

PART 1 MINOR REPAIRS

The repairs described in this Part are limited in scope because they have been devised with a view to avoiding, as far as possible, the use of non-portable special tools, jigs, or other equipment which it is not practicable to provide as standard Unit equipment. Repairs which are beyond the scope of this Part will be described in the Repair Leaflets in Part 2 and Appendix 1 to Part 2 of this Volume.

In this Part, the prohibition of repairs in certain areas or the absence of a suitable repair instruction for any damage sustained is not to be taken as meaning that the component is beyond repair. Reference should be made to Part 2 where a Repair Leaflet covering major damage may be found.

In the absence of any instructions and when the appropriate technical officer considers that repair on site is practicable, a request for a repair scheme is to be submitted to the Directorate of Aircraft Engineering, Ministry of Defence. When such a request is submitted, full details with sketches and/or photographs indicating the exact location and extent of the damage are to be attached.

LIST OF CHAPTERS

NOTE...

A detailed list of contents appears at the beginning of each chapter.

1. Introductory repair information
2. Fuselage
3. Main planes
4. Tail unit
5. Alighting gear
6. Engine nacelles
7. Systems
8. Fly-in repairs

RESTRICTED

AIR MINISTRY

VULCAN AIRCRAFT - REPAIR AND RECONDITIONING INSTRUCTIONS

ADVANCE INFORMATION LEAFLET No.1/57

Note.- This leaflet is to be inserted in its correct numerical order following the Marker Card for Advance Information Leaflets at the beginning of the book.

BONDING OF VORTEX GENERATORS

Introduction

1. This information draws particular attention to the modified method of preparing the wing surface prior to bonding. Use is made of a proprietary cleaning material to remove the M.B.V. protective treatment from the surface of the metal. The following are the materials found to be most suitable for this process:-

Araldite 121N (33C/1451), Hardener 951 (33C/1372), Paint remover special (33B/1125), and Deoxidine 202 (33C/748).

Scope of Process

2. The method is specifically intended to cover the "cold set" bonding of Light Alloy Vortex Generators to the Vulcan phase 2 wing.

General description

3. The Resin adhesive (Araldite 121N) is made to cure at normal room temperature (60°F) by addition of a specific quantity of hardening agent (951 hardener). This temperature is regarded as an absolute minimum for bonding work.

Process Details

4. In all metal bonding, surface cleanliness is important. Where it becomes necessary to remove paint, **Paint remover** is to be applied locally to an area slightly larger than the bonding area. Before removing the protective treatment from the metal, all traces of paint and stripper must be removed by swabbing with water. **Deoxidine** is then applied to the surface by means of a fitch brush and allowed to remain in contact for 5 - 10 mins. after which time the area is swabbed thoroughly with water and dried with clean rags. The surface will have a clean 'whitish' appearance.

A similar treatment or mechanical roughening may be given to the Vortex Generator surface.

Mixing the Adhesive

5. It is important to remember that the pot life of the mixture is only 1½ hours in 60-65°F. temperature and therefore a limited amount of mixture is recommended. A half pound bulk of resin (ARA.121N) in a beaker like container with a 4-5% by weight proportion of hardener (hardener 951) should be well mixed, taking care to dislodge the resin adhering to the container sides. Do not whisk, as the setting of the resin will be affected by trapped air. The mixture must be used within 20 minutes. To extend the pot life transfer from the container and spread on an Aluminium sheet in a layer ¼" thick or less.

Pot life is considered expired when the resin has thickened to a point when it cannot be easily applied or spread.

Note.- No divergence from the 4-5% by weight proportion of cold setting hardener 951 can be permitted.

Application

6. Using a knife a film of resin should be worked in to both surfaces. If the resin does not wet easily, the pot life is exceeded and the resin should be discarded. A larger quantity of paste is then applied to both surfaces, this ensures trapped air will be swept out with the surplus paste. The excess paste should be spread over the remaining unprotected metal in a thin film to prevent corrosion. It is not necessary to apply pressure to ensure adhesion. To do so may result in an abortive joint.

Curing Time

7. At 60-65°F the cure to initial hardness may take 24 hours, though during summer months curing takes place very reliably overnight, and full strength (for cold curing) will develop within a few days.

Note.- Should bonding not set hard after 24 hours the resin must be suspect.

Care in handling

8. Frequent handling can cause Dermatitis. Avoid unnecessary contact and keep all containers, equipment, and seals in a clean and non-sticky state.

