Superflite

System II/L
Kit/Homebuilt

Covering & Finishing System for Superflite 104 & Dacron Fabrics

Introduction

It has been many years since an improved finishing system has appeared for fabric covered aircraft. During those years, the coating and chemical industries have made great strides in developing new and improved finishes.

Outstanding among these achievements have been the development of polyurethane coatings, along with the further refinement of elastomeric plasticizers (flex agents). Together the polyurethane paint with the plasticizers added can be tailor-mixed to combine the properties of adhesion, strength, durability and high solids to a degree never approached by traditional aircraft coatings. When used directly over polyester aircraft fabrics, they penetrate and combine with the fabric to provide a true fiber reinforced plastic coating to protect your aircraft. Because of the high solids and rapid "build," they reduce the number of coats required and provide a superior finish with a great reduction in labor.

The chemical industry was also responsible for the development of lightweight, durable synthetic fabrics. Few of these found their way into the aircraft covering field, but the ones that did, such as our Superflite 104, signaled the beginning of the long lasting, almost lifetime aircraft covering.

General Information

Methods and techniques of covering and finishing are uncomplicated and can be easily executed by anyone with average mechanical skills and patience.

Covering procedures for aircraft which are certificated in the standard category are addressed in FAA Advisory Circular 43-13-1A, which you may find to be helpful, although much of this information is becoming obsolete. Advisory Circular 56-15A," Airframe and Powerplant Mechanic's Airframe Handbook," chapter 3, also covers this subject.

Basic Steps:

1. Clean and prepare structure.
2. Install new fabric using U-500 adhesive.
3. Tauten with hot iron.
4. Secure fabric to ribs with rib stitching, rivets or adhesive.
5. Apply surface tapes, drain grommets and inspection rings as specified.
6. Apply two cross coats of mixed primer/filler.
7. Sand surface and apply one cross coat of finish color.

1. Preparation

When beginning the task of covering an airplane, a big temptation exists to tear the old material off in the fastest possible manner and wrap the structure in sparkling new fabric. Resist this impulse and you'll be glad later. The old fabric should be removed carefully in as nearly intact condition as possible and saved until the new cover job is completed. You will want to refer to the original to locate the proper position for inspection openings, rib stitch spacing, and probably several other things that don't occur to you to make note of at the time of removal.

The structure must be inspected and signed off as "O.K. for cover" by a person authorized by the FAA to do so before you can install the new fabric. Take time to carefully prime the metal structure with mixed SF-10 and SF-320 epoxy primer. Clean and revarnish all woodwork and replace any electrical wiring and control system components which may be even slightly questionable. Sharp edges should be protected with chafe-point tape to preclude cutting or catching on the fabric. Replace inter-rib lacing if it is specified for your airplane.

2. Installation

Presewn envelope sets are available for most standard category airplanes. This method will provide the most satisfactory results with the least expenditure of time and effort. Installation consists of simply slipping the envelope over the surface to be covered much like pulling on a sock. Wing covers will normally have two or three chordwise seams which should end up parallel to, but not immediately over, a rib. Aileron and flap wells will be left unsewn with enough material left protruding past the edge to cement securely to the structure in these areas. Odd shaped wingtips on some aircraft may be left open as well. The fabric should be cut to overlap the structure one to two inches and cemented smoothly with SF-U-500 adhesive. The same treatment should be given the wing root rib.

