POLY FIBER
Aircraft Coatings

How to Cover an Aircraft Using the Poly-Fiber System

By Jon Goldenbaum

CONSOLIDATED AIRCRAFT COATINGS

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Revision Page

This manual is Revision 21, dated September 2006.

This revision is printed and permanently bound with 156 pages. Pages are not replaceable; rather, the whole manual is revised and reprinted when required.

Major sections are:

A Better Manual: pages v through vii
1. Getting Ready: pages 1 through 7
2. Airframe Prep: pages 9 through 13
3. Tune Up Your Iron: pages 15 & 16
4. Attaching the Fabric: page 17 & 18
5. Let's Do a Wing: pages 19 through 56
6. Control Surfaces and Fuselage: pages 57 through 63
7. Spraying Poly-Brush: pages 65 through 68
8. Poly-Spray UV Protection: pages 69 through 76
9. Color Coats: pages 77 through 92
10. Appendices A through I: pages 93 through 109
11. Appendix J: Product Profiles, pages 111 through 130
12. Reference Documents: pages 131 through 154

Product Descriptions

Appendix J, Product Profiles, has a complete description of all PMAed fabrics, tapes, and chemicals called for in the installation of this covering system.

Mixing instructions, shelf lives, and specific application instructions are covered in detail for each product.

We recommend that you refer to Appendix J, Product Profiles, to answer specific questions about products as you follow the installation instructions in the front text of the manual.

How To Cover An Aircraft Using the Poly-Fiber System

A Complete Manual

By Jon Goldenbaum
Poly-Fiber, Inc.

This is a step-by-step guide to covering and finishing your fabric-covered aircraft using the Poly-Fiber family of products. By following this guide, you can safely and legally cover or re-cover your amateur-built or certified aircraft like a pro.

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Many thanks to:

- Ray Stits, who invented it all
- Norm Douthit, who simplified it over twenty years
- Richard Kunc, who translated it all and created this new manual.

Concept, design, execution, and revisions by

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A Better Manual

We've all been frustrated by instruction manuals that don't instruct, so we tried very hard to create one that instructs, inspires, and entertains.

Throughout this manual you'll see some special little sections that stand apart from the main text. They will look like these:

Whenever there's an important point that needs to be discussed before going on with the job, we'll pause and take a **Coffee Break...** →

How Tight Should That Fabric Be?

Let's talk about how tightly you should be attaching the fabric. How taut you pull the fabric as you... etc etc.

Whenever we need to make a short point of information during the project, you'll see this **Note...** →

This means, "Take notice of this!"

The only authorized heat source for accurate control of the temperature transferred to fabric is a CALIBRATED CLOTHING IRON. Period.

If there's a point that's really important or that deals with basic safety, you'll see one of these **Warnings...** →

It means, "Read and heed, Jim! This is MAJOR important!"

NEVER APPLY AN IRON HOTTER THAN 250° TO A CEMENTED AREA. DOING SO COULD RELEASE THE SEAM OR THE BOND!

Meet LeRoy...

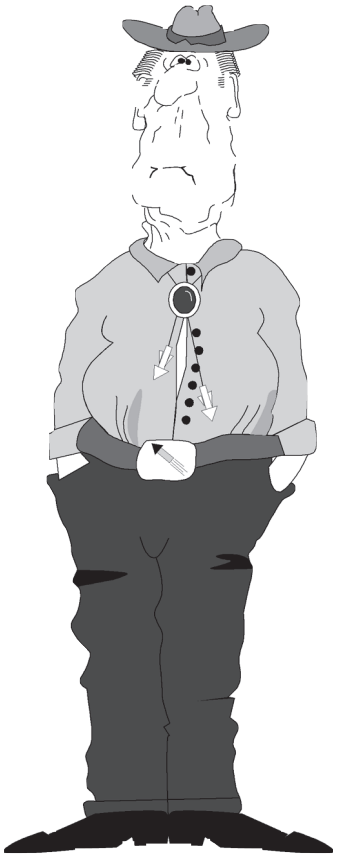
You know LeRoy. He lives someplace out near the airport, and he likes to come around and share his wisdom about covering tube and fabric airplanes. He does this with the greatest of ease, because he's an expert. Just ask him!

There's a LeRoy at just about every small airport. Why, he's been covering airplanes for *years*, and he knows all there is to know about it. He'll show you his own secret recipes and shortcuts. Shucks, it was good enough for Wilbur and Orville, and that gangly kid from Minnesota… I guess it's good enough for you. Right? **Wrong!**

You MUST follow the Basic Rules to the letter! Maybe LeRoy used to use his old blowtorch to tighten up his fabric, or maybe he liked to add a little castor oil to his cement before he slathered it on… but ***you'd better not!***

You'll see LeRoy from time to time throughout this manual. He'll show up whenever we hit a point where there have been some off-the-wall "short cuts" suggested in the past.

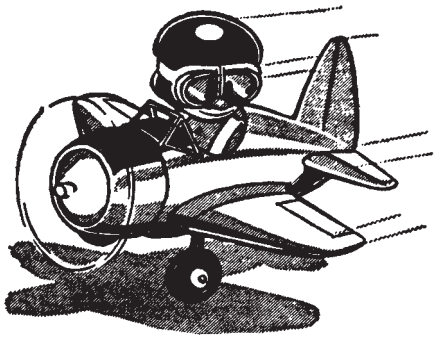
Look for LeRoy… but ***DON'T LISTEN TO HIM!***



LEROY SAYS you need to buy at least a gross of sandpaper to have a good dope and fabric job. NOT SO. You can do gorgeous work in preparing your Poly-Fiber covering job for a big trophy at Oshkosh with an iron, and skip lots of sanding.

About the Other Cartoons...

Here and there you'll see cartoons like this, rescued from pilot training manuals of World War II. For those of you who were there, we think they'll be delightfully nostalgic. For younger builders, they're a humorous glimpse into what was perhaps the richest, most patriotic part of America's past.



How to Speak "Poly"

Here's a quick "dictionary" of some of the products we'll be talking about.

POLY-TAK
This is our own special proprietary fabric cement. It's used to cement fabric together, and to cement fabric to the airframe.

POLY-BRUSH
This is our fabric sealer. It's used for closing the "pores" of bare fabric and prepare it for subsequent coatings. It's also used to attach finishing tapes.

POLY-SPRAY
Applied just before the final color paint, this silver coating protects the fabric against ultra violet (UV) rays.

POLY-TONE
Here's the final color paint. It has a nice satin-gloss finish. Used over fabric, it is easy to repair. Not the best when used over metal, but it works OK with proper preparation.

VINYL
This is the basic stuff all four products above are made from. All four are chemically compatible, meaning they won't separate over time.

MEK
The universal "fixer" solvent that cuts the four vinyl products above. It's used to "unglue" fabric-to-fabric and fabric-to-airframe bonds. It'll also remove any of the four products at any point in the process, and it's handy during repairs, too. However, it's too harsh to be used as a reducer.

R 65-75 REDUCER (Thinner)
The stuff used to thin **Poly-Brush**, **Poly-Spray**, and **Poly-Tone** at "normal" temperatures, between 65 and 75°F.

RR 8500 REDUCER
Serves the same purpose as 65-75, but works at temperatures above 85°F.

AERO-THANE
If you want a high-gloss high-tech "wet-look" finish, this is the colored paint to use. It's a two-part product that uses it's own **U-865** catalyst and **UE-820** reducer. MEK doesn't cut it. It works great over fabric and metal, but it's more difficult to repair than **Poly-Tone.**

RANDOLPH RANTHANE
Ranthane is an addition to the Poly-Fiber STC from the our sister line of Randolph Products. Like **Aero-Thane**, **Ranthane** is a two-part polyurethane, but it has it's own AU-2X1 catalyst and G-4200 reducer. It also works great over fabric, primed metal or composites.

DOPE
Not understood in polite Poly. This word does not exist in our language. There is no dope in Poly-Fiber.

EP-420 EPOXY PRIMER
This is our two-part catalyzed epoxy primer for use on steel and aluminum. It's the only consistently successful primer you can use in the Poly-Fiber system. Familiar zinc chromate and other one-part primers will peel off after contact with the Poly-Fiber products. Not a good idea.

EV-400 EPOXY VARNISH
Serves the same purpose as **EP-420** above, except this one's for wood.

BR-8600 BLUSH RETARDER
Used to slow down the drying time of our coatings to reduce the possibility of "blush" in high-humidity environments. It also makes **Poly-Tone** paint glossier.

1. Getting Ready

The Goal of This Manual

We hate to see builders shy away from fabric-covered aircraft projects because they don't think they can handle the covering and finishing. They're depriving themselves of a very satisfying experience, and for no good reason. Fabric covering is not hard to do. Today's methods and materials are huge improvements over what was available back in the '30s. All it takes today is careful work and some patience. There's no magic required. Really.

This manual can take even a complete novice through the entire process of covering a newly-constructed homebuilt or re-covering a restored classic. The steps are the same. In either case, we'll assume you're familiar with the construction of the aircraft you're covering. If you don't really know your way around your aircraft, we strongly suggest you get some experienced help before you begin.

The Poly-Fiber System

Certified Aircraft and STCs

The Poly-Fiber STC (Supplemental Type Certificate) SA1008WE allows you to replace the original covering that was on your aircraft when it rolled off the assembly line, probably Grade A cotton and cellulose dope, with the Poly-Fiber system. It does not license you to get creative and depart from this manual in any way.

In order to fly a safe and legal aircraft, you must follow these Basic Rules.

The Basic Rules

For certified aircraft, you **must** follow these rules without substitution. For experimental aircraft, we encourage you to stay with these rules for a safe cover job with proven performance.

❶ Products applied to a certified aircraft **must** have a Parts Manufacturer Approval) PMA. Poly-Fiber fabrics, tapes, cements, coatings, and paint all have PMA.

❷ You **must** use only **Poly-Tak, Poly-Brush, and Poly-Spray.** You can't use any amount of either nitrate or butyrate dope in the build-up process.

❸ You **must** use only **Poly-Tone, Aero-Thane,** or **Ranthane** topcoat paint over fabric components. **Poly-Tone, Aero-Thane,** and **Ranthane** have a PMA and have established track records over **Poly-Brush** and **Poly-Spray. Using any other topcoat paint voids the STC.**

❹ You **must** heat tighten with a **calibrated household iron** only. Heat guns may **not** be used.

❺ You must not cover critical inspection ports. For example, some aircraft have inspection ports in the aft portion of the wing, aileron, or flap wells that allow inspection of the spar. These holes must not be permanently covered. If in doubt refer to the original aircraft maintenance manual.

SUBSTITUTIONS WILL VOID THE STC AND YOUR AIRWORTHINESS CERTIFICATE IF DISCOVERED BY A SAVVY INSPECTOR AT ANY TIME DURING THE SERVICE LIFE OF YOUR AIRCRAFT. DON'T RISK IT!

When you have finished your re-cover job, an **A&P with an IA** must complete an **FAA Form 337** to certify that the aircraft was re-covered according to the Poly-Fiber STC. He must also make the appropriate entries in your logbook.

A list of the aircraft eligible for re-covering under the Poly-Fiber STC appears in the back of this book. If your certified aircraft is not included (but most have been during the 40 years the STC has been in effect), you can have it added to the **Approved Model List** on page 134 of this manual. A Poly-Fiber installation report form for adding aircraft not on the AML is included in the back of this manual on page 133. An A&P can fill this out and mail it to us for processing.

Amateur-Built Aircraft

If, on the other hand, you're covering or re-covering an **amateur-built aircraft** with an Experimental Airworthiness Certificate, our STC doesn't apply as gospel. However, it's a good idea to follow the steps in this manual just as though you were working with a certified aircraft. AC 43.13 can also serve as an excellent guide. You can get a copy of it from one of the homebuilders' supply companies.

Simply passing an airworthiness inspection is no guarantee that what you have done is safe. Don't second-guess the experts. Follow the instructions carefully and completely.

The Fabric to Use

Poly-Fiber **Heavy** and **Medium** fabrics are manufactured under our PMA and are included in our STC. Remember, you **MUST** use either our **Heavy** and/ or **Medium** fabrics to comply with the STC. Both of these fabrics are marked with a stamp like the one shown here. These stamps appear on our fabrics and are a sure-fire way to identify a genuine Stits Poly-Fiber job.

POLY-FIBER ACFT.
MEDIUM - 2
F.A.A. P.M.A.
2.6 oz./sq. yd.
Over 102 lb./in.

Our **Heavy** and **Medium** fabrics may be mixed or matched on every aircraft included on our STC.

UNCERTIFIED LIGHT is an uncertified fabric and is **not approved for certified aircraft.** It is recommended for covering plywood surfaces on any aircraft, certified or uncertified. It may be used for any uncertified ultralight. **UNCERTIFIED LIGHT** fabric is not stamped.

We publish a **Fabric Product Data Sheet** (currently 2004-1) that presents and explains test reports on all three of our fabrics. We'll be happy to recommend a fabric style to fit your airplane. Just call our Poly-Fiber Tech Support Line, 800-362-3490.

Health Issues

Protect Your Skin!

Serious allergic reaction to some chemicals can show up years after exposure to them, so protect yourself now. Start with one of the **barrier hand creams**, like Invisible Gloves, available from all the supply houses.

Then top that off with some of those **disposable latex surgical gloves**. They're cheap so you can don new ones whenever solvents begin attacking the ones you're wearing.

Protect Your Lungs & Body!