Note.- The use of Acetone, cellulose, and thinners will dissolve resin if applied prior to cure.

April, 1957

Air Publication 4505
Volume 6, Part 1

AIR MINISTRY

VULCAN AIRCRAFT - REPAIR AND RECONDITIONING INSTRUCTIONS

ADVANCE INFORMATION LEAFLET No.2/57

Note.- This leaflet is to be inserted in its correct numerical order following the Marker Card for Advance Information Leaflets at the beginning of the book.

BONDING OF CANOPY FAIRINGS

General Information

The positioning of these fairings upon a completed canopy by mechanical means e.g. bolting or rivetting, is difficult because of the presence of the internal structure. Adhesive bonding is therefore adopted as a means of holding the fairings to the canopy and the procedure given below should be followed in sequence should it be necessary to replace canopy fairings. The following materials have been found to be most suitable for this process:-

Stripaline No.397, Aloclene No.2, and Araldite 121N.

Preparation

The surface of the canopy skin must be clean and free from paint. This is to be removed by Stripaline No.397 applied locally to the bonding area. All traces of loose paint and stripper to be removed by washing with water, then thoroughly dried with cloths. The clean alloy surface should be treated with Aloclene No.2 by brush to remove the protective treatment. After 5-10 min. all traces of Aloclene must be washed off and the area thoroughly dried.

Note.- The bottom and front edge of structure members are magnesium castings and the protective treatments on these should not be disturbed. The adhesive in respect of these members should be applied on top of the chromate treatment.

Application

The bonding of fairings to canopy is similar in procedure to leaflet instructions given for Vortex generators and further information in respect of materials and curing processes can also be obtained from this leaflet, paras.4-8 of A.I.L.1/57.

Final finish

Additional quantities of 121N should be used as a filler material to blend out irregular contours, surface blemishes and around the joints of fairing to canopy.

Effect of Cabin Air leaks

In the event of a cabin leak between the canopy skin and fairing a small "leak hole" has been provisioned. Care must be taken that this hole is not blocked during the bonding operation.

R E S T R I C T E D

May, 1957

AIR MINISTRY

Air Publication 4505
Volume 6, Part 1

VULCAN AIRCRAFT - REPAIR AND RECONDITIONING INSTRUCTIONS

ADVANCE INFORMATION LEAFLET NO. 3/57

Note.- This leaflet is to be inserted in its correct numerical order following the Marker Card for Advance Information Leaflets at the beginning of the book.

RIVETING OF AIR INTAKE SKINS

When it is necessary to renew "pop" rivets in the air intake skin, or to fit them in place of solid rivets, the following procedure should be adopted, to obviate any possibility of loose mandrels being drawn into the engine and to ensure that the rivets are sealed.

Dip replacement rivets in cold setting Araldite 121 N before fitting. After curing time has elapsed for the Araldite (generally 12 hours, or over night) the rivets should be filled with Ryland's "pop" rivet filler No. 2313.

Z.14446.R.

R E S T R I C T E D

VULCAN AIRCRAFT - REPAIR AND RECONDITIONING INSTRUCTIONS

ADVANCE INFORMATION LEAFLET NO.4/57

Note.- This leaflet is to be inserted in its correct numerical order following the Marker Card for Advance Information Leaflets at the beginning of the book.

Control Surface - Balance Seals

General

- (1) Repairs to the seals will mainly depend upon the extent and disposition of the damaged area. If deterioration due to ageing of the fabric is apparent, the seals should be renewed.
- (2) Materials required
 Indiana/Cashmere Fabric Ref.8099, 1/32 inch thick.
 Dunlop Adhesive L.107 (Ref.330/1361).
 2 inch Circular Sewing Needle. Stores Ref.1B/1604.
 Single Linen thread (waxed) No.40 B.S.3F.34.
- (3) Method of attachment
 Damaged seals may be repaired by patching; the patch being attached by solution and stitching. Using a 2 inch circular sewing needle and incorporating an overhand stitch, with eight stitches to 1 inch, the stitching should be locked at every 1 inch round the edges of the patch. It is recommended that the stitching is carried out while the solution is still 'tacky'.
- (4) Repair limits
 The extent of damage will govern the size of patch required, but an overlap of 1 inch is necessary to give the required results, therefore a rent 1 inch long should have a patch 3 x 2 inches applied. No patch may overlap an adjoining patch.
- (5) Procedure
 It is important to ensure that the seal is absolutely dry and free from oil, grease, and dust before proceeding as follows:-
 - (a) Stitch the rent using a herringbone stitch.
 - (b) Measure the damage for length and width and cut out the patch to include overlap limit.
 - (c) Place the patch over the damage and mark an outline on to the seal - remove the patch and check for central positioning.
 - (d) Apply one coat of solution to both patch and fabric seal and allow to dry completely.
 - (e) Apply a second coat to both surfaces. When a 'tacky' state becomes obvious, place the patch on to the seal, using the outline as a guide. Press firmly and check that the patch is well adhered before commencing the next operation.
 - (f) Using needle, thread and type of stitch as described, stitch the edges of the patch to the seal. Care must be taken to avoid pulling the thread too tight. Smooth out wrinkles and puckers during stitching procedure.
- (6) Damage occurring near or up to fixing strips may be repaired in the same method, except that the patch must extend under the fixing strip by one thickness. Refer to illustration overleaf.

