COVER AND FINISH SPECIFICATION FOR FABRIC-COVERED CONTROL SURFACES

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1. SCOPE

1.1 Purpose.- This specification establishes the requirements for the materials to be used and the method of applying the fabric and finish to the control surfaces of Beech airplanes.

1.2 Precedence.- Should any conflict exist between this specification and the requirements of any Beech drawing or specification listed in Section 2 of this specification, the requirements of the Beech drawing or specification listed in Section 2 shall take precedence.

1.3 Definitions:

1.3.1 Aluminum Paste.- Material referred to in this specification as aluminum paste shall conform to Specification TT-A-468, Aluminum-Pigmented; Powder and Paste for Paint.

1.3.2 Clear Dope.- Material referred to in this specification as clear dope shall conform to Specification MIL-D-5553, Dope; Cellulose Nitrate, Clear.

1.3.3 Fabric.- Material referred to in this specification as fabric shall conform to Specification MIL-C-5646, Cloth; Mercerized Cotton Airplane.

1.3.4 Finishing Tape.- Material referred to in this specification as finishing tape shall conform to Specification MIL-T-5083, Tape; Cotton Surface, Class 1.

1.3.5 Lacing.- Material referred to in this specification as lacing shall conform to Specification MIL-C-5649, Cord; Prewaxed Braided Cotton.

1.3.6 Pigmented Dope.- Material referred to in this specification as pigmented dope shall consist of a mixture of 3 ounces of Specification TT-A-468, Aluminum-Pigmented; Powder and Paste for Paint, and 1 gallon of Specification MIL-D-5553, Dope; Cellulose, Nitrate, Clear.

1.3.7 Reinforcing Tape.- Material referred to in this specification as reinforcing tape shall conform to Specification MIL-T-5661, Tape; Cotton Reinforcing.

1.3.8 Thinner.- Material referred to in this specification as thinner shall conform to Specification MIL-T-6094, Thinner; Cellulose-Nitrate Dope and Lacquer, or MIL-T-6095, Thinner; Cellulose-Nitrate Dope and Lacquer, Blush Retarding, whichever is applicabee. Other thinners recommended by the manufacturers of the dope may be used when approved by the Procuring Agency.

1.3.9 Thread.- Material referred to in this specification as thread shall conform to Specification V-T-276, Thread; Cotton, 16/4 to 20/4 ply, Type 1B1 for machine sewing and 8/4 ply, Type 111B for hand sewing.

2. APPLICABLE SPECIFICATIONS AND DRAWINGS

2.1 Specifications:

2.1.1 Federal:

V-T-276	Thread; Cotton
TT-A-468	Aluminum-Pigmented; Powder and Paste for Paint
DDD-S-751	Stitches; Seams; and Stitching

2.1.2 Military:

MIL-T-5083	Tape; Cotton Surface
MIL-D-5553	Dope; Cellulose Nitrate, Clear
MIL-C-5646	Cloth; Mercerized Cotton Airplane
MIL-C-5649	Cord; Prewaxed Braided Cotton
MIL-T-5661	Tape; Cotton Reinforcing
MIL-T-6094	Thinner; Cellulose-Nitrate Dope and Lacquer
MIL-T-6095	Thinner; Cellulose-Nitrate Dope and Lacquer Blush Retarding

2.1.3 US Army:

98-24100-U	Doping Aircraft Surfaces

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2.2 Drawings:

2.2.1 Air Force-Navy Aeronautical:

AN230 Grommets--Metallic, Plain and Spur, with Washers

3. REQUIREMENTS

3.1 Materials.- Use materials and compounds equivalent in quality to United States Air Force, United States Navy, and Bureau of Aeronautics' standards with the exceptions specified herein. All finishing materials, substitutions, or equivalents must be approved by the Engineering Department.