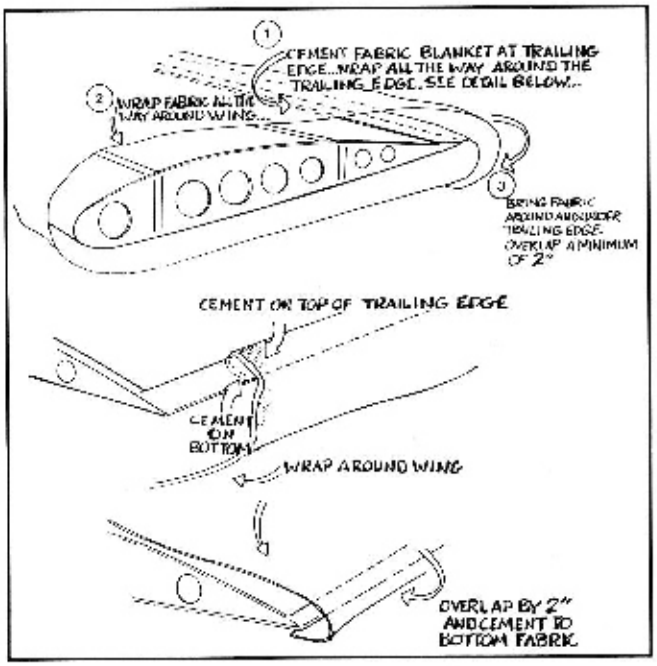
NOTE:
SF-U-500 cement is shipped in undiluted form for economy. Begin by thinning SF-U-500 with equal parts (1:1) of Methyl Ethyl Ketone (MEK). Further adjustment of viscosity may be done from that point, as desired.

A second option is fabrication by the installer of a blanket large enough to wrap the surface to be covered. A wing blanket would be made up of three of four sections of fabric cut long enough to reach from the trailing edge, around the leading edge and back to the trailing edge with three or four inches of overlap at the bottom. The adjoining panels are then sewn together with a double stitched "folded fell" as shown in FAA AC 43.13-1A. The blanket is draped over the wing and secured at the trailing edge with SF-U-500 adhesive, first cementing the lower fabric to the structure wrapping all the way around the trailing edge, then lapping the top fabric around the back and cementing to the bottom cover with a minimum of two inches of overlap. Wingtip cementing is done in the same manner, brushing cement onto the structure, pressing and smoothing the fabric down into the cement then following with another coat to which is attached the upper fabric, again allowing a two inch overlap. Be sure the cement is used liberally enough to coat each individual thread of the fabric in the attaching area but avoid excessive build-up of cement which will leave lumps and ridges that require laborious sanding of the filler coats to hide.

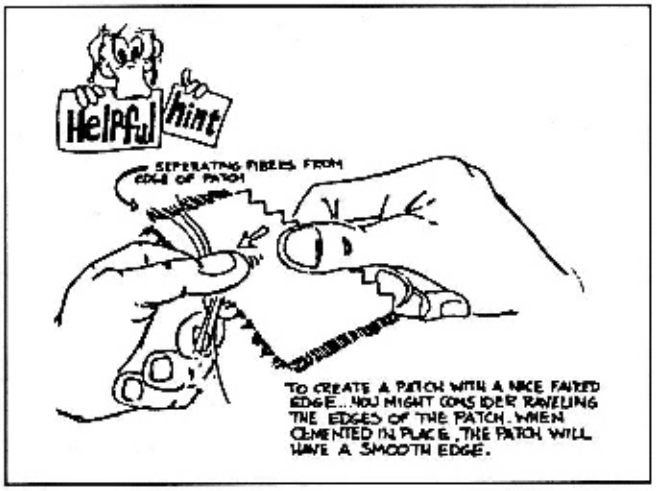
An alternate method of cementing the fabric to the structure is to apply two coats of cement to the areas on the structure to which fabric will be bonded. Allow to dry (approx. 15 min.) then lay the dry fabric over the dried cement and activate the cement through the fabric by brushing MEK on top of the fabric. Use sufficient pressure to assure that the fabric weave settles into the glue. Adding approx. 10% SF-U-500 cement to the MEK will extend glue drying time to allow good penetration.

A third method, involving no machine sewing is also allowable due to the fact that Superflite fabric is equally strong in the fill or "woof" in the direction of weave, or "warp." The fabric may be oriented spanwise with a length running from root to tip covering the bottom surface and another full span covering the top surface. This requires a minimum overlap of four inches at the leading edge and this lap joint must be covered with a six inch wide surface tape. Some light aircraft without flaps will have too long a chord to allow this treatment as the widest fabric available is 72 inches.

