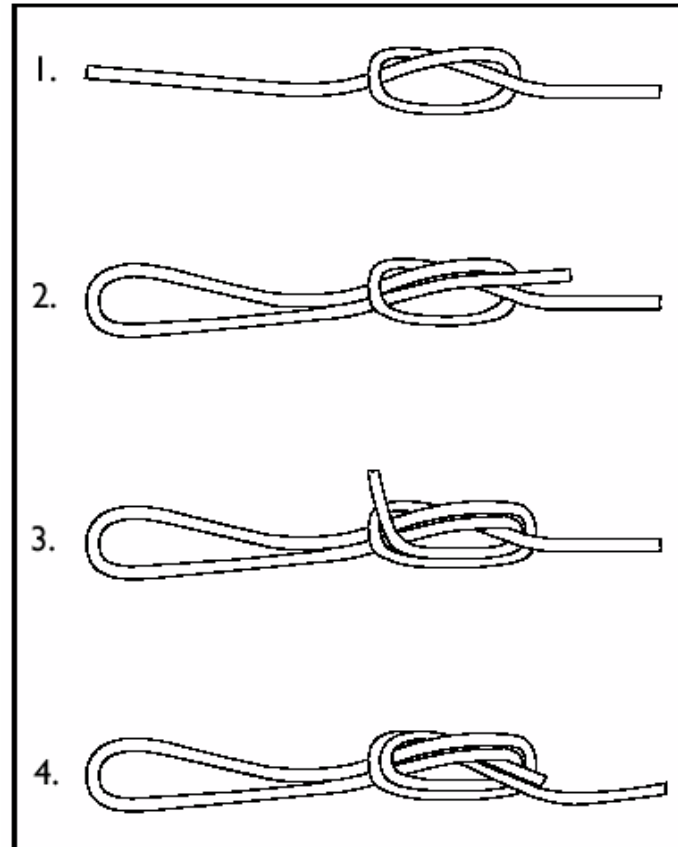
#### **4.8. Hook and Loop Closures**

Hook and loop closures that are damaged or clogged must be cleaned or replaced.

### **5. Vectran Flying Cable and Suspension Rope Repairs**

Should the vectran flying cable or harness suspension ropes be damaged then they must be replaced. New cables / ropes are to be manufactured using materials of the same type.

End loops in the cables must be made using the Cameron Knot.



▲ Tying The 'Cameron' Knot

## 6. Harness Repairs

Damage to the structural webbing is not acceptable and should such damage occur the harness must be replaced.

Damage to the fabric supports of the harness may be repaired by an overlay patch using PAK-CLOTH or similar.

## 7. Burner and Fuel System Repairs

The burner and fuel system is very basic.

Leak detection is carried out using soapy water. Leaks will be shown by the presence of bubbles.

Leaking joints must be disassembled and reassembled with new PTFE tape or a high pressure jointing paste suitable for LPG use.



If the liquid pilot regulator housing and / or piston are heavily soiled they may be cleaned using a chlorinated solvent, hydrocarbon solvent or water based detergents.

O'rings are to be lubricated using KSP125 or another PFPE lubricant.

## **8. Fuel Cylinder Maintenance**

Fuel cylinders must be maintained in accordance with AS1596.

## 9. Periodic Inspection Schedule

### 9.1. **Envelope – check:**

- a) that the temperature link is still in place
- b) temperature tell tale label . If overheating is indicated add a new label alongside, and inspect the top of the balloon for signs of damage. Record the installation date on the new label.
- c) if a grab test is required.  
A grab test is required to be carried out if the envelope
  - i. has flown more than 250 hours; or
  - ii. if the envelope is suspected of having been overheated; or
  - iii. at the discretion of the person conducting the inspection.Appendix 2 details the grab test procedure.
- d) Check the fabric for porosity. If substantial porosity is suspected then perform a flight test, but only after a grab test has demonstrated the balloon is safe to fly.
- e) the joint of the vertical load tapes with the crown ring.
- f) the condition of the crown ring.
- g) the stitching of joints between the vertical load tapes and the top edge of the balloon envelope.
- h) the stitching of the joints between the vertical load tapes and the overlaying tapes across the deflation aperture.
- i) the joints of the vertical load tapes with the flying cables for chafing or heat damage.
- j) the condition of the control lines, pulleys and the tape loops
- k) the condition of flying cables.
- l) for holes, tears or abrasions either by inflating the balloon or by panel-by-panel inspection.

### 9.2. **Turning Vents (if fitted)– check:**

- a) the stitching at the top and bottom of the vent, at the ends of the free tapes and at the ends of the pulling triangles.
- b) the condition of the fabric in the turning vent – especially the portion of the fabric inside the balloon. Grab test this area if required.

### 9.3. **Deflation system – check:**

- a) the condition of the fabric particularly at the edge of the parachute panel.
- b) that the rigging and operating lines are in good condition (especially where they pass through pulleys and guide rings).
- c) the knots and stitching of loops to both the balloon and the deflation panel.

- d) if there is any doubts about the deflation seal then the balloon must be inflated and the deflation seal inspected.
- e) The condition of hook and loop fasteners.

#### **9.4. Burner and fuel system – check:**

- a) check type and condition of burner frame karabiners.
- b) check physical condition of burner, frame and gimbal system
- c) check condition of hoses and fittings and that the hoses have legible date stamps.
- d) Check that the hoses do not exceed 10 years since manufacture.
- e) Perform a function check on the burner and fuel system including correct operation of non-return seals.

