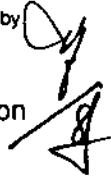


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Ärende/Subject
SAAB 91 SAFIR. Fabric on Wings and Control surfaces.

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1 Effectivity

The guidance is applicable to all aircraft of type Saab Safir 91A, 91B, 91B-2, 91C and 91D.

N.B

This instruction is based on an instruction earlier used in Swedish Airforce.

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2 General

The following constitutes guidance for Fabric covering of Wings and Control surfaces as complement to drawing SAAB – 506000, as well as advise on how Fabric damages shall be repaired.

Recovering, repair of Fabric covering and sureface treatment requires good knowledge about the material.

It is of great importance that good workmanship is maintained in order to get a satisfactory result. Recovering of whole Wing and Control-surface shall be carried out by a suitable specialist.

Before any component is covered with Fabric, or the existing Fabric is repaired, the component in question must be checked for any damage by a Licensed Engineer. The control shall aim specifically to satisfy that there is no structural damage on ribs and other structural parts, as well as cables and other control devices for control surfaces. The check shall also include correct fitting of control cables and push/pull-rods included in the aeroplanes control system.

Follow the advice stated in the Health and Safety Act when working with paint, dope and solvents.

NB. Dope does not stick to metal surfaces, therefore Fabric which shall be attached to metal must be glued with specified Fabric Adhesive.

For cleaning and removal of paint, – use Acetone.

3 Tooling

Sewing machine
1 pair of straight Scissors
1 pair of serrated Scissors (Pinking shears)
Straight Needle, 1,2 mm diam.
Curved Needle 1,2 mm diam L = 90 mm
20 off Safety Pins # 4/0
Thread Wax
Tape measure
1 Meter straight Ruler (4')
Thimble
Marker
Knife
30 mm round Paint brush (1 1/4")
40 mm flat Paint brush (1 5/8")
Flat Screwdriver
Phillips Screwdriver

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4 Material information

Linen	MIL - C - 5646, grade A
Cotton Tape	White 25 mm 41131 - 04
Cover Tape (serrated/pinked)	MIL - 5646, grade A 2" wide 3" wide
Thread (nylon)	for Hand sewing MV 18/5
Thread (nylon)	for Machine sewing
Nitrate Dope (Nitrals Cement)	MF 42 - 705H
Dope	Clear Butyrate Dope Nr: 9701 APB
Aluminium Paste (Supplier "Duells" Gothenburg)	Aluminium Paste Nr: 701
Thinner	Thinner 9703 APB
Acetone	MN - 75
Wash primer	FF - MF88
Drain Grommets	AS 215801-1 (Aluminium)
Zip	AS 216704-1 (2 off per Wing)

5 Procedure for re-covering of Wings and Control Surfaces

5.1 Preparation of Wings and Control surfaces

Remove the old fabric and wrapping on the Wing-ribs. Remove three Phillips screws in the rear lower edge-list. Drill out the rivets in the riveted edge-lists on the wings. Mark the lists for identifying when refitting the lists at their previous position. Remove the list from the cut-out for the aileron. Remove paint/dope and fabric residue properly.

(50B) Sta. 2920 - 3195.7

Drill out the front rivet row (by the main-spar) on the upper panel over the aileron-segment. Remove old fabric residue under the panels front edge. Alternatively is the edge-list according to the above fitted according to Fig 7.

Drill off permanent Trim Rudders from ailerons and rudder. Remove the metal fin from the rudders lower edge. Check the structure and installation for damage and corrosion. Clean all surfaces (with acetone) which shall be treated with Nitrate Cement or being primed. Prime the metal surfaces if necessary.

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5.2 Wrapping of the Wing-ribs

Wrapping of the Wing-ribs shall be carried out in the areas which shall be covered with Fabric. The tape must be wrapped in overlapped (50/50), and be secured with at least five stitches at the ends.