Some of the materials you will be using can do nasty things to you if you inhale them for any length of time. The first thing you should buy is **a good, effective respirator. Don't begin your project without one!**

Those paper masks won't do. You need the real thing, one rated for lacquers and enamels. Check with homebuilders' supply companies. They have respirators in their catalogs. You might even find a local source in your yellow pages. If you feel yourself getting nauseous while working with solvents, wear a respirator rated for organic solvents.

Wear a **Tyvek spraying suit**, or **old clothes** with long pants and a long-sleeve shirt. If you spill solvent on yourself, remove the clothes, wash your skin well, and put on fresh work clothes. Wash the first outfit promptly.

There's a right way and a wrong way to dress for spraying. Can you tell which is which up above?

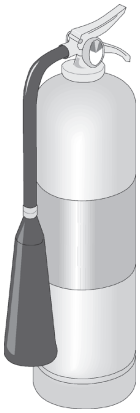
Protect Your Eyes!

At some point in your project you're bound to spill or slosh or spatter something. Wear safety **goggles** in any situation where that might occur. Don't take chances.

Fire Prevention

Work in a Well-Ventilated Area

Some of the products used in the Poly-Fiber system are **highly flammable**! While they are being used, potentially explosive vapors accumulate. Make sure there are no open flames, such as gas water heater or furnace pilot lights, anywhere near your work area. Outlaw all smoking. Lay down the law to visiting kibitzers. Be aware that even a sparking electric motor or a light switch could trigger a no-fun afternoon. Seek out all potential sources of flame or spark.



Have the right kind of **fire extinguisher** on hand, one designed for petroleum fires, and make sure it is fully charged.

Under certain circumstances, especially in warm weather with low humidity, the action of sanding or spraying can generate **static electricity**. When this static charge is transferred to the fuselage or other part, the resulting spark could ignite solvent vapors explosively. Ground the structures being sanded or sprayed. Some builders even ground their spray guns.

A Practical Work Area

Make sure you have **enough room to work.** You not only need room for the fuselage, wings, and other structures but you also need plenty of room to walk and work around them without knocking things over or backing into fresh paint. Basements are poor choices due to lack of ventilation and potential fire hazards. Not only that, but the solvent vapors will rise right up in to the house above. Garages are better. **Empty hangars are best.** Just make sure you have plenty of room and that the area is as clean as you can make it. Dust and junk floating in the air will wind up in your nice new finish, guaranteed.

Ventilation fans are very desirable. They will help with vapors, sanding dust, and spraying mist. Under no circumstance should you work in a closed room with no ventilation!

During the sanding it will occasionally be necessary to flush the surface with **water.** That means the floor of your work area should be able to stand getting wet. It also means you'll need a source of running water within hose distance.

Atmospherics and Spraying

In a perfect world, your work area would always remain at 77°F with 0% humidity, the accepted laboratory standards. Fat chance. The best tool you have for climate control is your calendar.

Temperature. Remember: the glossiness of a paint finish is determined by drying speed; the drying speed is determined by temperature. The slower paint dries, the glossier it becomes. As the temperature goes up, drying time goes down.

In a perfect world, you'd always spray at 77°. If the temperature is 87°, the drying time will be cut in half. At 97°, the drying time is even shorter. If the temperature is 67°, the drying time is doubled. At 57°, though, drying time may be endless.

Humidity. The ideal humidity for spraying is anything between 0% and 70%. Since there are lots of places that never see humidity as low as 70%, we need to look at what humidity does to coatings.

As an aircraft coating dries, the rapidly evaporating solvents lower the temperature at the surface. Any water vapor in the surrounding air condenses on the surface. If the humidity is 80% or more this condensed water vapor gives the coating a milky appearance called **blush.** It also weakens the coating. Blushed coatings MUST be wiped off with some MEK or reducer and resprayed.

If you are stuck with high humidity, you can still spray with good results by using **blush retarder.** This is a special solvent that slows down the drying of the coating, therefore minimizing the chance of blush. Face it: if you spray on a 95° day with the humidity at 99%, you're going to have problems. Period.

Use common sense when spraying. Always wait for moderate temperatures and the lowest humidity. If you live in a normally hot humid area, make sure you have lots of blush retarder on hand. Work in the cool of the early morning, or wait until a front has just blown through. Don't wet the floor in an attempt to keep dust down. You're just increasing the humidity. Sweep and vacuum the floor thoroughly before spraying, and give the dust in the air plenty of time to resettle. If you want to wash the floors, let them dry for a few days before you start spraying.

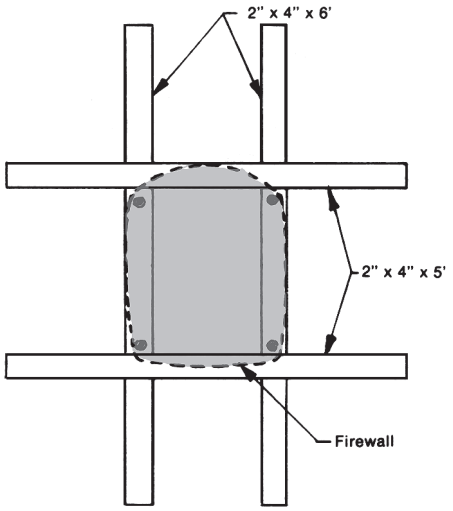
Tools You'll Need

Let's Start With an Ideal List

- Fuselage holding and turning jig. We'll talk about this in a minute.
- Sturdy sawhorses, about 3' high; pad the tops with carpet scraps; great for wings and tail surfaces. We'll go into detail about this later.
- A nice big sturdy snag-free table will make handling and cutting fabric much easier.
- Drop cloths to protect floor, cover airframe parts, etc.
- An electric clothing iron. Don't use your wife's!
- A small "sealing" iron. Great for tapes, patches, and hard-to-reach areas.
- Thermometers to calibrate irons.
- Heat sink compound.
- An effective respirator, plus extra replacement filters.
- Brushes: 1″, 2″, 3″, and 4″.
- Glue brushes, ½″ wide (acid brushes are good).
- Sandpaper: 400-grit wet or dry.
- Two 12″ straight and two 12″ curved rib lacing needles.
- Sharp scissors; polyester fabric dulls them quickly, so buy several pairs of cheap ones.
- Pinking shears. Buy a good pair and wear them on a cord around your neck while using them; if you drop them, they're ruined.
- Sharp X-ACTO or other knife.
- Paint spray gun and accessories.
- Cotton rags. Do NOT use shop rags; they aren't clean enough and residual silicon will ruin your work.
- Paper towels.
- Scotch-Brite pads, ultra fine.
- Single-edge razor blades. Big box.
- Chalk snap line.
- Measuring tape.
- Paint stirring paddles.
- Paint filter cones, 60x48 mesh.
- Soup ladle.
- Lots of clean soup and coffee cans with tight lids.
- Small wide-neck container to use as a glue pot.
- Craft masking paper (don't use newspaper).
- Six spring clamps with 2″ throats - for holding fabric.
- Wooden spring clothespins. Great for fabric work.
- T-head pins.
- Tack cloths - for cleaning just before painting.

Fuselage Holding & Turning Jig

You can make a simple jig from two-by-fours, as shown here. The center square of the two-by-four "tic-tac-toe" grid bolts to the front of the fuselage using the engine mount bolt locations. Make the legs long enough for the fuselage to sit level with the tail resting on one of your sawhorses. You and your helper can then turn the fuselage whenever needed.



About Spray Guns

Don't skimp here! After all your careful and patient preparation, this is where "the rubber meets the road." You can ruin your entire job by trying to pinch pennies and using "bargain" spraying equipment. Don't do it. You'll hate yourself.

Most spraying is done with a compressed air system capable of at least 40 pounds of pressure AT THE GUN. Measurements taken at the compressor tend to be higher than the actual pressure delivered at the gun itself. Don't get fooled.

If you use a compressed air system:

- You must have filters and a water trap on the air line.
- Cleanliness is everything. The spray gun must be disassembled and thoroughly cleaned after EACH USE. Borrowed guns are never clean enough, and rented guns are usually junk.
- Pressure pot lines become coated inside with whatever's been sprayed. Solvents in subsequent spraying can loosen this old material which then contaminates your job. Replace pressure pot lines often.

The newer turbine-powered high-volume, low-pressure (HVLP) sprayers are terrific. They're expensive, but well worth it. Consider buying one with a few friends or have your club or chapter buy one for everyone to use. When you factor in the cost of the compressor, tank, lines, filters, water traps, and standard guns of a compressed air system, the cost of an HVLP isn't really that high at all. And the HVLP systems are self contained, more or less turnkey. All you need is 110 volts.

Use two lengths of hose with turbine-powered HVLP systems. HVLPs heat the air delivered to the gun, sometimes up to 90°. The extra length of hose solves this problem.

Regardless of the system you use, use the needle, aircap, and nozzle combination recommended by the manufacturer for the type of paint you're spraying. You'll need one combination for **Poly-Brush**, **Poly-Spray**, and **Poly-Tone,** and probably a smaller one for enamel and urethanes. Be sure to read the instruction very carefully.

Sorry, but those inexpensive airless sprayers designed for latex house paint won't work for aircraft.

Materials You'll Need

We'll use a J-3 Cub as our example. Naturally, your list depends upon what you're covering, and you can scale things up or down as needed. Here's our list.

- 45 yards of Poly-Fiber Med-2 fabric
- 1 roll of 1″ Med-2 finishing tape
- 7 rolls of 2″ Med-2 finishing tape
- 2 rolls of 3″ Med-2 finishing tape
- 1 roll of 4″ Med-2 finishing tape
- 1 roll of 4″ Bias finishing tape
- 1 roll of rib lacing cord
- 2 rolls of ½″ reinforcing tape
- 2 rolls of inter-rib brace tape
- 1 roll of cloth anti-chafe tape
- 100 plastic drain grommets
- 30 inspection rings

- 30 inspection ring covers
- 1 gallon **Poly-Tak**
- 10 gallons **Poly-Brush**
- 11 gallons **Poly-Spray**
- 6 gallons Reducer
- 10 gallons **Poly-Tone** color

Other Things You Should Know

There's No Dope in Poly-Fiber!

The term "dope" refers to cellulose-based coatings, and goes back to the earliest days of aviation. Nitrate dope was first used, then was gradually replaced by butyrate dope during World War II. Because butyrate was somewhat less flammable than nitrate, it soon became the predominant product used over Grade A Cotton and Irish Linen.

Heat-tightened polyester fabric was introduced in the late '50s. This fabric was a big time saver when it was glued rather than sewn to airframes before tightening. Ceconite soon became the predominant polyester covering system, and flammable nitrate dope was resurrected as an initial coat over the slick polyester fabric. Butyrate dope would not stick to raw Ceconite, so a combination system of nitrate/butyrate dope with Ceconite was introduced in the '60s, and remains unchanged today.

By the early '60s, Ray Stits had designed, produced, and kitted 16 original sport aircraft. He'd used nitrate and butyrate dope most of his professional life, even though he knew they had serious drawbacks when used with either cotton or Ceconite:

- Dope burned readily.
- Dope shrank over the years, even "non-tautening" dope.
- As dope shrank, it delaminated from polyester fabric and deformed lightweight structures.
- Dope could become brittle, crack, and "ringworm" within years.
- Dope was extremely sensitive to humidity in application.

In 1965, Ray introduced a whole new process that started with his own specially-designed polyester fabrics. The Stits Poly-Fiber system was similar to the nitrate/butyrate/Ceconite system in the initial step of cementing rather than sewing of fabric to the airframe. However, there the similarities ended.

In fact, there is **no dope** in Ray's system. All the liquid products in the Poly-Fiber system are made from **vinyl**, not from cellulose dope. All the reducers and other coatings are also from the same chemical family, so they all "melt" together.

Chemical fire suppressors have been introduced to insure that the system does not support combustion.

Vinyl has real advantages over dope:

- Poly-Fiber vinyl coatings never shrink or make fabric get tighter.
- They remain flexible, similar to the vinyl on the dashboard of your car.
- They don't support combustion.
- The are easily removed from the fabric with MEK, which makes repairs a snap.

The Poly-Fiber system was awarded its STC in 1965. Forty years of service experience have proven its ease of application and longevity.

Notes

2. Airframe Preparation

Removing Old Fabric

Old fabric should be removed with care. Use razor blades or an Exacto knife to cut the old fabric away, and if necessary, soak cemented areas with MEK to loosen the old cement. Take care not to splash MEK into your eyes or onto your skin; wear protective equipment and goggles. Cut old rib laces before pulling fabric from ribs. If rib rivets are installed, carefully drill them out, insuring that the drill does not slip and damage ribs. If Martin or Cessna fabric clips were used, do not rip the fabric off of the ribs without releasing the clips, or severe damage can result to thin aluminum cap strips. Note positions of inspection rings, fairleads, and drain grommets. A photographic record of the old installed fabric is always helpful.

Take Your Time

The hours you spend preparing for the minutes you'll spend spraying will bring you years of enjoyment. Keep that in mind. There is no shortcut to thorough, meticulous preparation.

The Right Stuff: Epoxy

Whether you're preparing a steel, aluminum, or wood structure, do not use any of the familiar one-part zinc chromate primers or "spar" varnishes, the type you find in hardware stores. The fabric cements and dopes used in covering aircraft will wrinkle and lift them. Use only two-part epoxy primers or varnishes. They are unaffected by cements and dopes. Two-part epoxy products may also be sprayed right over old zinc chromate or varnish for a safe attachment surface and additional protection from the elements.

Wood Surfaces

Dry-sand old flaking varnish scale. You needn't remove all the old varnish, just the loose parts. After sanding, wipe the surface with **Poly-Fiber C-2210 Paint Cleaning Solvent** to remove any grease and contamination. Then wipe with a clean dry rag.