Note.- Seals removed for repairs should be checked that the form strip is well glued to the seal before replacing. This repair may be used for elevator and aileron balance seals.

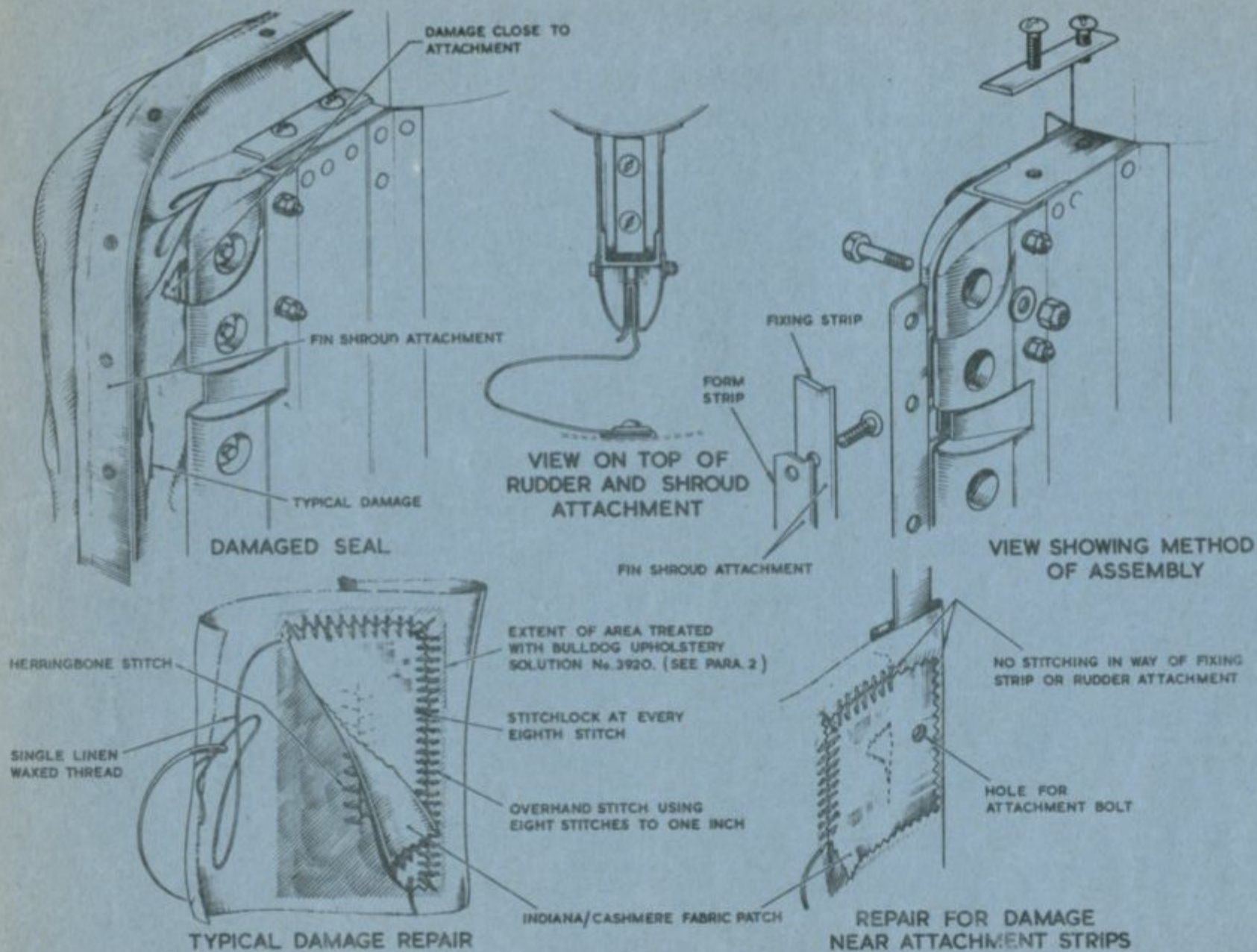


FIG. 1. RUDDER BALANCE SEAL REPAIRS

RESTRICTED

AIR MINISTRY

VULCAN AIRCRAFT REPAIR AND RECONDITIONING INSTRUCTIONS

ADVANCE INFORMATION LEAFLET NO. 5/57

Note.- This leaflet is to be inserted in its correct numerical order following the Marker Card for Advance Information Leaflets at the beginning of the book.

Remove and destroy A.I.L. No.2/57 which this leaflet supersedes.

Canopy fairings replacement

General

The fairings are attached at the forward end of the canopy and should it become necessary to replace one or more of the panels the following procedure must be strictly adhered to.

Preparation of surfaces

In all metal bonding, surface cleanliness is very important. The bottom and forward members of the canopy are magnesium alloy castings, and the chromate protective treatment on them should be protected against the various solvents used for cleaning the bonding surface.

- (1) Remove paint etc. in the area to be bonded by applying paint remover (33B/1125) taking care that the treated area is slightly larger than that required for fitment of the fairing. After removal of the paint great care must be taken to wash off with water all traces of the spent stripper. Thoroughly dry the surface with a clean rag.
- (2) The clean alloy skin surface is now etched for bonding by treating with Deoxidine (33C/748) applied with a brush. The surface must be kept wet for a period of 5-10 minutes after which all traces of Deoxidine must be removed by washing with cotton-wool swabs soaked in water. Thoroughly dry the surface which should now show a "whitish" appearance after the above treatment. If the skin under the fairings has been etched previously there is no need to carry out the foregoing. The following treatment is all that is required. A cleansing and light etching operation with Deoxidine 202 should be carried out, and the surface afterwards washed down with water to remove any traces of the etching liquid. Dry the surface with a clean rag.
- (3) Offer the replacement fairing to the canopy which should be in position on the aircraft, and check for alignment of the faces, noting if there are any slight discrepancies so that allowance can be made when applying the Araldite compound (33C/1451).