5.3 Application of Fabric

The application of the fabric shall be carried out with the fabric structure parallel with the aircraft's length axis. Joints in the fabric shall be positioned, if possible, parallel or perpendicular to the aircraft's flying direction. Joints or seams who are positioned perpendicular to the aircraft's flying direction should from aerodynamic point of view be made as little protruding as possible.

5.3.1 Machine sewn joints. (Seams)

Machine sewn joints (seams) should be carried out according to Fig 1. If fabric patches with overlapping edges are to be joined then may method according to Fig 2 be used. The separation between the stitches shall be 2-2,5 mm.

5.3.2 Hand sewn seams

Hand sewn seams shall be carried out in a zig-zag pattern according to Fig 3. The fabric shall be cut so that the seam edge can be folded double. The separation between the stitches shall be app. 6 mm.

5.3.3 Fabric covering of wings

Re-rivet the with new Fabric supplied edge-lists. Brush the lists with dope once before riveting.

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Rivet a double folded edge Fabric under the metal-panel's front edge over the Aileron-segment according to Fig 7. Alternatively, an edge-list according to the above used.

Fit Phillips-screw in the lower rear list. Brush surfaces where the fabric is to be glued to with **three coats of nitrate cement**. Glue Fabric in the cut-out for the ailerons in preparation for the adhesion of the wing fabric. Fit the aluminium-list in the cut-out. Apply another coat of nitrate cement in preparation for the attachment of the wing fabric. Cut out and make sure the fabric fits. Make a temporary fit with the help of pins. Mark out the position for the zips under the Wing and sew in the zips with the sewing-machine.

Sew in the fabric at the front end. Stretch the Fabric and sew the rear end (the lower side of the wing) and at the wing-root. Stretch the fabric and glue the rear edge and sew it towards the wing-tip. Sew the fabric to the wing-ribs in accordance with Fig 4.

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5.3.4 Re-covering of Ailerons and Rudder

Coat the surfaces where the fabric is to be glued **three times with nitrate cement**. Cut out, stretch and fit the fabric over the front and rear edge. Sew the fabric at the trailing edge on the control surfaces, –for the ailerons the inner edge, and for the rudder, –the upper part. Trim the fabric. Tighten the fabric and sew the lower part of the rudder. Glue the fabric at the cut-out for the aileron attachment and at the aileron's outer end. Sew the fabric to the ribs. Re-rivet the trim-rudder after the first treatment with dope. Fit the aluminium-fin to the rudder's lower end.

5.3.5 Re-covering of Elevators

Coat the surfaces where the fabric is to be glued **three times** with nitrate cement. Cut out and shape the Fabric after the elevator. Machine-sew the fabric at the front end and around the outer tip. Fit the fabric to the elevator. Trim the fabric. Hand-sew the fabric at the trailing edge and the inner edge.
Glue the fabric at the cut-out for the elevator attachment. Sew the covering to the elevator ribs.

6 Dope treatment

6.1 General

It is of great importance each step in the procedure is finished off section by section and without interruption. In order to avoid uneven stretching of the fabric it is important that the hole surface treatment is finished off within a week. Doped fabric may not be exposed to sunlight.

The dope does not stick to metal surfaces, therefore the fabric must be sewn or glued with nitrate cement.

NB.

Open fire is prohibited during the work.

The dope is not flammable when fully cured.

Adhere strictly to the Health and Safety regulations when working with dope and solvents.

6.2 Thinning of dope

The dope is usually delivered in thickness suitable for application with paint brush. If application with spray gun is considered, then the dope must thinned in accordance with the dope manufacturer's specification. Thinning of the dope affects the curing time and the stretching of the fabric and must therefore be mixed proportionally correct.

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6.3 Application of surface tape

Surface tape shall be attached to all joints in the fabric, over ribs trailing edges etc. after the first treatment with dope.

The contact side of the tape is to be coated with dope before the tape is attached to its position over the joint/rib. The other side of the tape shall be doped at the same time as the rest of the covering fabric. Edge lists and glued fabric edges on the wings shall be covered with 75 mm (3") serrated (pinked) surface tape. Rib-scams and edge-seams on control surfaces shall be covered with 50 mm (2") serrated (pinked) surface tape.