Now apply **Poly-Fiber EV-400 Epoxy Varnish** directly to the surface. Use our **EV-410 Catalyst**, and thin as instructed with **E-500 Epoxy Reducer**.

Steel Tubing

If you are re-covering a tube-and-rag airplane, you must first remove ALL the old fabric. Once you do that, you'll be presented with tubing structures loaded with old primer and cement. There may also be some rust.

If the rust is extensive, you are probably facing some metal repair. Examine the structure carefully, marking areas that will need fixing. Make all needed structural repairs now, replacing damaged tubing or other members in accordance with accepted standards and practices.

Now you must remove the old cement, paint, primer, and rust WITHOUT pitting or damaging good metal under it. The best way to do this is by blasting it with one of the many media available. Test a painted tubing scrap first. Find the combination of air pressure and media that will remove the paint and leave everything else.

Once the structure has been repaired and stripped, the metal must be protected as soon as possible. Letting more than an hour or two go by between blasting and priming invites new rust to begin forming. Be sure to have everything you need – cleaner, primer, catalyst, reducer, spray equipment, and spraying area ready to spray – BEFORE you start blasting.

Immediately before priming, wipe the bare areas with **Poly-Fiber C-2200 Metal Surface Cleaner** to remove all traces of oil, grease, and contamination. Wipe dry with a clean rag, NOT with a shop towel.

Finally, prime with **Poly-Fiber EP-420 Epoxy Primer**. Use **EP-430 Catalyst**, and thin according to the directions with **E-500 Epoxy Reducer**.

If the metal is in good shape, just deal with the few spots of rust and let it go at that. If the areas are small, you can remove them with dry sandpaper and elbow grease. You need not remove all the old paint and/or primer from the rest of the structure.

Just before priming, wipe the entire structure with **Poly-Fiber C-2200 Metal Surface Cleaner** to remove all traces of oil, grease, and contamination. Wipe dry with a clean rag.

Finally, prime with **Poly-Fiber EP-420 Epoxy Primer**. Use **EP-430 Catalyst**, and thin according to the directions with **E-500 Epoxy Reducer**. This two-part epoxy primer will encapsulate any old paint and primer, giving you a safe, sound surface to which new coatings will safely adhere.

Fiberglass

Many fiberglass parts are pretty rough. Fill big holes or seams with **SuperFil**, our epoxy filler. Sand until smooth with 180-grit sandpaper. Fill pinholes with our **UV Smooth Prime**. Apply in light coats with a fine cell foam roller, or spray it on. Dry sand with 320-grit until smooth.

Once the **UV Smooth Prime** has dried for 4 days, spray our white **EP-420 Epoxy Primer** to seal the surface. **Poly-Tone** or **Aero-Thane** can then be sprayed over the primer. If you are using **Poly-Tone**, spray it directly into the tacky **EP-420** for best adhesion. See the section on **Painting Poly-Tone** for more on this.

Aluminum

Old Aluminum

After stripping, inspect carefully for corrosion. If there is any corrosion present, it *all* must be removed before you go any further. Use fine sandpaper (not emery), Scotch-Brite pads, or aluminum wool. Do NOT use steel wool or a steel brush! These just introduce tiny bits of steel into the aluminum which will promote even worse corrosion. Avoid blasting. It is very hard on aluminum sheet.

Old aluminum must now be acid etched, treated with a conversion coating, and then primed for best results.

Thoroughly wash all the aluminum parts with **E-2310 Phosphoric Acid Etch and Brightener,** diluted with two parts water. Use an ultra-fine Scotch-Brite pad.

Rinse thoroughly with clean water to insure that no etch is trapped in seams or under rivet heads. For best results, blow seams dry with compressed shop air nozzle.

Next wash with **E-2300 Conversion Coating,** diluted with two parts water. Wash and keep wet with a sponge for at least five minutes. Rinse with clean water and allow to dry completely.

Prime with epoxy primer. We recommend using **EP-420** White Epoxy Primer over aluminum. Remember that there are three components to our epoxy primer systems; you must also have **EP-430** Catalyst and **E-500** Epoxy Reducer to get the job done. See a complete explanation of epoxy primer in our Product Profiles section at the end of this manual.

New Aluminum

There is no need to use **Phosphoric Acid Etch** on new aluminum. First wipe the new aluminum surface with MEK, Acetone, or Toluene to remove packing oils. If the new aluminum has an Alclad surface, gently scuff the entire surface with an ultrafine Scotch-Brite pad or 320-grit sandpaper to impart some tooth adhesion. Be careful not to leave any noticable scratches in the Alclad, go easy.

Next wash with **E-2300 Conversion Coating,** diluted with two parts water. Wash and keep wet with a sponge for at least five minutes. Rinse with clean water and allow to dry completely.

Prime with epoxy primer. See the directions in the paragraph above on **Old Aluminum.**

Dealing With Dents and Imperfections

Nothing looks worse than a new covering job with dents and old damage showing through. Maybe you taxied into a hangar door, or a hail storm tattooed your airplane, or maybe there are some low spots in those plywood fairings. Take the time now to smooth or correct them. Once the new fabric is installed, it's too late. Here are some suggestions.

Replace Badly Damaged Areas

If the damage is severe or extensive, you might be better off just biting the bullet and replacing the material. The time you take installing nice smooth new aluminum or plywood will pay for itself later in the praise your airplane will get from jealous onlookers.

Fill With Poly-Fiber's *SuperFil*

SuperFil works great on wood, fiberglass, steel, and aluminum. It really grips the surfaces, and stays flexible enough over its service life to keep from cracking. **DON'T USE BONDO!** Bondo is heavy! Bondo will shrink over time and separate from the surface. Bad news. And Bondo is made from polyester. You need **epoxy** products.

Apply **SuperFil** with a squeegee, and

work it into the basic shape you want. After 12 hours, **SuperFil** will be ready to sand and smooth. Apply primer to **SuperFil** used on aluminum; apply varnish to **SuperFil** used on wood.

Make a point of reading the **SuperFil** instructions. Remember to thoroughly stir each of the two parts before mixing them. Mix them carefully, by either weight or volume. "TLAR" mixing ("That Looks About Right") doesn't fly when you're working with epoxy.

Use Polyester Padding

Poly-Fiber polyester padding is a special thick "cloth" that hides minor dents and glitches. It is most commonly used on wing leading edges, and is sandwiched between the leading edge aluminum or plywood and the Poly-Fiber fabric itself. The padding fills the dents and levels the surface.

There are a few drawbacks. Padding can collect **Poly-Brush** in areas where it tends to pool with gravity. The result is a permanent mottled effect. Also, you must not construct any cemented seams over padding. We'll get into cemented seams a little later. If you use leading edge padding, you must use a sewn seam over it, or use an envelope. More about these later.

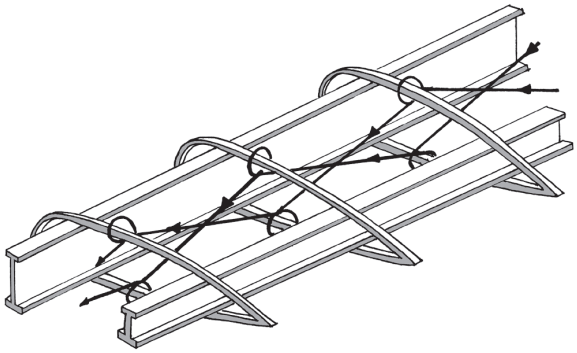
Only Poly-Fiber polyester padding is compatible with the Poly-Fiber system. Don't substitute felt or some cheap padding purchased from a fabric store. Many non-Poly-Fiber paddings will melt or produce strange results when they come into contact with **Poly-Tak** and **Poly-Brush.** You don't need this.

Cement the padding around the perimeter of the leading edge fairing with **Poly-Tak.** Then cover the rest of the wing normally.

Inter-Rib Bracing

This bracing keeps the ribs straight up and down when the fabric is heat tightened over them. It is nothing more than twill tape to provide stability for the ribs while covering. As the drawing shows, the tape is looped around the top capstrip of the first rib halfway between the front and rear spars. Then it loops the bottom capstrip of the next rib, and then back to the top capstrip of the next rib, and so on until the whole wing is braced.

When complete, the inter-rib brace looks



like a series of "Xs" in each rib bay. It is important to only loop the inter-rib bracing without tying it to each rib, except at the very ends. If you tie it, the ribs won't be able to move and readjust their positions during the tightening process. This bracing is not removed.

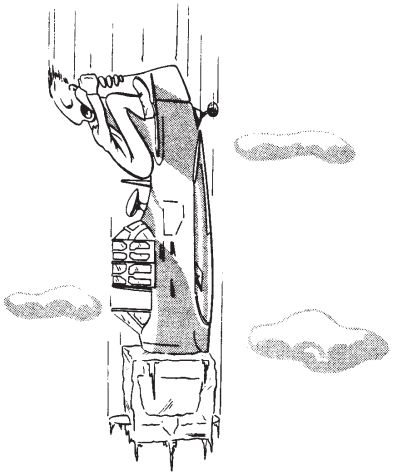
Anti-Chafe Tape

Any sharp edge or structural feature that might cut or poke through the fabric should be covered with cloth sticky-back anti-chafe tape. It is self adhesive and easy to use.

There's no hard and fast rule about where to put the tape. Obviously, it should go over rivet heads, metal seams, and sharp edges that could cut the fabric. You don't need it over smooth ribs or well-prepared wood or aluminum. Let your sense of touch be your guide. If you feel something sharp or pointy, put some tape on it.

CAUTION: Don't go crazy with anti-chafe tape and make your airplane look like the mummy's revenge. Keep tape off places where you need a good **Poly-Tak** bond. Wherever you cement something to anti-chafe tape, the bond is only as strong as the sticky adhesive on the underside of the tape!

NEVER use paper masking tape, duct tape, or aluminum-faced tape instead of genuine Poly-Fiber anti-chafe tape. All of these retain water and will bring about rust or corrosion on metal under them. Also, paper masking tape turns brown with age, and will show through light-colored paint. **Very ugly!**



Notes

3. Tune Up Your Iron!

From this point on you will be using your iron to install fabric and smooth out any wrinkles that appear. Now's the time to prepare your iron for use.

The only authorized heat source for accurate control of the temperature transferred to fabric is a CALIBRATED CLOTHING IRON. Period.

Heat Guns? No!

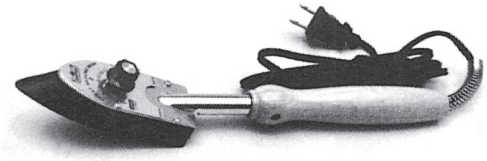
How come you can't use your heat gun? Because there's no way to calibrate it, and the temperature changes as the gun's distance from the fabric changes. You run a tremendous risk of permanently loosening your fabric and ruining all your nice work. Leave the heat gun for removing paint and for emergency corn popping.

The Right Iron

Avoid Any Iron With an Automatic Shutoff!

Understand that individual irons vary. It helps if your iron is rated at 1100 watts or higher.

There may be some non-load carrying areas that can't be reached with a standard size iron, places where exact fabric tension is not important as long as the wrinkles are removed. For these areas we recommend a small **165-watt heat sealing iron**.



It's available through Poly-Fiber distributors. It should be calibrated the same as your large iron and used only to smooth the edges of trim tapes and patches and in areas not subjected to flight loads because these little irons can't maintain their temperature in contact with a large heat sink area.

Why Calibrating Your Iron Is So Important

Polyester fabric does different things at different temperatures, and we take advantage of this to make the fabric do what we want when we want it.

- **225°** is used to smooth the edges of finishing tapes and patches, heat form fabric around corners, and remove fold creases.
- **250°** is used for the initial tightening and to smooth wrinkles from seams before final heat tightening.
- **350°** is for the final tightening.
- **Above 350° the fabric gets looser, permanently looser!**

At about **375°** polyester filaments start to thermo-soften and lose all measurable tension. At **415°** they start to disintegrate. Not good at all. You can see why calibration is so important. **Don't just guess or assume your iron's dial is accurate.**

How to Calibrate Your Iron Correctly

You need an accurate thermometer with a stem that can be placed in contact with the plate of your iron, plus some **silicone heat sink compound**, available from Poly-Fiber distributors.

An accurately calibrated low-cost glass thermometer is available through Poly-Fiber distributors. A deep fry, candy and jelly thermometer, available at hardware stores, is another economical choice.

Remove the protective glass shell, check the calibration in boiling water (212° at sea level), then secure the calibration card with cement.

- ❒ Put a nice big glob of **heat sink compound** on the bulb end of your thermometer.
- ❒ Build a ½″-thick stack of **dry paper towels** on your workbench.
- ❒ Lay the **thermometer bulb** in the **center of the paper towels.** Place your **iron on top of the thermometer bulb** and the towels. **Make sure the bulb is in contact with the plate of the iron.**
- ❒ Advance your iron's heat control knob and watch the thermometer. Give your iron time to change temperature, and give the thermometer time to react.

- ❒ When the thermometer has settled down at **225°,** mark your iron's dial. Use something visible and removable. You'll probably have to change your calibration marks at some future time.
- ❒ Now do **250° and 350°**.

Your iron should hold the desired temperatures, ±10°. It should be recalibrated at the start of each new covering project or if it is dropped.

Always use the same extension cord.

SUPER IMPORTANT!

After calibrating is finished and your iron has cooled, carefully remove all traces of silicone heat sink compound from the sole of your iron!

The latest and quickest (although more costly) way to calibrate your iron is with a temperature sensing gun, available through Poly-Fiber distributors. You simply point the laser beam at the sole plate of the iron for a quick and accurate reading of the iron's temperature. Then record 225°, 250°, and 350° temperatures on the tape-covered dial.