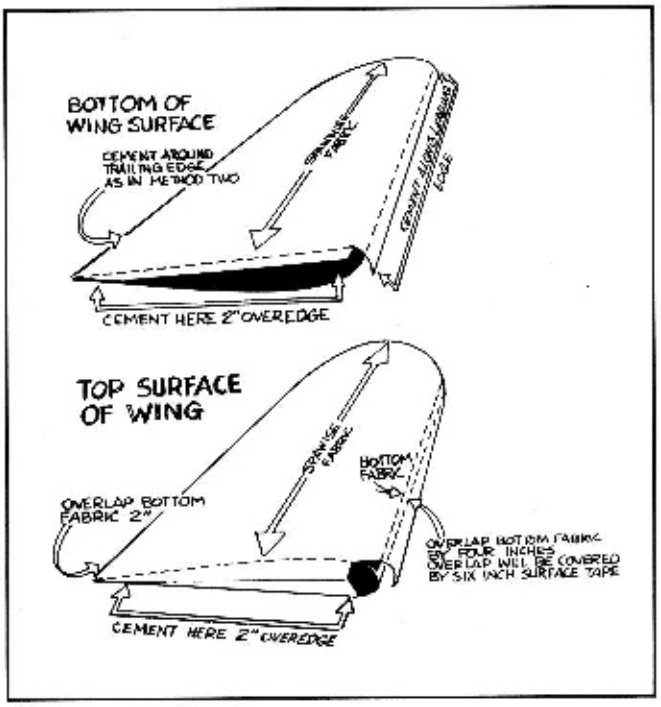
Care must be exercised to avoid lumps and ridges in the critical leading edge area which might seriously affect the performance of the airfoil as well as present an unsightly appearance. Trailing edge attachment will be the same as that used with the sewn blanket method. Of course, hand sewn seams at the trailing edge and at aileron or flap wells, using SF-207 thread and a baseball stitch as shown in 43.13-1A may be used, but a smoother seam will be obtained using the lap method with SF-U-500 Urethane adhesive.



Installation – Method Two



Helpful Hint – Separating Fibers from Edge of Patch



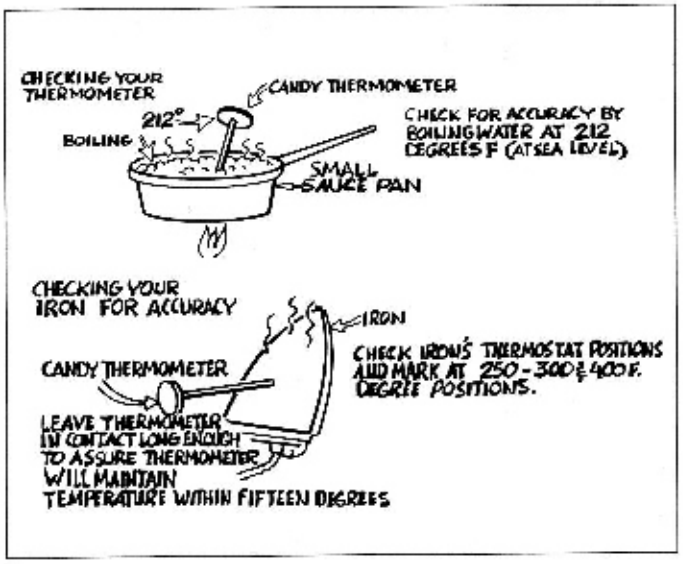
Spanwise Method

3. TAUTENING

For the tautening process an ordinary household iron rated at 1100 watts or higher will provide the most satisfactory heat source. Calibrate the iron using a candy thermometer or similar glass gauge type which has been checked for accuracy using boiling water (212° F at sea level) as a standard. The iron's thermostat position should then be marked at the 250°, 300° and 350° positions. Leave the iron in contact with the thermometer long enough to determine that the thermostat will maintain the selected temperature within fifteen degrees. A hobby-type thermometer, such as the Coverite brand, may be used by placing directly on the face of the iron.