3.2 Workmanship.- Workmanship must be in accordance with high-grade commercial practice.

3.3 General Considerations:

3.3.1 Care of Fabric.- Store the fabric in a dry place protected from direct sunlight. Age at room temperature for at least 48 hours prior to fabrication. The ideal room temperature is 70 to 80 degrees Fahrenheit with a relative humidity of 50 to 55 percent.

3.3.2 Working Area.- The working area should be clean and well ventilated.

3.3.3 Preparation of Surfaces To Be Covered:

3.3.3.1 Cleaning.- Thoroughly clean all metal surfaces that come in contact with the fabric just prior to application of the covering.

3.3.3.2 Protection of Sharp Edges.- Protect all sharp metal edges that are likely to come in contact with the fabric or rib lacing such as lightening hole flanges by covering with 1/4-inch cellulose tape at the points of contact.

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3.4 Fabrication of Covers:

3.4.1 Methods of Fabricatibn:

3.4.1.1 Envelope.- The envelope method of covering is accomplished by machine sewing together widths of fabric cut to specified dimensions to form an envelope which can be drawn over the frame. The trailing and outer edges of the covering are machine sewed in accordance with Paragraph 3.4.3.1 of this specification. Where machine sewing is not practicable the trailing and outer edges are hand sewed in accordance with Paragraph 3.4.3.2.

3.4.1.2 Blanket.- The blanket method of covering is accomplished by machine sewing together widths of fabric of sufficient length to form a blanket covering for all surfaces of the frame. The trailing and outer edges of the covering are hand sewed in accordance with Paragraph 3.4.3.2 of this specification.

3.4.2 Cutting and Application of Fabric.- In fabricating both the envelope and blanket type coverings, cut the fabric in sufficient length to pass completely around the frame starting at the trailing edge and returning to the trailing edge. Apply the fabric so the warp threads--the threads running parallel to the selvage--will be parallel to the line of flight. The only seam along the span is to be at the trailing edge except as specified in Paragraph 3.4.3.4.3. Unless otherwise specified join the fabric by hand sewing at the inner and outer ends of the frame, recesses, hinges or other obstructions which make it impracticable to draw a machine sewed envelope over the frame. Make allowance in cutting for hand sewn seams as described in Paragraph 3.4.3.2.

3.4.2.1 Tension.- Attach the coverings so the fabric will have proper and equal tension over all parts of the surface after being drawn into position for doping. Apply equal tension in all directions in order to equally stress each system of threads in the fabric.

3.4.2.2 Pinning for Hand Sewing.- Whenever the covering cannot be applied without pinning the fabric in place before hand sewing, use one or two wraps of friction tape applied around the metal frame at intervals of one to two feet on which to pin the cover to hold it in position for hand sewing.

3.4.3 Seams:

3.4.3.1 Machine Sewed.- Use plain lap or folded flat fell seams Type LSc-2 of Specification DDD-S-751. Use double row stitching, Type 301 or 401 of Specification DDD-S-751, commonly called lock stitch, with 8 to 10 stitches to an inch to close machine-sewed seams. Space the stitches approximately 1/4 to 1/8 inch from the nearest edge of the seam with 1/4 to 3/8 inch between the two rows of stitches.

3.4.3.2 Hand Sewed.- For hand sewed seams the material is cut so it can be doubled under at least 1/2 inch to form a hem through which the hand stitching is accomplished. Use a baseball-type stitch with a minimum of 4 stitches to an inch. Make a suitable lock stitch at 6-inch intervals and finish the seam with a final lock stitch and knot.

3.4.3.3 Combination Sewed.- On irregular covers requiring a combination of machine and hand stitching, start hand stitching at the point where the machine stitching stops and continue to a point where machine sewing starts again or uncut fabric is reached. Accomplish stitching as described in the preceding paragraphs.

3.4.3.4 Location:

3.4.3.4.1 Longitudinal.- Locate the longitudinal fore and aft seams parallel with the line of flight where practicable. Do not locate over a rib or place so the lacing will be through or over a seam.