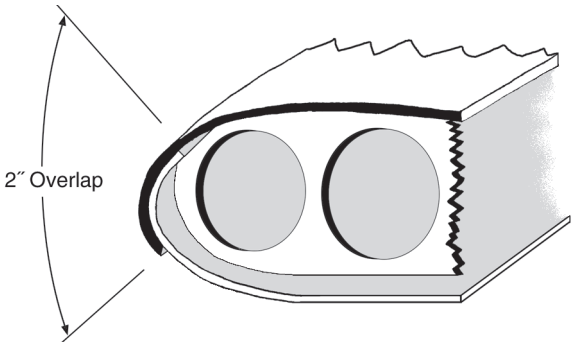
4. Attaching the Fabric

Cemented Seams

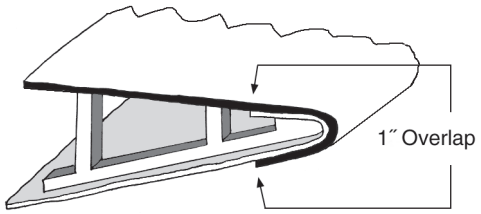
Our fabric is attached with **Poly-Tak** cement, using **cemented seams**. A cemented seam is a place where **Poly-Tak** is used to join two pieces of fabric where they contact an airframe structure, as when covering a wing, for example. There is virtually no sewing to do, unless you want to.

In our STC, cemented seams are approved for any airspeed and any wing loading if you follow these rules:

- All seams require *at least* a 1″ overlap of the two pieces of fabric.
- Wing leading edge seams require a 2″ fabric overlap.



- Wing trailing edge seams require a 1″ fabric overlap.



NOTE: The structure over which these seams are created has been left out of the illustrations to make them easier to understand.

- All cemented seams must be covered with a finishing tape at least 2″ wide. You can use wider.
- All cemented seams must lie over a structural part of the airplane, and that structural part must be at least as wide as the cemented seam.

So what's a structural part of the airplane? On wings, it's the leading edge, trailing edge, the tip bow, and the butt rib. Ribs are not considered structural.

On control surfaces, it's leading and trailing edge or the perimeter tubing.

On fuselages, it's the longerons or main cross tubes that are part of the load-bearing structure. Wooden formers or stringers that are there just to give shape aren't considered structure.

All fabric edges that will overlap as part of a cemented seam should be cut with STRAIGHT SCISSORS.

Here's a great way to make a sharp cut with no loose thread or ravels:

1. Draw your cut line with a #2 lead pencil.
2. Coat the line with a thin coat of **Poly-Tak Cement.**
3. When dry, cut with straight scissors.
4. Voila! A crisp, sharp cut!

The Cementing Process

Use a soup can for the **Poly-Tak** with a 1″ wide gluing brush. If the **Poly-Tak** gets thick in the soup can, add pure MEK to get it back to the original consistency. If you spill or have a messy area with excess ooze or drips, clean it up with MEK. MEK will clean up even dried **Poly-Tak**.

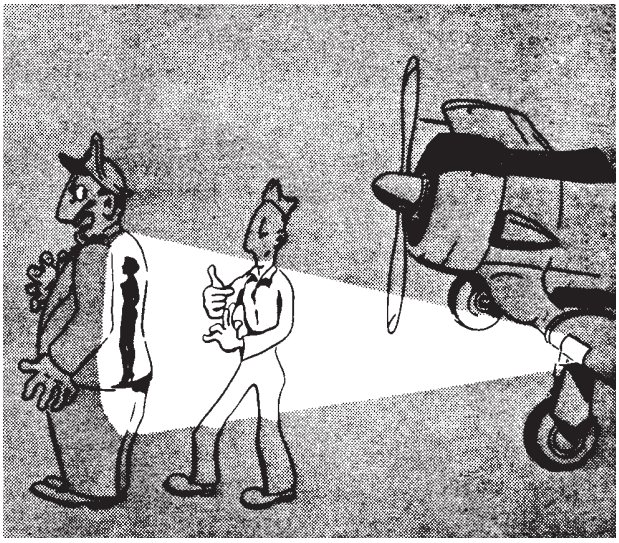
Poly-Tak cement dries fast… *real* fast. In hot weather it can dry in five minutes. It normally dries in about 15 to 20 minutes.

Because **Poly-Tak** dries so fast, you have to brush it on a little at a time, then stop and press the fabric into it while it's still wet. Normally, you only cement about 12″ to 18″ at a time to keep it from drying. The trick is to keep the cement liquid when the fabric is placed into it. If it dries, that's no good. You must do it again.

The best cement bond is accomplished by brushing about a 1″ wide strip of wet **Poly-Tak** onto the area where fabric is to be attached, then immediately laying the fabric wrinkle-free into the cement. Force the cement up through the fabric until it wets out the surface. Use your fingers (you *do* have on your barrier cream or latex gloves, don't you?) to smooth the fabric into the wet strip of cement, making sure it penetrates the fabric.

If you make a mistake, you can uncement any seam. Simply wet the seam with MEK on a rag, pull the seam apart, and immediately re-cement it correctly with fresh **Poly-Tak**. You can't make a mistake here that MEK can't fix.

Don't brush more Poly-Tak over the top surface of a drying cemented seam. Resist this temptation! Doing so could hurt the bond. The top coat will dry before the original bottom coat, impeding drying of the bottom.



Before setting out on a night flight, check your airplane's lighting system.

5. Let's Do a Wing!

You're going to cover a wing from start to finish, right up to where you're ready to begin building up the final coating. Once you understand the steps involved, you'll be ready to tackle the rest of the airplane.

Basically, the steps are...

1. Cement the new fabric to the wing.
2. Heat-tighten the fabric in stages.
3. Brush on the 1st coat of **Poly-Brush**.
4. Rib-lace the fabric to the wing.
5. Apply finishing tapes and inspection rings.
6. Smooth rough tapes and imperfections with the iron.

All the prep work discussed earlier, priming, varnishing, inter-rib bracing, anti-chafe tape, etc., is done, right?

If you have control cables installed, or electrical wire for lights, pull them all normally taut and secure them that way with clamps or tape or whatever.

You'll use the **blanket** method to cover this wing. A blanket is simply a rolled-out length of fabric cemented to the wing. Poly-Fiber **Heavy and Medium** fabrics are about 70″ wide, so they can easily cover almost any normal wing. If you have an unusually wide chord, **two pieces of fabric can be sewn together** to make a wider blanket. Or you might be able to use three pieces of fabric with an insert, as long as you follow the basic rules for cemented seams. If you think you'll need to sew fabric together, see the appendix on sewn seams.

Handy Sawhorses

The best way to hold the wings for covering is to rest them upon specially modified **sawhorses**. Two pieces of wood, typically 2-by-4s long enough to reach across at least two ribs, are fastened perpendicular to the top beam of each sawhorse. Space them the same distance apart as the spars.

Cover the whole shebang with scrap carpet. Position the sawhorses beneath the wing, with the padded pieces parallel to the spars and directly under them.

Covering the Wing, Step by Step

The game plan for this wing is simple. You'll use **one long piece of fabric** applied spanwise to cover the bottom of the wing, and another for the top.

Following our basic rules on cemented seams, you'll join the top and bottom pieces with a 2″ overlap at the leading edge, and 1″ overlaps at the trailing edge, tip bow, and butt rib. You won't cement fabric to the ribs themselves, since later you'll use rib lacing or some

other mechanical means to hold the fabric to the ribs. Other common mechanical attachments are pop rivets, PK screws, and fabric clips. More about them later.

We're assuming your wing has an essentially flat bottom surface. However, if it's concave, you MUST instead go to Appendix C, "Concave-Bottom Wings."

You'll start with the bottom of the wing first, although it doesn't matter.

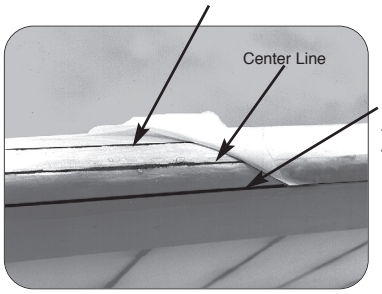
First, the Leading Edge

❒ Mix up some thinned **Poly-Brush**. The recipe is **3 parts Poly-Brush to 1 part Poly-Fiber Reducer**.

❒ Brush **two coats** of this thinned **Poly-Brush** onto the leading edge to provide a "bedding" that will help adhesion and reduce the possibility of pinholes in the finish coat. Actually, all large metal, wood, or fiberglass parts that will be covered with fabric should get these two coats of **Poly-Brush**.

❒ Let this dry for about 15 minutes.

❒ Get out your chalk line and snap a line along the center of the leading edge. Then measure 1″ above the center line and 1″ below that center line and snap parallel lines at those marks. By the way, regular blue carpenter's chalk lines will disappear later and won't bleed through. These chalk lines will be your guide lines. Cement bottom fabric to this line.



Cement the top fabric to this line. If you use these lines when cementing, you are assured of straight seams with a legal 2″ overlap.

❒ Roll out a piece of fabric to cover the bottom of the wing. Trim off any selvage (built-up edges where threads are doubled over during looming). They may show through the finishing tape. Trim it off carefully with sharp **straight scissors.** Take care to make a straight, clean cut with no raveled threads. Flaws and ravels will show through later. If the selvage is straight and is not noticeably raised, you may choose to leave it on.

The fabric has no top or bottom. There's no special orientation to the weave. Attach it with the stamp in or out. Doesn't matter.

Scallops

Scallops are troughs that form between the ribs, more so with modern polyester fabrics than classic Grade A Cotton. Although they present no aerodynamic problems, for cosmetic reasons, some prefer fabric that is more level to the ribs with little scalloping. To avoid scallops:

1. Use Poly-Fiber **Medium** fabric; its weave pattern results in little or no scalloping.

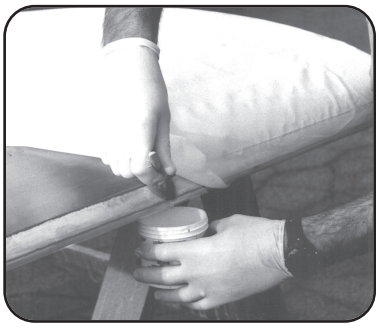
2. If you use Poly-Fiber **Heavy Duty** fabric, consider purchasing a pre-sewn wing envelope with the seams running chord-wise. This chord-wise orientation also prevents scalloping.

However, you can always use **heavy duty** fabric with the blanket method; the aircraft will fly the same, it will just show a bit deeper trough between wing ribs.

OK... back to work.

❒ Allow about an extra foot at the wing-tip and the butt, and cut it off the roll. Clamp it in place with spring clamps or clothespins. Don't be afraid to remove the clothespins and move the fabric as necessary throughout the cementing process.

❒ Starting at the butt rib, brush a strip of **Poly-Tak** about 2″ wide (1″ each side of the center line) and 12″ to 24″ long along the leading edge where the fabric will be attached. Line up the fabric edge with the appropriate cement line.



❒ Lay the fabric onto the wet cement. Work the fabric into the cement with your fingertips or the brush to force the cement up through the weave. Work in short sections, applying tension to the fabric as necessary to keep the wrinkles out. Think ahead though. Make sure the whole piece of fabric is aligned and lying where you want it to be. Stop every now and then and look at the whole job. If you're unhappy with an area, un-cement it with MEK and do it again.

❒ Continue this process, working 12″ to 24″ at a time, until the entire bottom section of fabric is attached to the leading edge. Let this dry for about 15 minutes.

How Tight Should That Fabric Be?

Let's talk about how tightly you should be attaching the fabric. How taut you pull the fabric as you cement it at the trailing edge has a big effect on the final tension of the fabric when it is eventually tightened with the iron. Final tightening will shrink the fabric about 10%.

On a wing 60″ wide, that means it will shrink about 6″. If for some reason you left 6″ of slack in the fabric (and you certainly wouldn't want to do that) the fabric would pull up and conform to the shape of the wing, but would be far too loose.

On the other hand, if you pull the fabric as tight as a bedsheet in boot camp (remember bouncing a quarter off it?) and cement it down, and then tighten it, the resulting tension can warp or bend light structures. Stamped ribs or thin tubing can be deformed when the fabric is applied too tight.

As a good rule of thumb, the fabric should look like a bed sheet with the big wrinkles pulled out of it... snug, but not tight.

OK... back to work.

Uh Oh... Protrusions!

Strut fittings and other attachment points can work like tent poles under the fabric. If the protrusions are less than 2″ above the surface of the wing, you don't need to cut the fabric to make a hole for the protrusion before heat tightening. Leave the fabric intact and tighten it right around the protrusion. Don't worry, they won't rip through. More on this later.

If they are 2″ or more, you'll have to make a cut to let the protrusion through. Brush some **Poly-Brush** over the area of the protrusion before you cut to keep the fabric from raveling around the cut. Make the smallest possible cut you can. Make sure the fabric is as close to it's final position as you can before you cut anything. When you tighten the fabric, the hole will get a lot bigger, so take care.

Next, the Trailing Edge

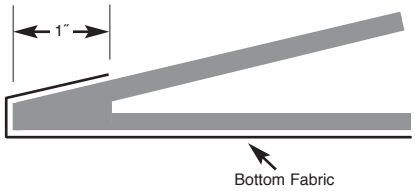
❒ Pull the bottom fabric gently toward the trailing edge to remove wrinkles. Rough-trim it to overhang 6″ minimum, and secure it with spring clamps. Rough-trim the fabric so it will fold at least 1″ down into any control surface recesses. Industrial single-edge razor blades are good for this. Inside corners of flap and aileron recesses are cut at a 45° angle to allow the fabric to fold down at the sides.