6.4 Drain/Ventilation holes

Drain/ventilation holes are to be made on the underside of the wings and control surfaces as close as possible to the trailing edge. The holes must be covered with drain grommets which are to be glued direct on to the fabric after the first treatment with dope. Furthermore, the attachment of the drain grommets must be reinforced with round patches of serrated cotton.

6.5 Dope treatment

The number of treatments with dope on fabric that previously not have been treated shall be four. In terms of repairwork shall necessary treatment with dope take place until the surface is back to its original strength.

The fabric must after the impregnating be sufficiently stretched so that a smooth surface is achieved.

6.5.1 First treatment

The first treatment shall be carried out with the dope thinned with 10 % thinner and be brushed on with paintbrush so that the fabric is penetrated with dope as even as possible. Do not brush the dope to hard in to the fabric because of the risk of excess dope forming a dope film on the underside of the fabric. The dope is fully dried after the first treatments after app. 2 hours.

6.5.2 Surface tape and drain/ventilation holes, see section 5.3 and 5.4

6.5.3 Second treatment

The second coating with dope shall be carried out with paint brush over the hole surface. After the dope has dried and if possible before the dope has hardened completely, rub down, **very carefully**, all small unevenness' with a fine grit wet & dry sandpaper. Be careful not to rub through the fabric in any places. Clean with compressed air.

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6.5.4 Third treatment

The third treatment with dope is to be applied with paint brush over the hole surface. Drying time; circa 2 hours.

6.5.5 Fourth treatment

The fourth treatment shall be done with the dope mixed with 10 gram aluminium paste to 1 kg dope. Drying time circa 2 hours.

7 Repair of fabric damage

Repair of fabric covered surfaces shall be carried out in such a manner that the original strength and tension is restored. Repair may be carried out as sewn or glued. Adhesion may not be carried out on surfaces treated with aluminium paint or other paint but primer. Before repair must all old paint and glue be removed with acetone. Soften the dope on the fabric with suitable solvent and clean the surface with a blunt knife or equivalent. Be careful not to let the solvent drip on to underlying fabric surface where it may cause blisters in the lacquer. Clear dope shall be used for adhesion on fabric surfaces. Nitrate dope shall be used for adhesion of fabric to metal. After treatment of the repair shall be the same as for re-covering.

7.1 Repair of tear in fabric

Tears in the fabric shall be repaired according to Fig 5. The edges must be sewn together with thread and a repair patch with serrated (pinked) edges shall be glued over the repaired damage. If the tear is straight, it shall be sewn from one end to the other. If the tear is L-shaped then the stitching shall be started from the "inner corner" of the L. The sewing is to be carried out with a curved needle. The surface which is to be covered with a repair patch must be well cleaned. A patch made from aircraft fabric which in all directions is at least 40 mm larger than the damage shall be applied over the damage and glued with clear dope. The edges of the patch shall be serrated (pinked).

7.2 Repair with stitched patch

If the damage is such that the edges can not be sewn together than a patch shall be sewn in into the clean cut hole provided the hole is no larger than 40 centimetres in any direction, see Fig 6. The hole may be cut oval, round or square. Dope and paint shall be removed close to the edges of the clean cut hole. If the hole is extended over a rib than the cover tape over the rib shall be removed. The edges of the patch, and in case of a square hole, the edges of the hole shall be folded in 12 mm whereupon the patch is to be sewn in with zigzag stitches. The patch and the part of the old fabric that has been cleaned must be re-doped. In conjunction with the second

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coating of dope shall over tape be applied over the repair. The cover tape must be 50 mm (2") wide. Repair similar to above may be extended over a rib area. The new fabric must be tied to the rib it covers in the usual manner.

7.3 Repair of a whole section

If a damage in any direction is larger than 40 centimetres, then the hole fabric section between the rib's closest to the damage as well as from the front and rear end of the damage. The binding to the rib's must not be disturbed. The old fabric shall be cut out from the section circa 25 mm from the centre line of the rib's and towards the damaged area. A patch of fabric shall be cut out covering the damaged area from the trailing edge of the wing to the main spar. The patch must overlap the rib's with 75 mm (3").