Begin at the 250° setting and iron the entire surface keeping the iron moving much in the same manner as ironing a shirt. Increase the heat setting to 350° and go over the surface again using the same technique. This should give the desired smooth, wrinkle free surface you are looking for. Puckers or corner wrinkles can be given preferential treatment and heat may be increased slightly for stubborn spots but care must be exercised not to heat the fabric in excess of 425° as the material will melt and all strength properties will be lost. Overheated fabric, when examined closely, can be seen to have lost the weave pattern, as the individual threads will have melted together.

Keep your eye on all seams as the fabric begins to pull up and apply heat on either side as required to keep the seams straight and trailing edge seams centered on the trailing edge. Wrinkles in the lapped area where cement has been applied may still be removed by



Tautening

the application of heat. Apply the iron in short bursts to avoid scorching the cement. If strut fittings or similar protuberances have been covered and the fabric is to be cut to expose them, apply a light coat of thinned SF-U-500 adhesive in the area and allow to dry before cutting. This will prevent frayed edges and loose raveled threads. This area can be spot shrunk with the tip of your iron before applying the primer coats.

4. Rib Stitching and Accessories

At this point rib stitching or other approved attachment procedure is performed. Various methods of attachment may be wing clips (Cessna), Pop Rivets (Citabria), P.K. screws, Martin Clips* or rib lacing (stitching) cord. If rib lacing cord is called for on your airplane, refer to the old covers or to FAA AC43.13-1A, Chapter- 3 for stitch spacing and procedure. SF693 standard lacing cord or the new low profile SF694 are both FAA approved for use with SF-102 fabric.

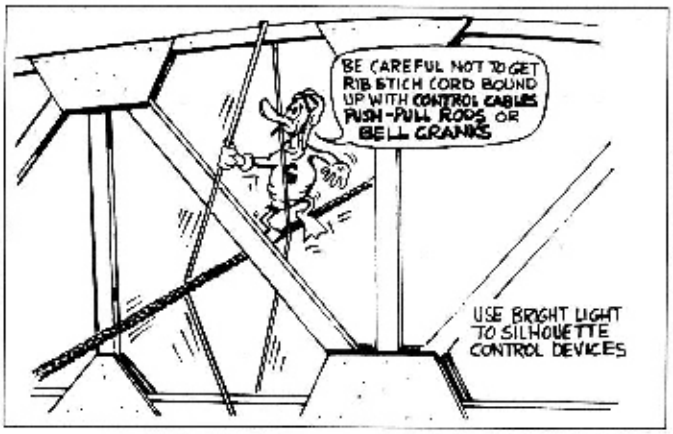
* Martin clips require use of "Grade A" type rib reinforcing tape.

Drain grommets and inspection rings are attached with SF-U-500 Urethane Adhesive. Fabric doublers and (optional) inspection ring reinforcements are best cut from a large scrap of Superflite fabric which has been stretched over the open end of a cardboard box or something similar, taping the edges down and ironing lightly to remove wrinkles. A light coat of SF-U-500 Adhesive which has been reduced with equal parts of methyl ethyl ketone (MEK) is brushed on the entire surface and allowed to dry after which any shape may be cut. without concern for raveled edges. These are cemented to the surface with the same thinned SF-U-500 adhesive. If you are covering more than one airplane or plan to do more In the future, you may wish to build a light wooden frame to which a length of fabric may be stapled for this purpose .