❒ Cement the fabric to the BOTTOM surface of the trailing edge ONLY. Work from the butt rib to the wingtip in short sections, keeping the wrinkles out just as you did on the leading edge.

Now, before cementing the fabric to the TOP surface of the trailing edge, you're going to heat-form the fabric around it. It's much simpler to pre-shape the fabric than to use clothespins, spring clamps or fingers to hold it in shape around the edge of the trailing edge while the **Poly-Tak** dries.

Warm up the iron to 225°. You DID calibrate it, didn't you? It's VERY important!

❒ With your iron, roll the fabric around the trailing edge, working from the bottom surface around to the top. Apply pressure so it permanently creases and takes the shape of the trailing edge. If you stay with it, the fabric will not only crease around the corner, but will lay flat on the top surface of the trailing edge without using clamps. It should end up like this:



The reason you are wrapping the fabric entirely around the trailing edge is to make sure you wind up with a real overlapped cemented seam. Later, when you attach the top fabric, it will overlay this bottom fabric.

That's where the required overlap comes in. If you simply trimmed the fabric flush with the trailing edge and then cemented it down, you would have no fabric-to-fabric overlap.

REMEMBER, you must always have an overlap.

❒ Once the fabric has been heat-formed to assume the shape of the trailing edge, cement it down and trim it off. Take care trimming. Uneven lines or raveled threads will show later.

Now for the Butt Rib

❒ With the wing **still top side up**, start heat-forming (**225 to 250°** iron) the extra fabric at the butt rib. You want to cover the entire butt rib with fabric. Heat-form carefully to make the fabric bend around the corners and edges to assume the shape of the rib.

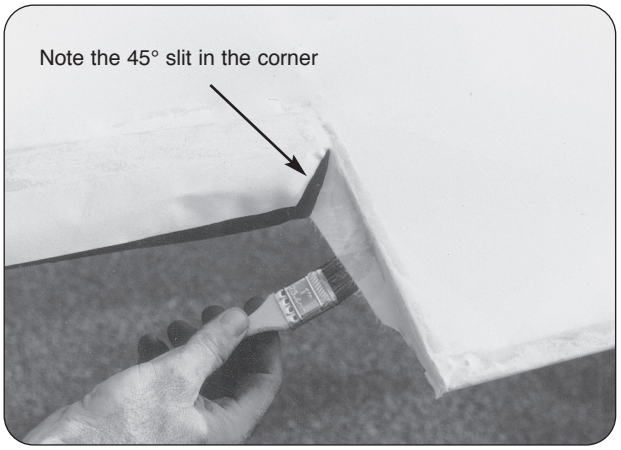
Heat-forming is best done by pulling the dickens out of the fabric (you can't tear it) and applying heat with the iron on the area to be formed. Stay with it; you can make the fabric take any shape you wish with enough practice and patience. Heat forming gets rid of all potential wrinkles and keeps you from having to cut "darts" in the fabric. Darts are those ugly 45° slits we used to have to cut in cotton to make the fabric conform to curves. With pressure and patience, you can even form polyester fabric around a bowling ball with no wrinkles. True.

❒ When you've successfully formed the fabric, cement it to the butt rib. You may need to make some cuts for cables or wires.

Never mark on fabric with anything but a soft lead pencil or a chalk line. Pens, magic markers, etc. will bleed right through your final paint.
V E R B O T E N !

❒ Trim the fabric even with the top edge of the butt rib. Later you will heat-form at least an inch of the top wing fabric around the corner and down onto the butt rib to make our 1″overlap.

Aileron and Flap Recesses



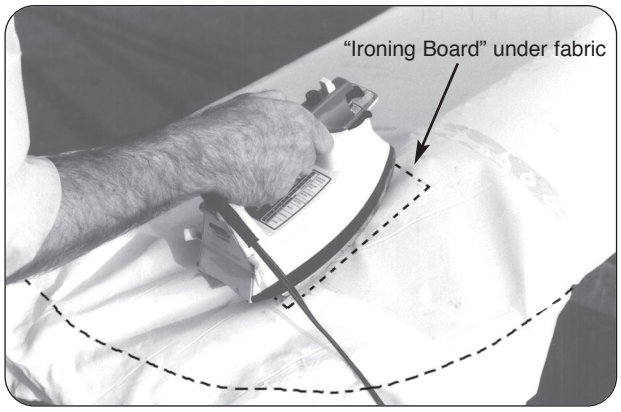
❒ For aileron and flap recesses, heat-form the fabric into the recess and cement it securely. Put your fabric overlap inside the recess as shown.

The Curved Wingtip Bows

You should have plenty of excess fabric left at the wingtip, hopefully about a foot. This excess gives you a good "handle" to pull on while heat-forming.

❒ Make a small "ironing board" out of cardboard, about 5″ x 3″.

❒ Place the ironing board under the fabric about a foot in from the bow. Tighten this area first at **250°.** This will help the heat-forming of the fabric at the tip. If you tighten the center of the radius, it makes it easy to make the curve at the bow.



❒ Now start rolling and heat-forming the fabric around the tip bow with the iron set at **225 to 250°**. Roll and form the fabric as far as you can to the inside of the bow.

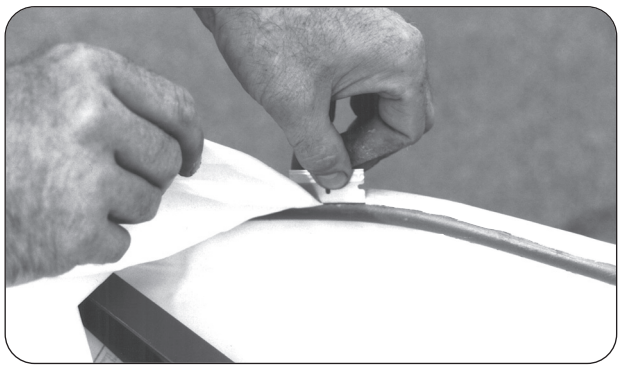
Yes, sharp-eyed readers! This IS the TOP of our wing, just to show how the curvature is smoothed out. You should start with the BOTTOM of the tip bow.

❒ Pull hard on the fabric around the bow and apply heat. The trick is to get the fabric wrapped around the bow at least an inch. More is even better. Whenever you can, wrap all the way around to the inside of the tube so the seam won't show.

At some point, you'll have to turn the wing right side up to wrap the bottom fabric around the bow tubing.

❒ When you have the fabric well formed to the inside of the bow, cement it down. Try to cement it in one application, rather than in short sections. You have to work fast, but you'll get fewer wrinkles.

A neat way to trim is to use single edge razor blade. Hold it firmly on the surface, and pull the fabric into the blade. Don't slice with the blade; you could cut the primer or fabric below.



❒ Let the **Poly-Tak** dry for about 15 minutes after the bottom fabric is cemented all the way around the perimeter of the wing.

OK, now the bottom piece is on, and most of the basics have been done.

❒ Before you attach the top fabric, go over all the cemented areas with an iron lower than **250°.** Use enough pressure to take out all wrinkles.

The idea is to iron out all wrinkles or imperfections in the cemented areas of the bottom fabric before you cement the top piece over it. The smoother you can make the cemented areas, the better they will look later when covered with the top piece of fabric. You are using the iron on JUST THE CEMENTED AREAS now. You'll heat tighten the whole wing later, after the top piece is applied. Patience.

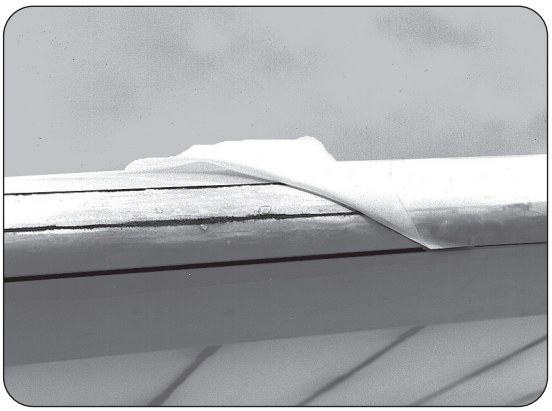
Notice how the iron can take out all the wrinkles that occur during the cementing process. Work carefully and stay with it until all the wrinkles are gone. Use pressure and the tip of the iron. The iron also softens the **Poly-Tak** below the fabric, allowing you to re-smooth any lumps. Use the little sealing iron in tight places.

NEVER APPLY AN IRON HOTTER THAN 250° TO A CEMENTED AREA. DOING SO COULD RELEASE THE SEAM OR THE BOND!

Now for the Top Fabric

❒ Roll out the top piece of fabric. Clamp and trim it as before, with a foot extra at the tip and butt.

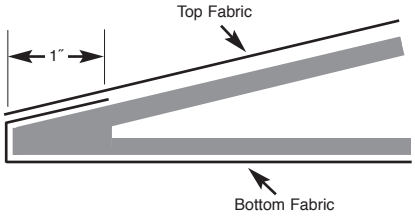
❒ Cement the leading edge, aligning it to the lowest chalk guide line.



That line is now covered by the bottom fabric and may be hard to see. If so, re-chalk it.

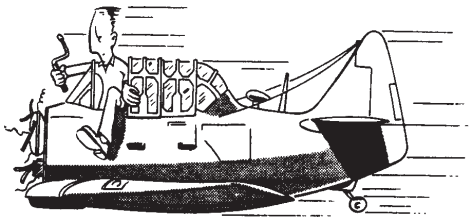
❒ Cement the trailing edge as before. For the best overlap seam, heat-form the top fabric around both sides of the trailing edge, and cement it to both sides. That will give you more than the required 1″ overlap and a very strong seam.

If your trailing edge fairing is at least 1″ wide, you can simply cement the fabric to the top of the trailing edge and trim the fabric off flush without wrapping it around. That would make a legal 1″ overlap also.



❒ Heat-form the top fabric over the edge of the butt rib until the fabric is smooth and flat. Keep forming until at least an inch of formed fabric lies flat over the butt rib. Trim this neatly and cement it to the fabric below making sure you have a legal 1″ overlap.

❒ At the wingtip bow, heat-form the top fabric the same way you did the bottom. Make sure you have a 1″ overlap where the top piece overlies the bottom. Trim the top piece with scissors as neatly as you can. Razor blades are dangerous here, you could inadvertently cut the bottom fabric while trimming the top.



Do not attempt restart if engine stopped because of obvious mechanical failure.

Before You Start Ironing...

OK, now the fun part. You're about to tighten the wing fabric with your carefully calibrated iron. The iron is ready, and the untightened wing is on the sawhorses. But first, a few important points.

❖ Remember, **a calibrated iron is the only approved source for tightening**. Heat guns or uncalibrated irons are the surest way to damage your project or invalidate your STC.

If you ignore this and use a heat gun or an uncalibrated iron, you could wind up with permanently loose fabric! At best, this means cracked paint. At worst, it causes fabric floppy enough to seriously deform the airfoil in flight! Bad news.

Regardless of what LeRoy says, you can't tell how tight your fabric is by feel. Thumping and bouncing quarters are old aviation wives' tales. You must know the exact temperature applied to the fabric to know how much it has been tightened.

❖ Remember that unlike dope, neither **Poly-Brush** nor **Poly-Spray** will tighten the fabric any further. Whatever you do with the iron is the finished product. LeRoys who use heat guns might get away with loose fabric now because the dope they put on later will pull the fabric tighter.

OK... back to work.

Heat Tightening

Start With 250°

The idea is to spread the increasing tension evenly and symmetrically across the surface. To do this, start at one end of the wing, say at the tip.

❒ Hold the iron in the center of the fabric near the tip bow. See the fabric pull up tight around the iron? Move the iron slowly around the fabric to take out the big wrinkles. Don't try to remove all the wrinkles on this first pass. They'll come out later with the next heat setting. Iron over the hard surfaces too, like the leading edge.

Don't start at one end of the wing and work toward the other. This can exert enough asymmetrical force to bend light structures. You could put unwanted dihedral in your wing (or maybe you always wanted a "bent-wing" Corsair), or you could wind up with deep troughs in the fabric between ribs as the fabric is pulled spanwise in one direction only.

❒ Now go out to the opposite end of the wing, by the butt rib, and do the same thing. Alternate your tightening at opposite ends of the wing, working toward the middle.

Don't be afraid of letting the iron pause on the fabric. It won't scorch the fabric like it does your cotton shorts. Nor will the fabric get any tighter. The amount of tightness depends upon temperature, not time.

❒ Turn the wing over and tighten opposing areas at **250°,** as you did on the top side of the wing.

Protrusions

Remember those strut fittings sticking up like tent poles 2″ or less under the fabric? Iron right around them; they won't break through. Later, when the whole wing has been tightened at **250°**, cut the fabric just enough to let the protrusion pop through, and cut no more. The idea is to make the smallest cut you can.

Now the Big One, 350°

Crank up the iron to **350°.** This takes the fabric to peak tightness. Anything over **350°** starts permanently loosening the fabric. Be sure of your calibration! This is the IMPORTANT one!

❒ Iron the fabric in opposing areas at **350°** the same way you did at **250°.**

You may see steam coming off the fabric at 350°. This is moisture in the fabric boiling out. It's normal and is nothing to worry about.

Make sure you iron every inch of the fabric. If you get distracted and skip an area, it will forever be looser than the rest. This is not a good idea. To make sure, do the whole wing **twice** at **350°,** or make check marks with **your lead pencil (no pens or magic markers)** in each area as you final-tighten it.

CAUTION: NEVER IRON OVER A CEMENTED SEAM AT ANY TEMPERATURE OVER 250°! A 350° iron can pop cemented seams. Use caution and stay away from glue bonds at the higher temperatures.