Parts of the old fabric which is covered by new fabric shall be thoroughly cleaned from dope and the new fabric put in to place, stretched and held into place with needles. The front and the rear ends of the fabric shall be folded in circa 12 mm (1/2") and thereafter stitched to the old remaining fabric. The next step is to fold in the sides of the patch and sew it to the old fabric in the same way as front and rear sides. Finally, sew the fabric to the rib's.

Repair according to the above may be extended to cover one or more rib's. The new fabric must be secured to the rib('s) by the means of thread in usual manner. The fabric shall be surface treated in accordance with chapter 5.

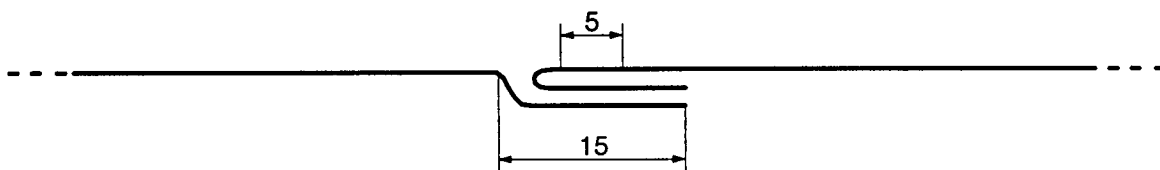
7.4 Repair of minor damages

If the damage is minor, (pin hole etc.) then a patch of suitable size may be glued over the damage. The damaged part shall be cut clean if necessary so that a oval or round clean opening with even edges is achieved.

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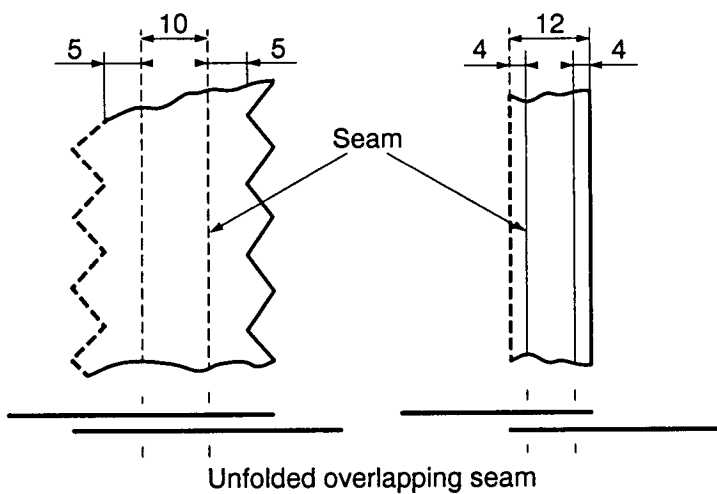
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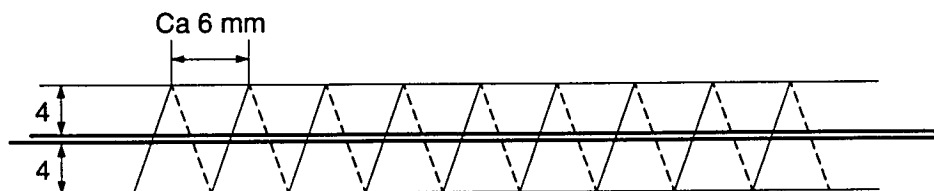
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Figure 1.



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Figure 2.



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Figure 3.