- (4) Before fitment the bonding face of the fairing should be roughened by means of coarse sandpaper or a hacksaw blade.
- (5) When carrying out operations sub.para.1 - 2 it would be advisable to remove the canopy from the aircraft, protect the hinge arms etc. before standing it upright in order that the solvents used, will tend to run away from the magnesium alloy members, and not effect the chromate treatment. If inadvertently some of the solvent runs onto the members and destroys the chromate treatment, the following action must be taken. Wash off with water the solvent involved and dry immediately. With a small brush apply Solenious Acid Solution over the damaged treatment area, making sure that no acid goes on the canopy skins. No further treatment is required and the fairing can be bonded on top of the chromate treatment.

Bonding compound

The compound to be used for attaching the fairing to the canopy is made up of 100 parts by weight of Araldite 121N (33C/1451) and 4 to 5 parts by weight of standard cold setting Hardener 951 (33C/1372). These constituents should be mixed thoroughly, adding the hardener to the resin, and taking care that the resin around the sides of the container is scraped off to dislodge the adherent resin. In order to extend the pot life of the resin, when mixed, it should be transferred from the mixing container and spread out onto a clean sheet of thick gauge aluminium in a layer of about

RESTRICTED

$\frac{1}{4}$ in. thick or less. The pot life of the resin is about $1\frac{1}{2}$ hours depending on the prevailing temperatures. When the resin has thickened up to a point where it can no longer be easily applied and spread, the pot life is considered to have expired.

Installation

Using a spatula or a blunt knife blade a film of the resin compound should be well worked into the bonding surfaces of the canopy and fairing. After the initial film has been smeared on, a body of the compound sufficient to fill up any discrepancies between the mating faces, and a fair surplus quantity should be applied so that in squeezing out the excess adhesive, any trapped air is swept out at the same time. Surplus resin should be wiped away to leave a neat fillet around the joint.