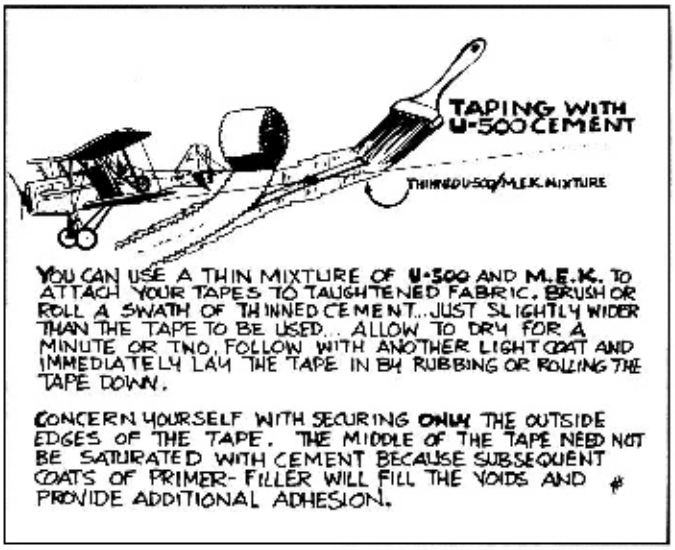
5. Tapes

Surface tapes are applied over ribs and seams whether cemented or sewn. Trailing edges are taped even if no seam exists there, and, if desired, on wing leading edges to provide additional abrasion protection. Tapes on a flat surface may be neatly installed using the SF Roller Applicator. On any shape surface, SF-U-500 may be neatly and economically applied using the Gluemaster pump brush applicator. Apply a swath of thinned SF-U-500 Urethane adhesive slightly wider than the tape to be applied, center the tape and smooth it into place by hand, then roll another coat of SF-U-500 onto the tape applying enough pressure to squeeze out the air bubbles This may also be done with a brush.

Tapes to be folded around a trailing edge or curved tip can be applied smoothly by cementing just the center 1/4-inch or so of the tape to the .sur-face, allowing the tape to stand up at right angles to the surface until the adhesive has dried. Now hold a small scrap of .cardboard as a backup behind the tape and iron the tape in place. Since it cannot: shrink lengthwise, being cemented in place, it will curl around the edge of the surface and lay flat, on even a fairly tight curve without the necessity of cutting "darts" in the edges. As it begins to lay down, remove the cardboard and continue ironing directly on the surface. SF-U-500 is then brushed up under the tape edge, cementing it in place Shrinking in width will be quite apparent so it's best to use a wider tape on the edges than that used for the ribs and seams. When reduced with equal parts of MEK, the SF-U 500 will penetrate the weave and give outstanding adhesion without excessive build-up on the surface, which saves sanding time on taped areas.



You can change spacing to avoid control devices



Alternately, tapes may be applied in the same manner as the fabric was attached to the airframe. Simply brush two coats of thinned cement onto the tautened fabric where the tape is to be affixed, and allow to dry (approx. 15 min.). Then lay the tape over the dry cement and activate with the MEK preparation as before.

IMPORTANT!
Before applying the primer/filler, a coat of U-500 which has been thinned to a watery consistency with MEK should be brushed onto the fabric in all areas where the fabric is in direct contact with solid structure, such as leading edges and fuel tank bays. This will seal the fabric to the structure and prevent "wicking" of the primer/filler which might otherwise require three or four extra applications to properly fill the weave.

NOTE:
Prior to beginning the spraying process, the surfaces should be washed with a standard solution of Spic-N-Span or equivalent, to remove any accumulated contaminates. This is far superior to a solvent wipe down.

6. Primer/Filler

Three coats of primer/filler mixture are now applied over the entire surface. The Superflite Primer/filler is a multi-function material, producing the bond to the fabric, filling the fabric weave and providing full ultraviolet (UV) block. The coats may be done in rapid succession, waiting only until the surface is dry to the touch – normally only a few minutes – before applying the next coat. The primer consists of four components. Mix only enough material to fill your spray equipment, mixing a fresh batch each time you refill your spraygun cup or pot. Proportions are not critical but the ingredients should be measured rather than just eyeballed. Pour two parts of SF-250 primer base into a clean container, add one part of SF-325 catalyst, one and a half parts of SF-220 Flex and one part of SF-450 reducer and stir.* The mixture is ready to use immediately. No induction time is required. This will produce a liquid of spraying viscosity without further reduction.