The trick is to make sure you tighten the whole fabric surface at **350°**. Don't forget the fabric that lies over hard surfaces like leading edges, tanks, or walkways.

Very Lightweight Aircraft

If you're covering an ultralight or very lightweight experimental aircraft, tighten at **250°** and see how the structure holds up. Calibrate the iron at **300°** and try that next, again monitoring for structural deformation. You may get all the way to **350°.**

If you must stop at **250°** or **300°** because of the lightweight structure, so be it. The fabric will not be at full tension, but the slow speeds of your ultralight or very light aircraft will keep the paint from cracking and keep in-flight airfoil deformation to a minimum. Always try for the maximum tightening you can get, however.

Remember, however, that on a certified aircraft you **must** tighten to **350°** with a calibrated iron. This is an inescapable part of the STC.

1st Brushed Coat of Poly-Brush

Applying **Poly-Brush** does two things:
1. It seals the fabric.
2. It acts as a cement that soaks through the fabric and further secures the fabric to the airframe.

Poly-Brush should ALWAYS be thinned 3 parts Poly-Brush to 1 part reducer.

Normally, you should use **Poly-Fiber R 65-75 Reducer**. Above 85°, use our **RR 8500 Reducer**.

Poly-Brush has a pink tint so you can see where it has been applied. It also comes untinted for use on open cockpit aircraft where you may not want the pink tint to show.

❒ Thoroughly scrub the fabric with MEK or reducer. Use a clean rag. Don't flood the cement joints!

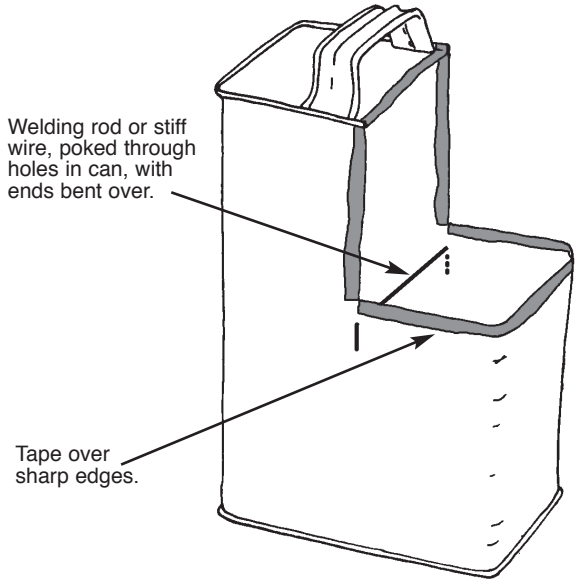
A NOTE ABOUT RAGS: Use only new rags. Cotton is best, but watch the lint. NEVER USE INDUSTRIAL SHOP RAGS OR LAUNDERED RAGS. They're full of somebody else's silicone and impregnated grease that never really comes out. Rub a shop towel on your fabric and you may ruin it.

Go to a builders' supply store and buy fresh **painters rags**. It's worth the expense. Or go to a fabric store and buy cheap 100% cotton cloth.

❒ After scrubbing the fabric with MEK or reducer, follow by passing a tack rag lightly over the surface to pick up any dust or lint.

Cut an old rectangular can (like a reducer can) to make a nice **Poly-Brush** application bucket. The handle at the top makes it easy to hold while you are brushing.

Stick a piece of rigid wire or welding rod through the side to wipe the brush on or hold it out of the liquid.



A WORD ABOUT BRUSHES:

Natural-bristle brushes are best for Poly-Brush. You can use high-quality polyester brushes, but avoid foam or nylon. They dissolve in Poly-Brush. Buy a good 3″ brush for applying Poly-Brush to fabric, and a good 2″ brush for applying finishing tapes later on.

Ok, get your bucket of thinned **Poly-Brush** (3 to 1), a good 3″ brush, and a can of MEK or reducer with a rag.

❒ Brush **Poly-Brush** liberally over all the fabric. Brush all open fabric areas and fabric over the hard surfaces. The idea is to turn the fabric pink, make it look glossy wet, and leave no dry starved areas.

This is no time to skimp. You need to really wet the fabric to fill the weave. Notice that over the leading edge the **Poly-Brush** soaks through and further bonds the fabric to the hard surface below.

Don't leave any dry areas or places where the surface doesn't look translucent when you're through brushing. This would mean the weave isn't sufficiently filled, and it leads to big problems with pinholes later. We'll talk about pinholes further on.

The idea is to brush on a wet coat, and then make only one more pass with the brush to level any small bubbles that may have formed. Look at the wet surface glare area to check for bubbles. **Work fast, quit brushing, and get your brush out of there before the Poly-Brush dries.**

Poly-Brush dries in about 15 minutes. In hot weather, it can dry in as little as 5 minutes. You have to brush it on and quit fiddling with it. If you continue to brush while it is drying, you can leave serious brush marks.

If you're putting enough **Poly-Brush** on, you'll see runs on the inside of the fabric. This is perfectly normal.

On the other hand, if these runs pool together on the underside of the top fabric and drip down onto the inside of the bottom fabric, you're brushing on too much **Poly-Brush**. These drips seal the bottom fabric where they fall on the inside, the wrong side.

If you let these drips stay, they'll show up as a difference in gloss in your final paint. Simply wipe these drips away with MEK and a clean rag. As you brush the top surface, keep monitoring for drips on the bottom and clean if necessary.

❒ When the **Poly-Brush** is dry on the top of the wing, turn it over and do the bottom. Drip-throughs are not a problem now since the top of the wing has already been properly sealed, and the drips won't show.

LeRoy will tell you this is a mistake cause this ain't the way he brushes on nitrate dope. Sorry, LeRoy, but that's just not true here. These runs tell you Poly-Brush is penetrating, and they will not be visible in the final product with vinyl coatings.

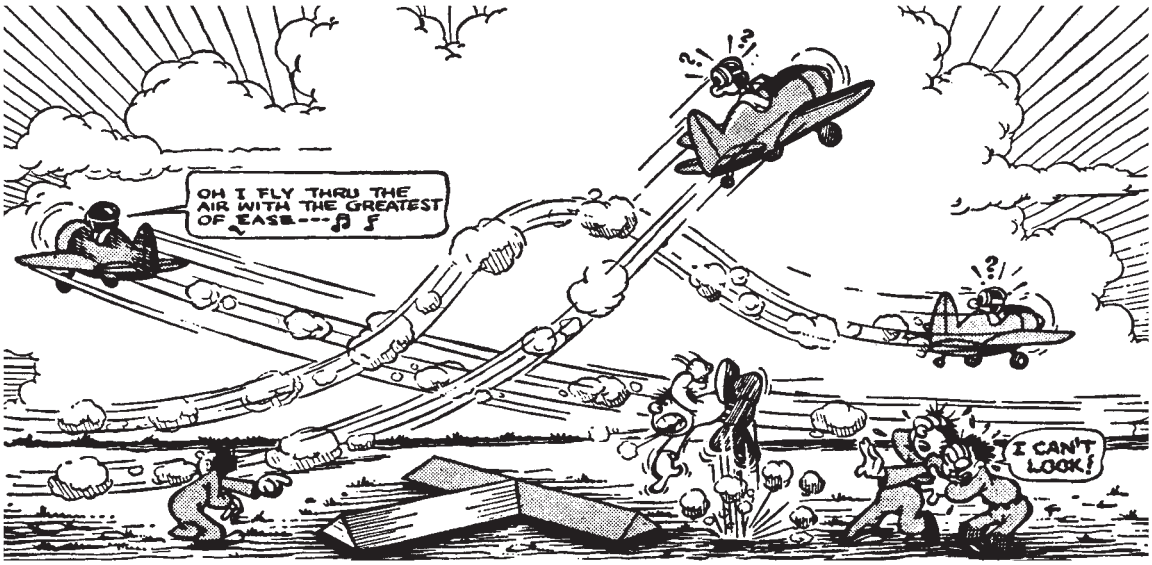
"Can't I spray on this first coat of Poly-Brush?"

We don't recommend it. Brushing does a much better job of filling the weave. If you don't fill the weave sufficiently, you get pinholes later.

Brush marks are not a problem if you follow the instructions above. Ray Stits didn't name it **Poly-Brush** for nothing.

"Can't I just sand the drips or flaws in Poly-Brush?"

Nope. **Poly-Brush** doesn't sand. It's too rubbery. Remove wet or dried drips and runs with some reducer on a rag. Or, you can smooth them out with a **225°** iron.



Rib Lacing

Fabric on wings needs to be mechanically secured to the ribs rather than just cemented. The standard mechanical attachments are: rib lacing, PK screws, pop rivets, and fabric clips.

On **certified aircraft**, the method you use to secure the wing fabric to the wing ribs should be the same one used at the factory when your airplane was manufactured. If you want to use a different method, you have to get a field approval from an FAA Field Service District Office.

On some aircraft, the tail feathers and occasionally some fuselages were rib laced. Again, replicate the way the factory did it.

Using cement alone is a recent idea that came out of the ultralight movement. The theory was that since the speeds and wing loadings were low, you didn't need mechanical attachments. However, many kit planes have evolved from enclosed ultralights to high-horsepower firebreathers. Some have 180 HP! **They need to be rib laced!** Additionally, any ultralight or very light aircraft you plan on keeping for more than just a couple of years needs **RIB LACING.**

Aircraft fabric cement is made for shear loads, not peel. But in flight, an aircraft is subjected to constant peel loads from the center of lift on the top of the wing. The giant vacuum cleaner called *lift* is always trying to peel your wing fabric off the top surface.

Aircraft fabric cements were never designed to resist this peel force. And certainly not for the long service lives fabric covering jobs can last today.

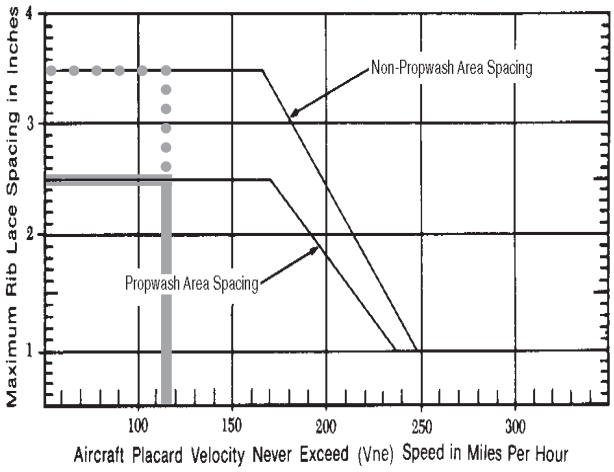
If you're covering an experimental aircraft for which there is no rule or precedent, WE STRONGLY RECOMMEND RIB LACING OR SOME OTHER MECHANICAL ATTACHMENT. Fabric cements were never meant to be the sole means of attaching fabric to ribs, even to 1˝ ribs.

Incidentally, we call it RIB LACING rather than rib stitching. We are lacing around the whole rib, not just stitching it to the top or bottom rib caps.

How Far Between the Laces?

Let's start with how to plan and lay out rib lace spacing. This works for screws and rivets, too.

Take a look at this chart:



This same chart is also in the FAA's AC 43.13, and should be used if you don't know the rib lace spacing of your aircraft as it was manufactured.

The bottom of the chart shows the placard maximum speed of aircraft in miles per hour. The left side shows the distance between laces (or screws or rivets).

Notice that there are two lines, one for spacing in the propwash areas, and one for spacing in other than propwash areas.

Propwash area includes all the wing ribs included within the diameter of the propeller, plus one more rib.

Using the Chart

We'll use our **J-3 Cub** as an example. Position the wing right side up. We'll mark the top of the wing first.

On the chart, you draw a vertical line up from the Vne speed of the Cub, which is 115 mph, until it reaches the line marked "Propwash Area Spacing." Then you draw a horizontal line from that point of intersection over to the scale on the left side of the chart. That gives us a spacing of 2½″ inside the propwash area. Then you extend the vertical Vne line to the "Non-Propwash Area Spacing" line, and turn left again to the left side of the chart. This gives us a rib lace spacing of 3½″ outside the propwash area. Perform these same steps for your airplane,

Most sport aircraft work out to 2½″ in propwash and 3½″ out of propwash. These are MAXIMUM spacings. The faster the aircraft, the tighter the spacing. You can pretend you're doing a P-51 if you wish and use 1″ spacing. No problem in using tighter spacing anytime. Aerobatic aircraft should always have tighter spacing.

So what you get out of this drill is that on an average wing the first three or four ribs out from the butt rib require 2½″ spacing since they are in the propwash area. The remaining ribs get rib laces every 3½″.

The chart gives us two sets of spacing, but you don't really have to lay out two sets of laces if you choose not to.

Remember, the spacing you get from the chart is the MAXIMUM spacing between laces. Since there is no restriction on using narrower spacing than the maximum, it's just as easy on most airplanes to use the propwash spacing (2½″) for the whole wing. It looks neater, it's easier to lay out, and you'll only end up doing a few more laces in the bargain.

So in our discussion on how to measure and layout the laces, we'll go with 2½″ laces for the whole wing.

Tailfeather Spacing: If your aircraft requires you to lace the tailfeathers, and you don't know the original spacing, use twice the wing propwash spacing.