3.4.3.4.2 Tapered Airfoil.- Locate tapered airfoil seams so they cross the fewest number of ribs consistent with efficient cutting of the pattern.

3.4.3.4.3 Lateral.- Where practicable locate lateral seams at the trailing edge of assemblies. In tapered sections an additional seam is permitted on the tapered portion of the leading edge provided the seam is covered with a strip of 3-3/4-inch finishing tape.

3.4.4 Reinforcements:

3.4.4.1 Lacing.- When fabric is attached by lacing use reinforcing tape under all lacing. Use moderate tension when attaching the tape from the forward to rearward ends of the fabric covered portion. Use a slip knot for

fastening the first point of lacing. Continue to the next point of lacing at which point and at all subsequent points make a tie with a seine knot as shown in Figure 1. Secure the lacing at the last point of lacing with a double or lock knot. Apply lacing on thin sections by passing the lacing completely around the rib, fabric, and reinforcing tape as shown in Figure 2. Apply sufficient tension so all slack in the lacing cord is removed before making the tie.

3.4.4.2 Patches.- With the exceptions noted herein or on applicable drawings, install reinforcement patches over any portion of the fabric that has been pierced by wires, bolts, or other forms of protrusion. Do not apply the reinforcement patches until the first coat of dope has been applied to the covering and allowed to thoroughly dry. Use fabric patches that have a pinked edge on all four sides or that have been frayed out not less than 3/16 inch on all four sides. Use a cotton duck patch of suitable weight which has been sewed to a fabric patch and dope in place to reinforce any area of the fabric susceptible to wear or friction induced by a moving part or fitting.

3.4.4.3 Finishing Tape.- Apply finishing tape over lacing, reinforcing tape, etc., after the first two dope coats on the cover have thoroughly dried. Before applying the finishing tape apply a third coat of dope to that portion of the fabric to be covered and center the finishing tape into final position over the doped surface. Apply a generous coat of dope over the finishing tape after it has been brought to final position.

3.4.5 Openings in Fabric:

3.4.5.1 Inspection and Repair Access.- Install openings to permit access for inspection and repair of the internal structure and equipment as specified on the applicable drawings.

3.4.5.2 Drainage Grommets.- Install drainage grommets on the underside of the airfoil, at the trailing edge, and as close to the rib as practicable. To insure adequate drainage install a grommet on each side of the rib. Check all drainage grommets after assembly and doping to make certain that the openings are not obstructed.

3.4.5.2.1 Brass Grommets.- Whenever brass grommets are used mount them on a fabric patch approximately 2 inches in diameter, or 2 inches square, and secure into position in the same manner that reinforcement patches are applied. Use brass grommets conforming to AN230-2 with the exception that AN230-1 grommets may be used on airfoils in the empennage unit.

3.4.5.2.2 Celluloid Washers.- Whenever celluloid washers are used to reinforce the drainage openings use washers from .030- to .050-inch thick and dope directly to the main covering after the first coat of dope on the covering has thoroughly dried.

3.5 Finish:

3.5.1 General.- The application of the dope finish as specified herein must produce the desired tautness and be of sufficient smoothness so the surface of the completed article can be readily cleaned. The total combined weight of all the finishing coats used is not to exceed 5 ounces per square yard of finished surface. The air pressure for spraying the dope is 30 to 50 pounds for the pressure pot and 40 to 70 pounds for the spray nozzle.

3.5.2 Clear Dope.- Apply the clear dope first, making certain that the nap of the fabric is completely sealed down. Apply the first 2 coats by a brush method. Following the initial 2 coats apply the finishing tape in accordance with Paragraph 3.4.4.4 and then brush or cross spray such additional coats as are necessary to produce the desired tautness and smooth appearance. The exact number of coats will depend upon the consistency of the material but it will not usually exceed a combined total of 7 coats. Thin the dope as necessary but only to the extent that each additional coat will produce a definite film over the previous one. The package consistency is usually satisfactory without thinning for brush applications. Allow each coat to thoroughly dry before another coat is applied.