#### **9.5. Fuel cylinders – check:**

- a) check that the cylinder internal inspection is current.
- b) remove the dust cover and inspect the pressure relief valve for contamination and corrosion. Check the date stamp on the pressure relief valve.
- c) remove the padded jackets and inspect the cylinder bodies for external damage or corrosion, pay particular attention to the cylinder base and welds.
- d) check the valve seals and fittings for correct operation and signs of corrosion.
- e) check all pressure holding joints with leak detector (all threads into cylinder, all joints between valves / regulators / connectors, valve stems (open and close during this test), the seal around the contents gauge and welds around bosses.
- f) inspect the off take bosses for signs of distortion, misalignment or depression, denoting a heavy impact or misuse.
- g) check freedom of movement of contents gauges.

#### **9.6. Harness – check:**

- a) the condition of the suspension cables.
- b) for damage to the structural elements of the harness.
- c) for damage to the fabric support parts.
- d) check that cylinder straps and buckles are functional.

#### **9.7. Ancillary equipment**

- a) launch restraint – check function of the latch. Check bridle for wear or fading.

- b) instruments – check for adequacy and that calibration status.

### **9.8. *Records – review maintenance records***

- a) for incorporation and correct certification of all maintenance; and
- b) including flight and technical record details; and the record of incorporation of AD's, and the results of doing so; and
- c) the balloons overhaul and special inspection records; and
- d) its major modification and major repairs records; and its weight and balance record.

## **10. *Unscheduled Inspections***

### **10.1. *Preflight Inspection***

Prior to hot inflation the pilot must check the condition of the following items:

- Envelope for fabric damage
- Flying cables and quick links
- Bottom load tapes
- Top load tapes
- Crown rope
- Attachment of the vent line to the shroud lines
- Vent line pulley or guide ring
- Burner gimbals
- Load frame
- Pilot harness and attachment lines
- Fuel tanks and attachment lines

### **10.2. *Over Temperature Inspection***

If the maximum temperature indicated on the 'tempilabel' fitted is 121°C or higher or if the heat link flag drops then the fabric and tapes at the top of the balloon must be inspected for heat damage.

- This inspection must include looking for parts with undue stiffness or changes in colour, especially at the edges of the parachute fabric.
- A new 'tempilabel' is to be added along side the original label and the maximum temperature recorded in the logbook.
- A grab test as per appendix B must also be performed and the result entered into the logbook.
- **If the temperature on the 'tempilabel' indicates 149°C then the balloon is considered to be permanently and irreparably damaged and is to be destroyed.**

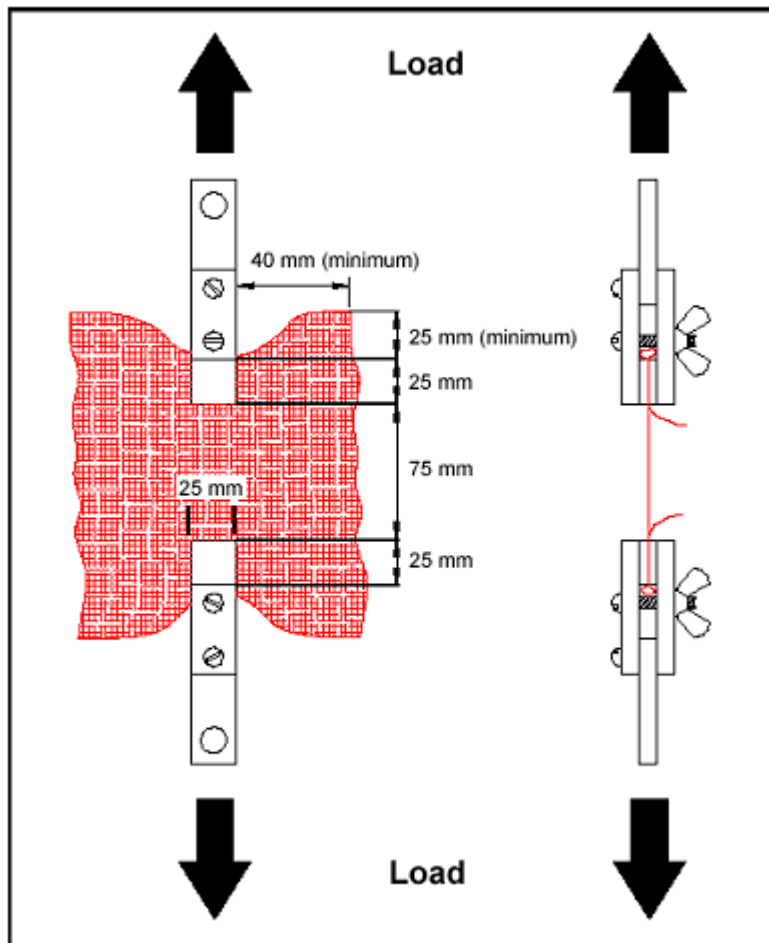




## 12. Appendix 2 Grab Test Procedure

The grab test must be performed on each colour of fabric near the top of the envelope. If multiple grades of fabric have been used in the construction of the envelope, (Hyperlast, Silicon Coated, Urethane coated, Calendered) then all of the grades are to be tested. Areas for particular attention include the outer section of the deflation port and valve, the overlap area of rotation vents. A minimum of 3 tests should be performed.

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



▲ Grab Test Procedure

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

The fabric is required to withstand a pull of 14kg to be airworthy.

If the fabric fails below 14kg then all the weak fabric must be replaced and the envelope reinspected.