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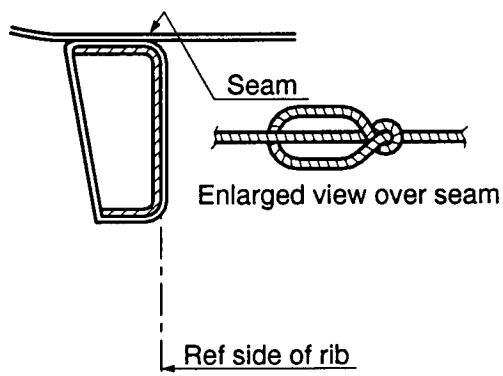
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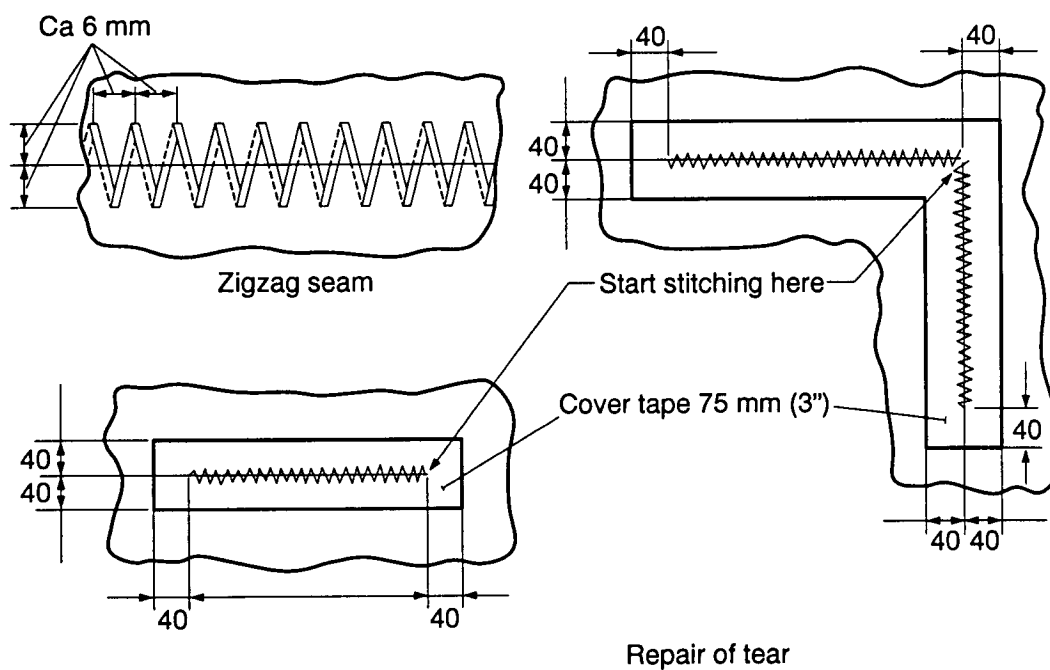
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Figure 4.



Repair of tear

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Figure 5.

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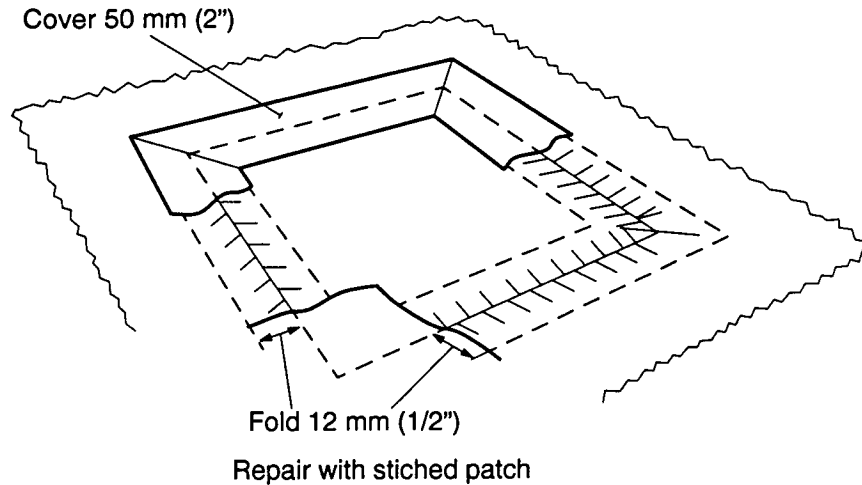


Figure 6.