3.5.3 Pigmented Dope.- Apply pigmented dope in the amount necessary to obtain a solid covering and provide a finish with a smooth appearance and feel. Do not apply more than 2 coats. Pigmented dope may be thinned with approximately 1 part thinner to 2 parts of dope. Use a thoroughly wet, sprayed cross coat for the final coat.

3.5.4 Sanding.- If necessary to produce a sufficiently smooth final finish, a light sanding after the second coat of clear dope and/or after the first coat of pigmented dope is permissible. Use No. 320 grit sandpaper. CAUTION: The surface that is being sanded must be properly grounded to prevent any static electrical charges from igniting vapors that may be present.

4. INSPECTION AND TESTS

4.1 Compliance.- All specifications and methods specified herein shall be subject to authorized Government inspectors who shall be given all necessary facilities to determine compliance with this specification.

4.2 Test Specimen.- To avoid the necessity of cutting out a section from the structural surface of a production article, a test specimen may be made up and finished side by side with a production article for testing compliance with the requirements of this specification. The specimen shall be air dried at least 10 days or oven-dried at 150 degrees Fahrenheit for 16 hours prior to the test.

4.3 Flexibility Test.- Cut a 2- by 4-inch sample from the area to be tested. Make a cut along the thread of the fabric. Fold the sample lengthwise, with the doped surface outermost and place on the sample a 2 kilogram (4.4 pounds) weight with a flat circular base approximately 2 inches in diameter so the crease formed is directly below the diameter of the weight. Fold the sample in a new place that does not intersect the first crease and repeat the test except use a 1 kilogram weight.

4.3.1 Evaluation of Flexibility Test.- The flexibility is considered satisfactory if the dope film does not crack at the fold under the 1 kilogram weight. The presence of a few slight cracks may be acceptable provided there are no long sharp cracks under the 2 kilogram weight indicating brittleness. Examination of a doped fabric surface for brittleness by the application of thumb pressure is not considered satisfactory.

4.4 Tautness and Weight of Applied Film Test.- Determine the tautness and weight of the applied film in accordance with Specification 98-24100-U.

4.5 Frequency of Tests.- The tests described in this section of this specification shall be conducted at least every 30 days.

Approved:

Kenneth Olger
USAF Quality Control

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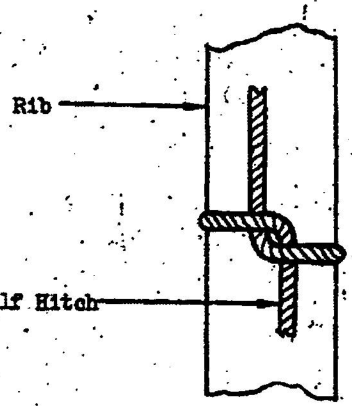
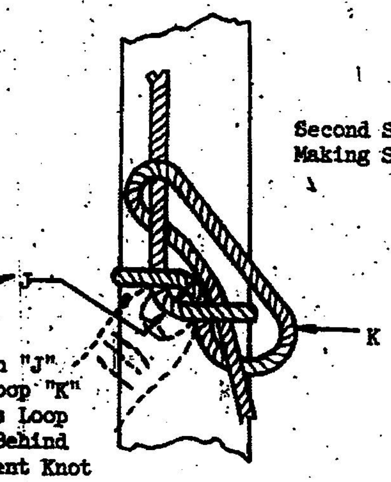
Figure 1, Seine Knot



First Step In Making Seine Knot



Second Step In Making Seine Knot

Maintain Tension In "J" With Thumb Until Loop "K" Is Tightened. This Loop Must Be Tightened Behind Half Hitch To Prevent Knot Slipping