* Refer to "Mixing Guide"

An alternative method is that the primer/filler may be neatly and smoothly applied by hand with our SF-Roller applicator. SF-250 primer penetrates the weave of the fabric and produces a better bond than any material we have tested. After applying the third coat, allow to dry overnight before sanding. One sanding with a medium grit Wet-or-Dry paper will be sufficient to hide the weave of the fabric. If it is desired to completely bury the tapes, additional coats and additional sanding operations may be performed. Avoid excessive buildup as it is possible to add undesirable weight to the aircraft. If you put a lot on, sand a lot off!

CAUTION: If bubbles appear in the surface as you are applying the Primer/filler, STOP and gently rub or brush the bubbled area before the material sets up. This is caused by drying of the surface before the solvents have all escaped and can be eliminated by applying thinner coats. Not a thinner mixture, just less material per coat. Allow all the solvents to evaporate before applying the next coat. This will normally be only a few minutes.

Mixing Proportions:
3 Since you will not want to mix more primer/filler than will be used in one work period, it is helpful to have a graduated container such as a glass measuring cup for preparing the mixture.

Whether spraying or rolling the primer/filler coats, the following proportions are used:

2 parts SF-250 Primer
1 part SF-450 Reducer

ALWAYS mix Reducer with Primer/filler
BEFORE adding Catalyst and Flex Agent

1-1/2 parts SF-220 Flex Agent
1 part SF-325 Catalyst
*** See "Mixing Guide"**

7. FINISH COLOR

When the fabric surface has been sanded to a satisfactory smoothness, two coats of Superthane color are applied. Enamel spraying techniques are employed – generally one light "tack" coat which is allowed to set-up for a few minutes followed by a full, wet coat will give adequate coverage without sags or runs. Color coats are mixed of equal parts of Superthane color and SF-350 Catalyst, to which SF220 Flex is added at the rate of one fluid ounce per quart. Thin to spraying viscosity with SF-410 reducer. When ambient temperatures exceed 95° F, substitute SF-420 Reducer for SF-410.(When painting metal and fiberglass parts exclusively, the Flex may be omitted, however it is not detrimental to the finish in any way and may be used if a mixed batch is at hand.) The mixture is ready to use immediately. No induction time is required.

Aluminum cowling, fairings, etc. should be stripped completely of old finish, etched with #33 Alumiprep (diluted per instructions on label), treated with Alodine 1201 conversion coating and primed with two parts SF-10/SF-320 Epoxy primer for lasting corrosion protection and proper adhesion of the Superthane color coat. Spray-can or lacquer base zinc chromate primer will not produce satisfactory results. SF10/SF-320 primer is equally effective on steel tubing and struts.

Apply two (2) wet double cross coats of primer mixture allowing a 10 to 15 minute wait between coats. Allow to dry for a minimum of one (1) hour up to a maximum of 7 days before top coating. For optimum results and maximum smoothness of Superthane Color Coats, the primer should be burnished to remove all traces of overspray with fine grade Scotch-Brite pads. The goal is to knock off the overspray, or "nubs", without actually cutting the primer surface. Do not use sandpaper.

Apply one full coat of Superthane mixed color. Allow the first coat to dry for 15 to 20 minutes and apply a second full coat. Allow 5 to 6 hours dry time before taping for stripes or second color.

MIX SUPERTHANE COLOR AS FOLLOWS:
1 part Superthane Color
1 part SF-410 or SF-420 Thinner
1 part SF-350 Catalyst
1/32 SF-220 Flex Agent
*** See "Mixing Guide"**

Superthane finish colors applied exclusively to metal or fiberglass need not include SF-220 Flex in the mixture, but the Flex is not detrimental should you have some paint premixed.