The adhesive itself, or the quality of the bond, does not benefit from the application of pressure during setting but some light pressure will almost certainly be required to ensure that the fairing is held down and in proper contact all round the rim. Adhesive tape and plasticine may be useful in maintaining the mating position of the parts while curing is in process. At this stage the rivets and Parker-Kalon screws which are fitted at the forward end of the fairings only, should now be assembled. Using the existing holes in the canopy skin and forward mag. alloy member as location points, drill through the fairing so that all the holes are in perfect alignment. All rivets and Parker-Kalon screws should be dipped in Celloseal before assembly. As the rivets are not the normal type a description is appended below.

Rivets $\left. \begin{array}{l} (422) \\ (508) \end{array} \right\} \text{Advel self-sealing C/sk. } 120^{\circ}$
Hole dia. Morse No.20 - .161 in. }

Parker-Kalon type 'Z' S.970 No.2 x $\frac{3}{16}$ in. long. (Self-tapping screw C/sk.)
Hole dia. Morse No.47 - .0785 in. x $\frac{3}{16}$ in. deep. C/sk. hole 82° x .048 in. deep. }

Alternative Parker-Kalon screws which may be used.

Parker-Kalon type 'Z' S.970 No.4 x $\frac{3}{16}$ in. long. (Self-tapping screw C/sk.)

Hole dia. Morse No.37 - .104 in. x $\frac{3}{16}$ in. deep C/sk. hole 82° x .064 in. deep.

Note.- Great care should be taken, if, for any reason the holes for the Parker-Kalon screws have to be redrilled, that the depth stated is not exceeded.

Special tools required are:-

- (1) Advel rivetting Gun
- (2) Backmarker

Manufacturer
Aviation Developments Ltd.

Curing time

Despite the term "cold setting", curing is still dependent on the actual temperature prevailing. If the temperature is below 60°F , localised heating should be used to bring the temperature up to at least 60°F as this figure should be regarded as the absolute minimum for serious bonding work.

With an ambient temperature of 65°F the curing to the initial hard state takes about 12 hours, and at least 48 hours to reach full strength curing. If the temperature should vary during the curing time, a check regarding the state of the resin can be obtained by retaining a sample of the squeezed out resin and keeping it under the same conditions. In normal

RESTRICTED

temperature 60°F the resin compound should certainly be quite hard, after 24 hours have elapsed, and a mix that has not hardened after this time must be suspect.

Final finish

Any irregularities in contours, and surface blemishes both around the joints, and in the actual fairings can be filled and smoothed over with an additional quantity of the Araldite 121N adhesive.

Bleed holes

A small 1/16 in. leak hole is provided in each fairing to bleed off any leaks that may occur in the canopy skinning under the fairing. Care must be exercised that this hole is not blocked up during the bonding operation.