Marking Rib Lace Locations

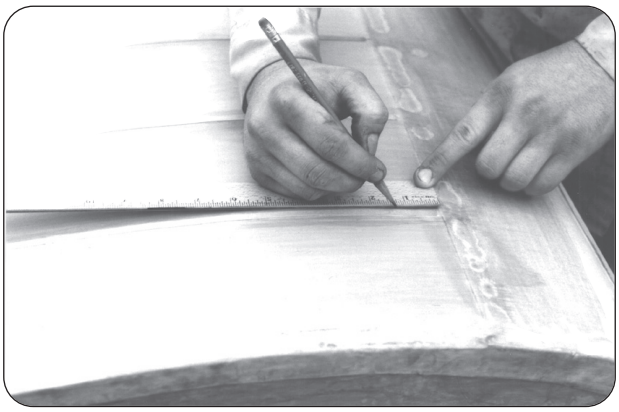
Now that you know the spacing, you'll **measure**, **lay out**, and **mark** the position of the individual rib laces. This will result in evenly spaced, neat looking laces. Once you mark the lace positions, you'll **pre-punch** the lacing holes with a needle to give us guides to lace through. Not only does this give us a good looking job, but saves lots of time by not having to measure while lacing. Pre-punched holes save lots of fumbling.

Put the wing **top side up on the sawhorses**. Get a ruler or a tape measure and a soft **lead pencil**.

Remember, no pens or magic markers. They will bleed all the way through the paint.

You begin measuring rib lace spacing at the **butt rib**, working from aft edge of the leading edge fairing, where it meets open fabric, toward the trailing edge. The first rib lace is always placed at **half** the required distance of the others. Since our required distance is 2½″, half of that is 1¼″.

❒ Place the tape on the top of the butt rib and start measuring and marking. The first mark goes 1¼″ back from the leading edge fairing (half the chart distance). The next mark goes 2½″ beyond that. Keep marking in 2½″ segments all the way to the trailing edge. Make sure the last mark is no greater than 2½″ from the trailing edge.



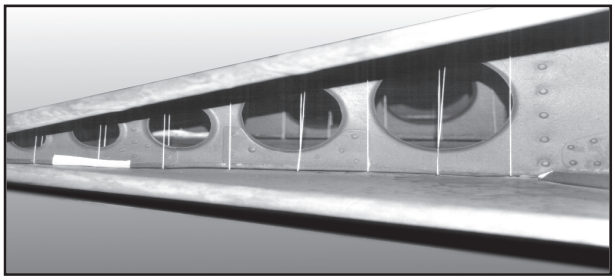
❒ Now lay the measuring tape on the rib closest to the tip bow and do the same thing. Then, to be safe, pick a rib in the middle of the wing and do it again.

❒ Get the chalk line out and line up the marks made on all three ribs. Snap lines on the top of the wing.

You should have parallel lines every 2½″ spanwise on the wing.

Every place the chalk line intersects a rib is where the rib lace will be. This is a nifty way to get nice even laces at the required spacing.

Rib laces go through the entire wing, and must be parallel to the spar face, or in other words they should go straight up and down and all be parallel if you looked at them in cross section inside the wing.



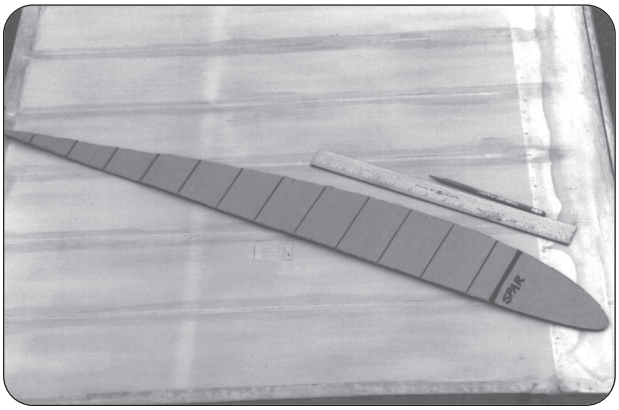
The bottom surface is different. If your wing was symmetrical, you could flip it over and measure and chalk the bottom as you did the top. The resulting laces would all be straight up and down and parallel. But most wings have an airfoil shape; that is, the top surface has a greater curve than the bottom surface, which is almost flat. Therefore, the top surface is longer than the bottom. So, if you measured the bottom exactly as you did the top of airfoil, the resulting rib laces would certainly not be straight up and down and parallel. In fact, they would look like a sunburst! Not to worry.

The Magic Template

You can keep the laces straight up and parallel by making a **simple cardboard template.**

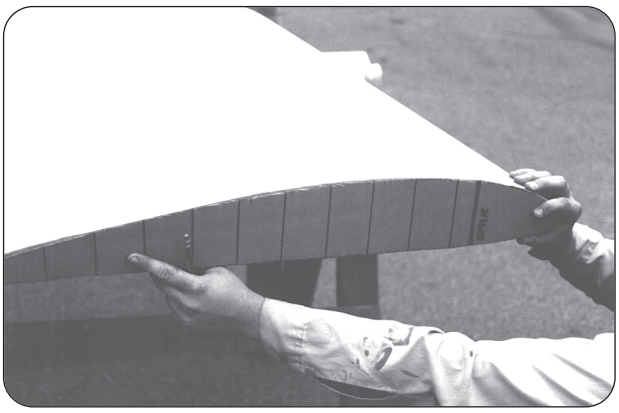
❒ Hold a piece of cardboard up to the butt rib and trace the shape of the rib. **Also mark on it the position of the main (forward) spar.** Cut out the shape of the butt rib to make a template. Put the template against the butt rib and transfer to the template the spacing marks on the **top** of the butt rib.

❒ Lay the template on something flat. At each lace position along the top of the airfoil, draw a line parallel to the main spar face, extending down through the bottom of the airfoil template. This gives you the proper positions for the rib laces on the bottom.



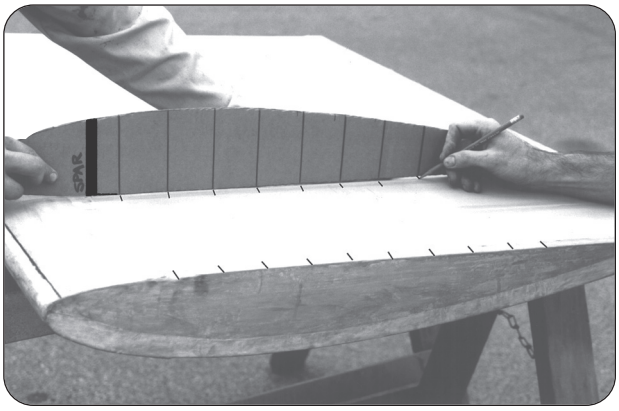
❒ Now transfer these lace positions, both top and bottom, to the other side of the template. This gives you a template for both wings.

❒ Place the template back on the butt rib and transfer the marks from the bottom of the template to the bottom of the butt rib.



Turn the wing bottom side up.

❒ Use the bottom edge of the template to mark the lace positions onto a middle and outboard bottom rib. Snap your chalk lines as before, and you are done. All the rib lacing locations are marked.



If you absolutely want to have both in-propwash spacing and out-of-propwash lace spacings, just make two templates. Use them as above.

Reinforcing Tape

Reinforcing tape is an adhesive-backed polyester twill material that is stuck to the fabric over the rib cap **before** rib lacing. It reinforces the fabric so that rib laces, screws, or rivets don't cut right through the fabric when mechanical attachments are snugged down.

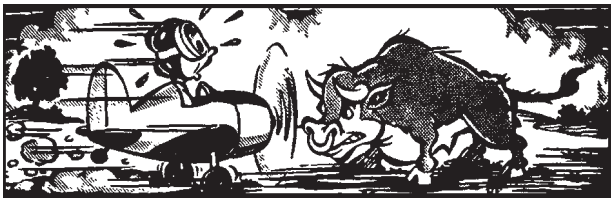
Poly-Fiber reinforcing tape comes in ¼″, ⅜″, and ½″ widths. **Use the width of tape that exactly matches the width of your rib cap.** Tape that is too wide will leave puckers when the laces are snugged down. Tape that is too narrow will allow fabric cuts where the reinforcing tape ends. Use two parallel ½″ tapes to cover a 1″ rib.

❒ Simply peel off the paper backing and press the tape into position over the bottom ribs. Align the tape precisely with each rib cap. Extend the tape a minimum of 1″ beyond the first and last laces on each rib. For cosmetics, it looks better to extend the reinforcing tape all the way to the leading and trailing edges of the wing.

Position the wing **right side up** on the sawhorses.

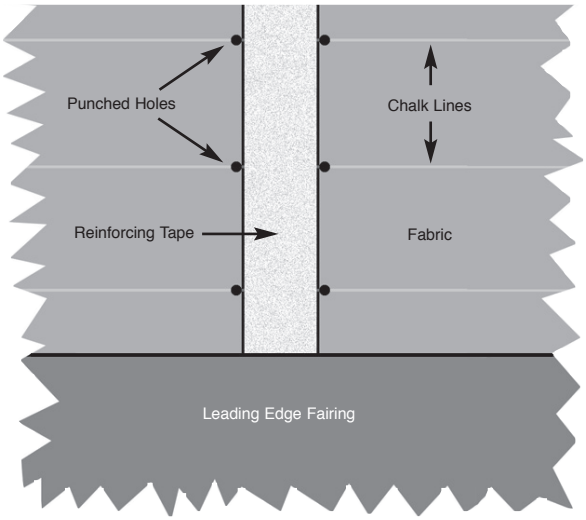
❒ Apply reinforcing tape along the top rib caps, just as you did for the bottom rib caps.

Take care when cutting reinforcing tape. Uneven cuts will show through. Keep everything nice and square.



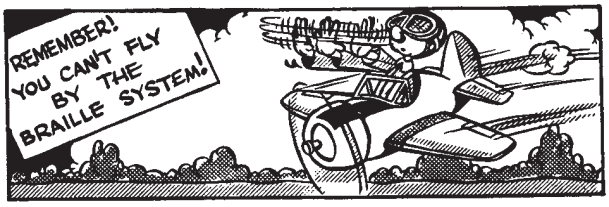
CAUTION: Don't use anything but genuine Poly-Fiber polyester twill reinforcing tape. Substituting fiberglass strapping tape, or any other tape, is not approved. Strapping tape fails easily in shear, and falls apart in a few years. Rib laces can fail if you use strapping tape! It also negates your STC.

❒ Once all the reinforcing tape is in place, pre-punch the top rib lace holes with a **rib lacing needle.** Punch holes where the chalk lines intersect the ribs, as close to the rib caps and tape as you can.



Turn the wing over again, **upside down** on the sawhorses.

❒ Pre-punch the holes on the bottom of the wing, same as on the top.



Let's Tie Some Knots!

There are two kinds of Poly-Fiber polyester rib lacing cords, round and flat. It is your choice. Flat rib lacing cord, like a shoelace, takes some untwisting at times. Round cord is faster and only slightly thicker than flat. Rib lacing cord is impregnated with a special wax.

Only two knots are approved with the Poly-Fiber STC:

1. The **modified seine knot** as shown in AC 43.13. After tying, this old standby stays on the exterior surface. The cord that runs between knots (the continuous cord) also runs on the surface. Leaves a lot of drag on the outside of the wing, but that's the way it was done from WW1 on. Tie this knot with a **12″ straight needle.**

2. We recommend, and will show you, the **hidden modified seine knot.** This "hidden" knot winds up on the inside of the wing. So does the continuous cord. So all you see with this knot is one small stitch across the rib. Much cleaner. You'll need a **12″ curved tip needle** to tie and hide this knot.

The video "Aircraft Fabric Covering," produced by EAA SportAir, shows you a different way to tie the knots than is illustrated in this manual. The video is available in either VHS or DVD from your Poly-Fiber distributor.

❖ You can rib lace with the wing on sawhorses and spend a lot of time exercising your knees, or you can put the wing in a vertical stand and pass the needle back and forth with a helper.

❖ Wings can be laced while positioned horizontal or vertical, usually leading edge down. Exceptionally wide-chord wings are easier to lace when positioned vertically, with the needle being returned by a helper.

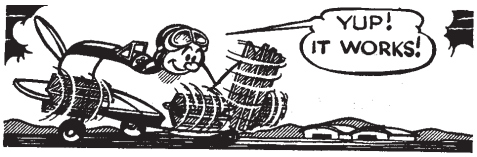
❖ You can start at the leading edge and work aft, or vice versa. You can begin on either the top of the wing or the bottom. It doesn't matter – all the knots will be concealed inside the wing.

❖ To save time untangling long lengths of rib cord and to prevent wearing off the wax coating and fraying the cord by pulling through the fabric too many times, use shorter lengths of rib lacing cord. Six to eight feet is plenty, depending on the rib thickness. Tie off the last knot in each length with a half-hitch.

❖ Make sure all cables are temporarily secured taut, in their normal runs. If you rib lace with them in a loose condition, they could destroy adjacent rib laces when you pull them back to their normal runs as you assemble the airplane.

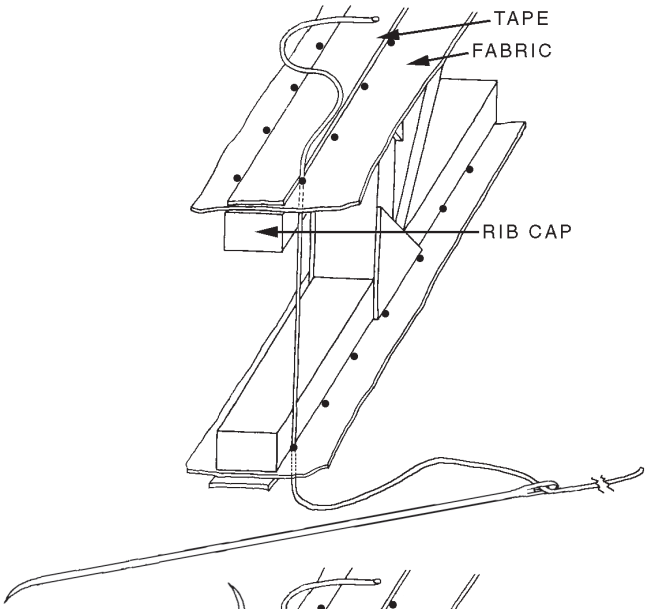
❒ Set up a floodlight so it shines through the wing to reveal structure and obstacles within.