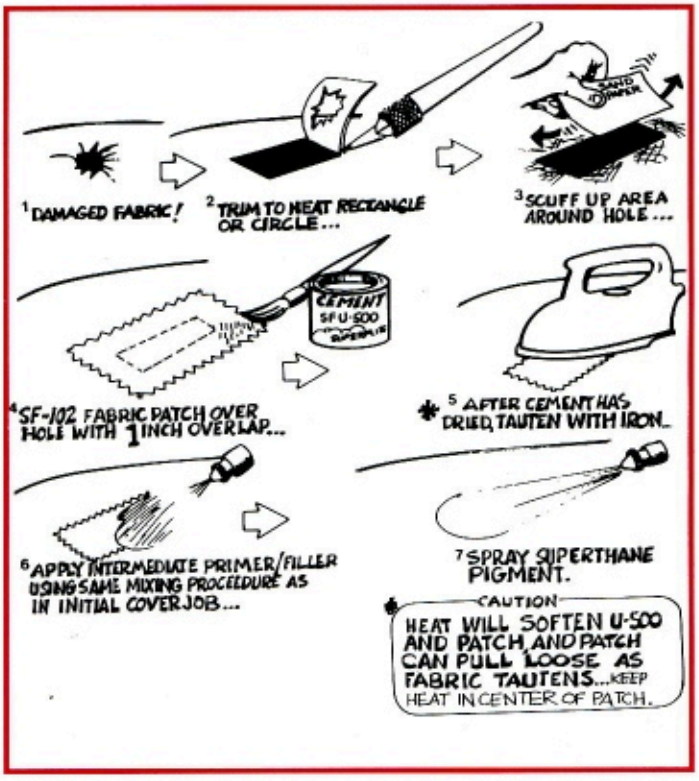
8. REPAIR PROCEDURES

Repairs to damaged fabric areas are made without the necessity of removing the finish coats. Simply trim the damaged area to a smooth circular or rectangular shape and lightly scuff sand two or three inches back from the edge in all directions. Apply a patch cut to the appropriate shape from SF-102 fabric with a one inch overlap of the hole, using SF-U-500 cement. Allow the cement to dry, tauten with the iron and apply intermediate primer/filler mixture using the same procedures as in the initial cover job. Finish color will not be melted by the new paint so the repair finish won't fade into an undefined edge. Superthane pigments are so stable that very little color change occurs with aging and the refinished area will be quite inconspicuous.

If the damaged area required a patch larger than 16" in any direction, an entire replacement panel should be installed using above procedure. If this is a wing panel, the new fabric must lap the rib on either side and be laced or ribstitched through both layers of fabric, leaving the original ribstitching in place. (Ref.AC43.13-IA,par.169.)

9. SAFETY WARNINGS

System II finish materials, as all polyurethane paint materials, contain Isocyanates. Application, particularly spraying, requires adequate ventilation of the painting area and the use of an OSHA approved respirator.



Mixing Guide

Mixing Chart for Primer/Filler

To mix 33 oz. Just over 1 qt.	Mixing Ratio	To mix 11 qts.
12 Fluid oz.	2 parts SF-250 (primer base)	1 gallon
6 Fluid oz.	1 part SF-325 (reducer)	2 quarts
6 Fluid oz.	1 part SF-450 (catalystr)	2 quarts
9 Fluid oz.	1-1/2 part SF-220 (Flex agent)	3 quarts

Always mix Reducer with Primer Base *before* adding Catalyst and Flex Agent.

Mixing Chart for Superthane Finish Color

To mix approx. 3 qts.	Mixing Ratio	To mix approx. 3 gallons
1 Quart	1 part Color (Superthane)	1 gallon
1 Quart	1 part SF-350 (catalyst)	1 gallon
2 Fluid oz.	1/16 part SF-220 (Flex Agent)	1/2 pint (8 oz.)
1 Quart	1 part SF-410 (reducer)	1 gallon

NOTE: Reducer is used only to thin the mixture to proper spraying viscosity. Quantities shown are very approximate. A viscosity cup should be used to assure proper consistency.