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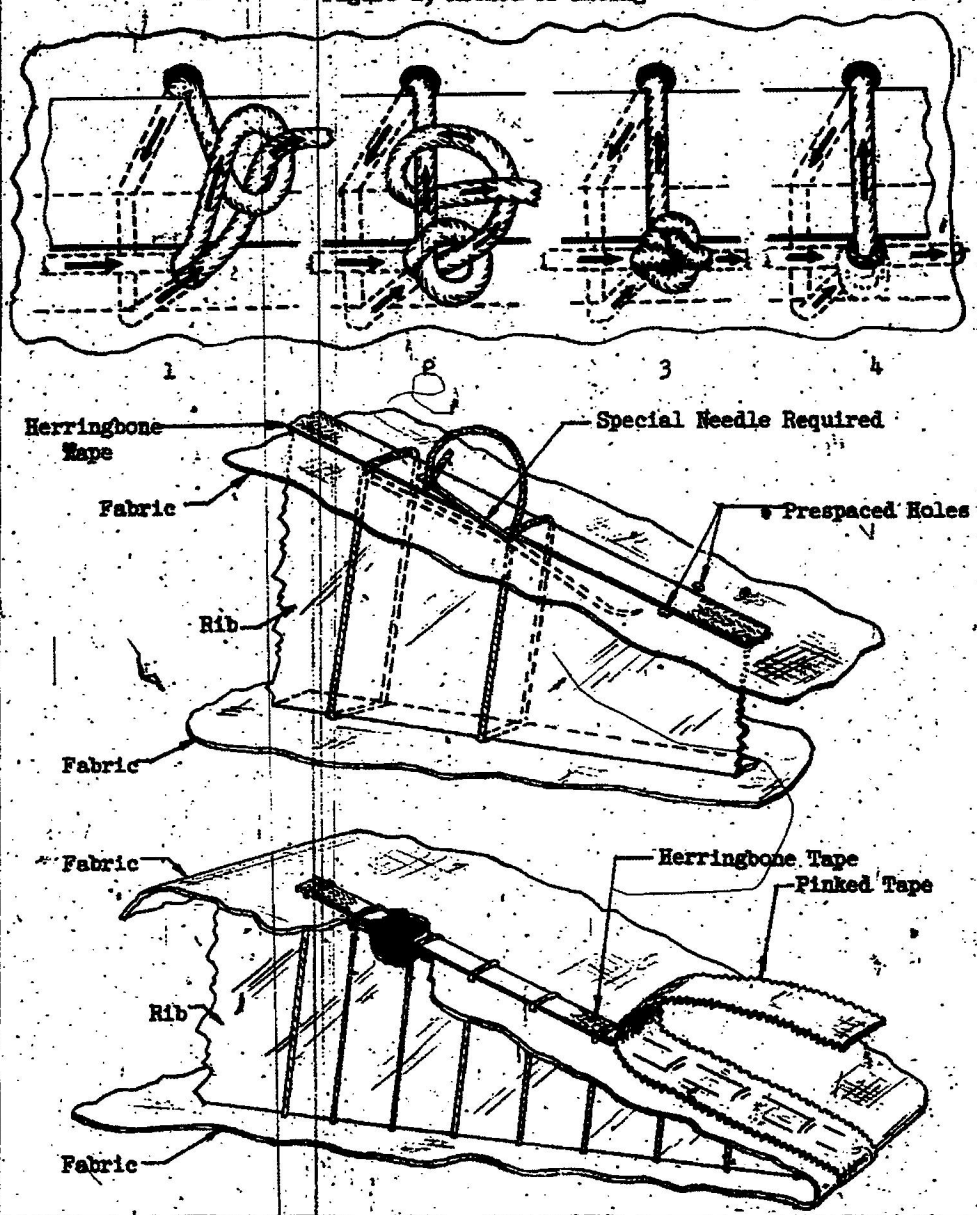
Figure 2, Method of Lacing



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