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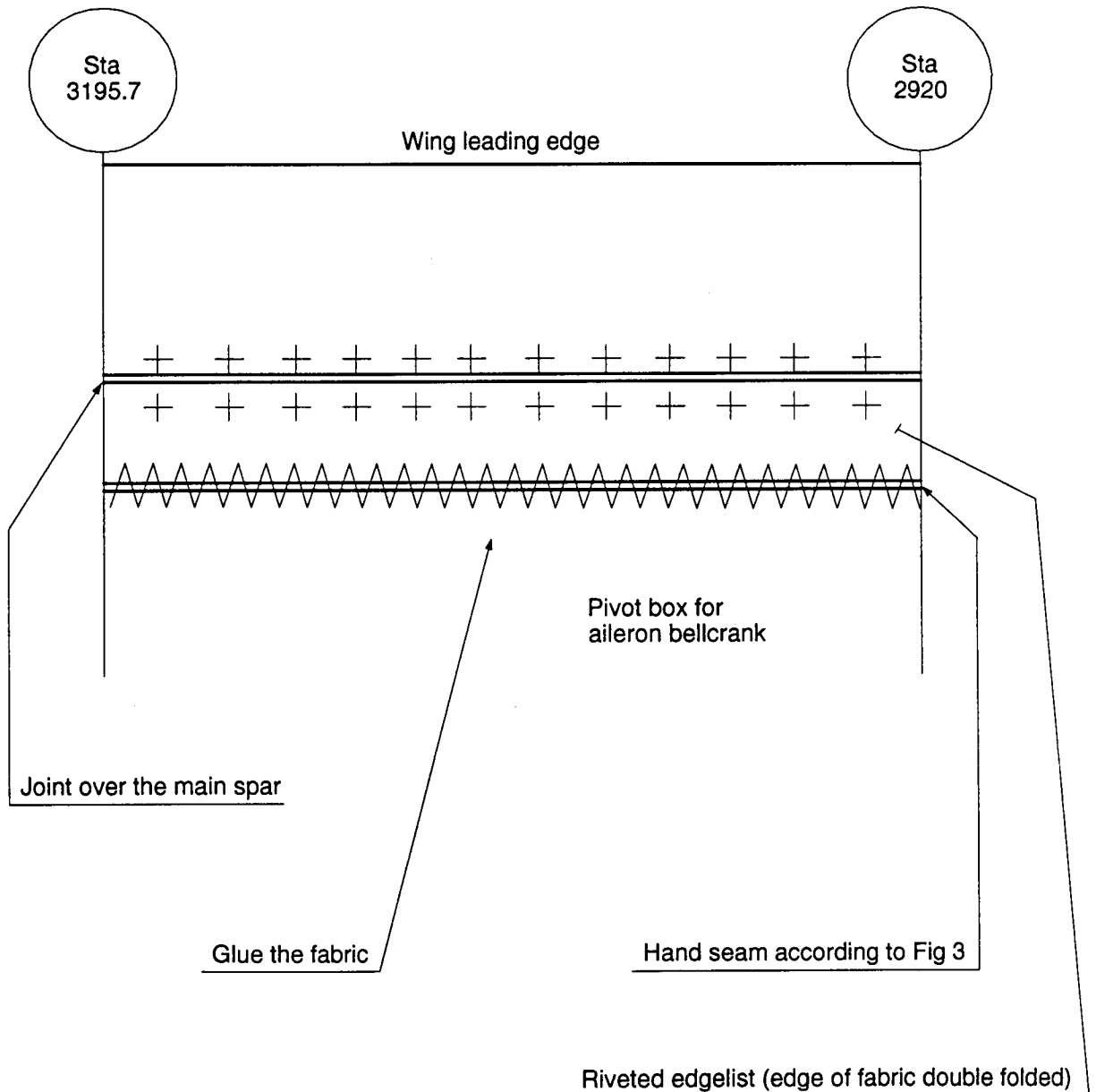


Figure 7.

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