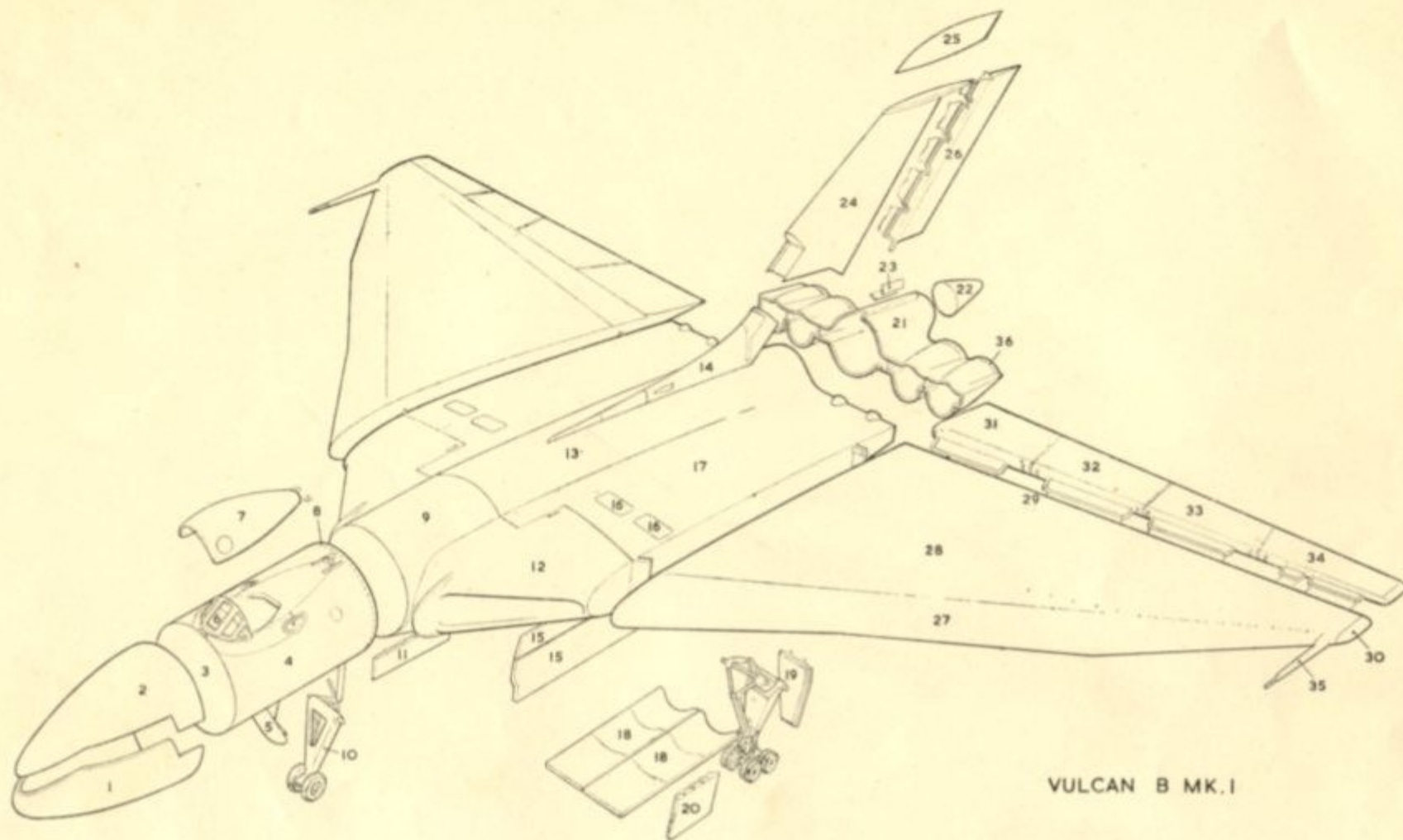
Final spray

No spraying should be undertaken until the resin compound has reached full strength curing. This may take several days depending on the prevailing temperature. Cellulose and synthetic thinners will dissolve the resin prior to full strength curing so the wisdom of not spraying until the cure is complete can be appreciated.

Care in handling

Frequent handling of cold setting Hardener 951 can cause dermatitis. Avoid unnecessary contact and keep all containers, weighing equipment, spatulas etc. in a clean non-sticky state. Clean all equipment immediately after use with the aid of cellulose or synthetic thinners, then washing down with water, and finally wiping dry.

R E S T R I C T E D



VULCAN B MK.1

- 1 NOSE RADOME
- 2 METAL NOSE STRUCTURE
- 3 FRONT PRESSURE BULKHEAD
- 4 FRONT FUSELAGE
- 5 ENTRANCE DOOR
- 6 WINDSCREEN
- 7 CANOPY
- 8 REAR PRESSURE BULKHEAD
- 9 No. 1 TANK BAY
- 10 NOSE WHEEL UNIT
- 11 NOSE WHEEL DOORS
- 12 AIR INTAKE

- 13 BOMB BAY
- 14 DORSAL FIN
- 15 BOMB DOORS
- 16 AIR BRAKES
- 17 ENGINE BAYS
- 18 ENGINE DOORS
- 19 MAIN WHEEL UNIT FIXED FAIRING
- 20 MAIN WHEEL DOOR
- 21 REAR FUSELAGE
- 22 TAIL RADOME
- 23 BRAKE PARACHUTE COMPARTMENT DOORS
- 24 FIN

- 25 FIN-CAP
- 26 RUDDER
- 27 MAINPLANE LEADING EDGE
- 28 MAINPLANE
- 29 MAINPLANE TRAILING EDGE
- 30 WING TIP
- 31 INNER ELEVATOR
- 32 OUTER ELEVATOR
- 33 INNER AILERON
- 34 OUTER AILERON
- 35 PRESSURE HEAD
- 36 JET PIPE CAP

RESTRICTED

This file was downloaded
from the RTFM Library.

Link: www.scottbouch.com/rtfm

Please see site for usage terms,
and more aircraft documents.