❒ Thread a **curved tip needle** with about six feet of cord.

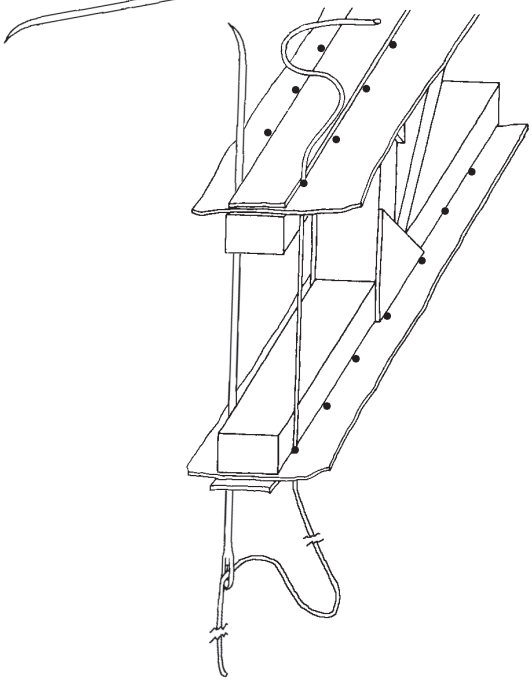


5. Let's Do a Wing!

A. Start by inserting the threaded needle into the prepunched hole on the right side of the reinforcing tape. Guide the needle through the wing and out the bottom prepunched hole directly below the top hole.

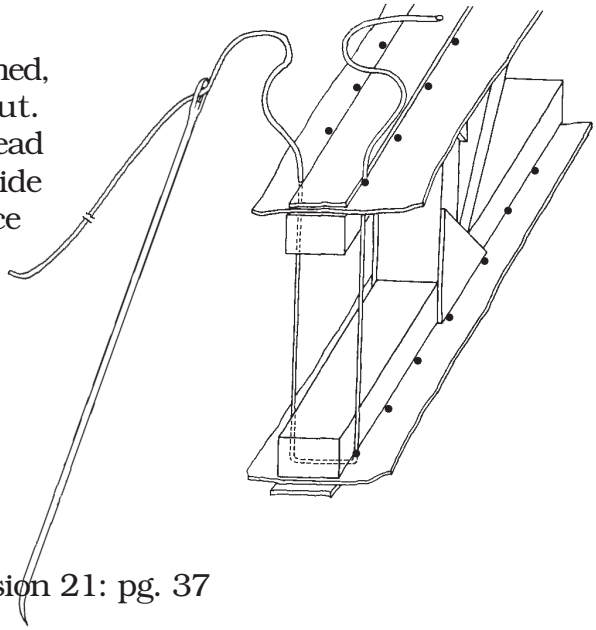


B. Leaving a tail of thread on the top of the wing, pull the needle out the bottom. Cross to the left of the bottom reinforcing tape, insert the needle into the prepunched hole on the left side of the tape. Push the needle and thread all the way back up inside the wing and out through the prepunched hole on the left side of the top reinforcing tape.



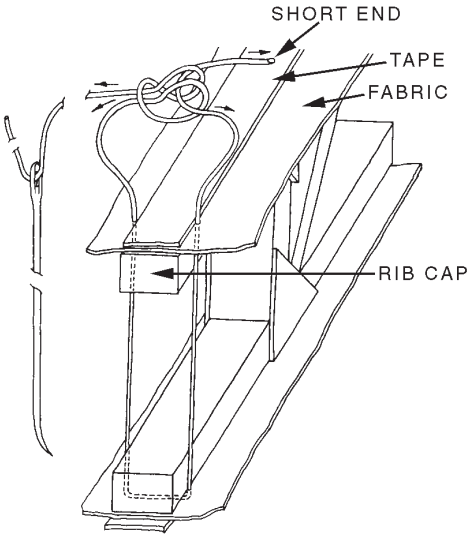
C. Pull the needle out with thread attached, but don't pull ***all*** of the thread out. You will have a short end of the thread (about 4 to 5 inches) on the right side of the top reinforcing tape and a lace of thread running from the top through to the bottom on the right of the rib and back up to the top on the left as illustrated.

Now you're ready to tie the **Starter Knot.**

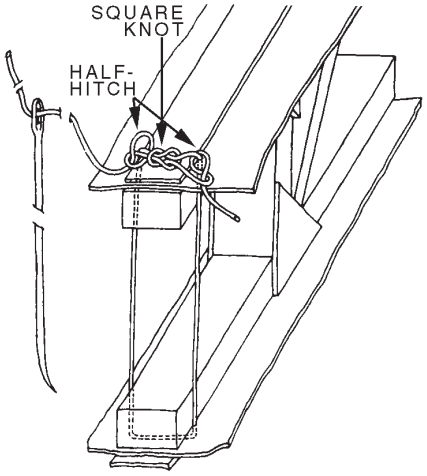


The Starter Knot. This handy knot is used when you start a sequence of **rib lacing**. It is simply a square knot with a half-hitch on each side.

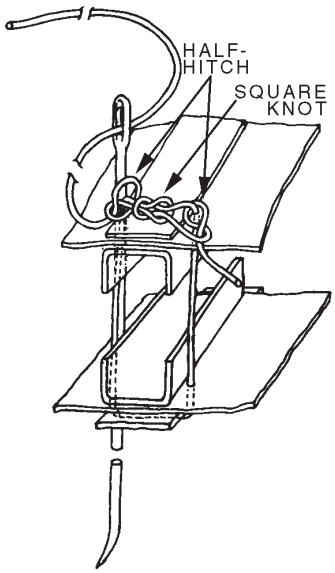
1. Tie a square knot by passing the short end of the cord through the folded-back loop.



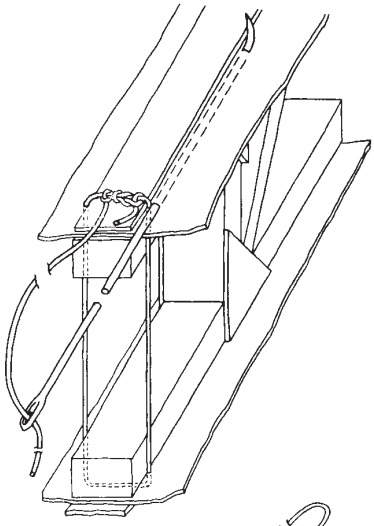
2. Lock the tightened square knot with a half-hitch on each side.



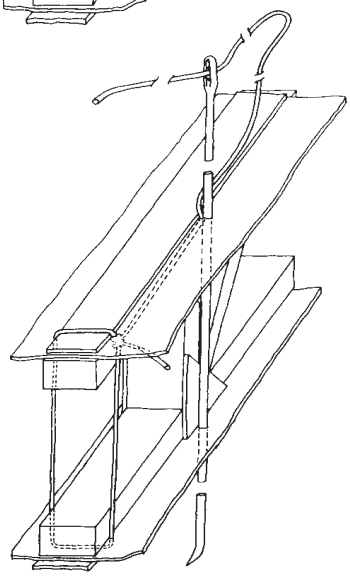
❖ The starter knot can also be used as a single lace in places where you cannot tie continuous seine knots. If you have a lot of time, you could lace your entire airplane with starter knots.



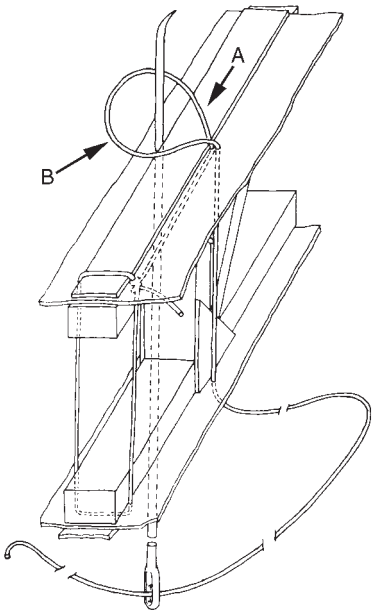
3. Route the needle back through the starting hole. Bring it back out through the next hole aft on the same side of the rib cap. Pull the square knot inside the wing.



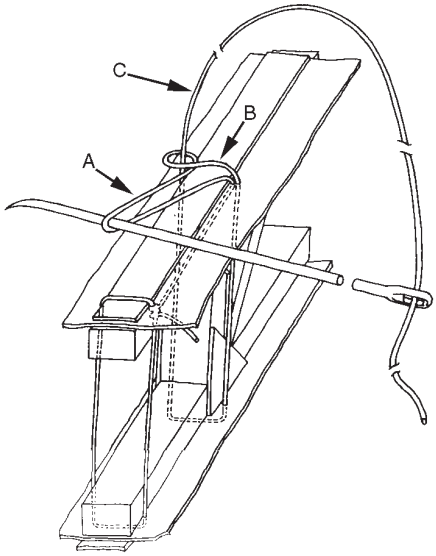
4. Route the needle back in through this same exit hole, and then out again through the corresponding hole on the opposite wing surface. Leave about a 3″ loop when the needle is pulled clear.



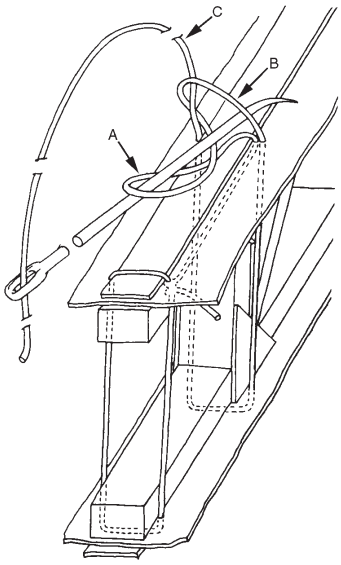
5. Cross over the rib cap, and return the needle. As the needle emerges, orient the loop as shown and pass the needle up through it. This is the beginning of the modified seine knot.



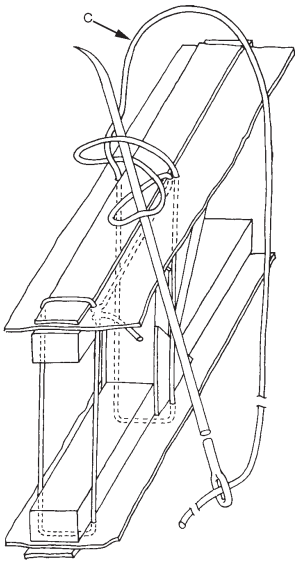
6. Pull the needle clear. Use the tip of the needle to reach under part B of the loop, hook part A, and pull it toward your starting point.



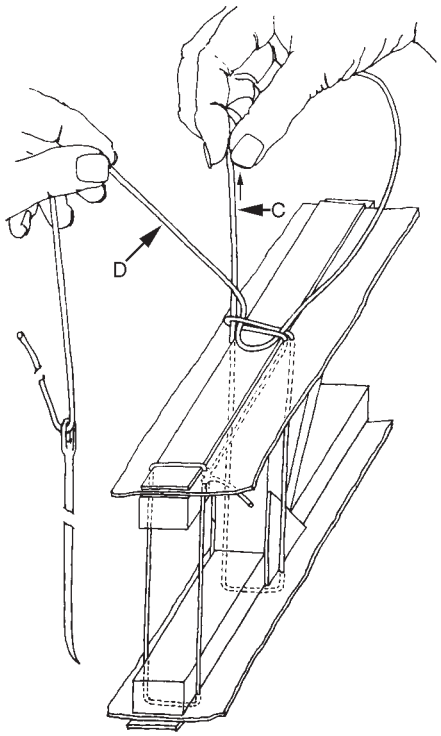
7. Rotate the needle clockwise, twisting the captured part A. Route the needle tip over part A, then under part B.



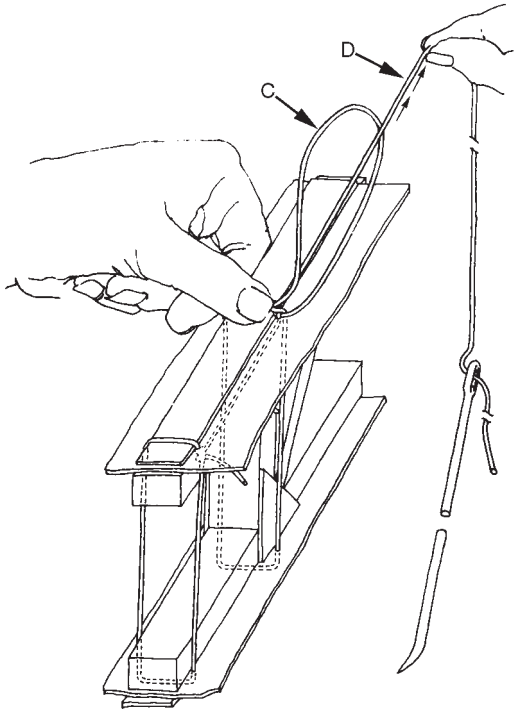
8. Now pass the needle over cord part C and pull it through. Hold part C perpendicular to the fabric while you pull, to keep the cord from getting tangled.



9. Pull part C perpendicular to the fabric to remove all slack in the lacing cord back to the last rib lacing knot, while working the loose knot over to the right side. Do not pull on part D.

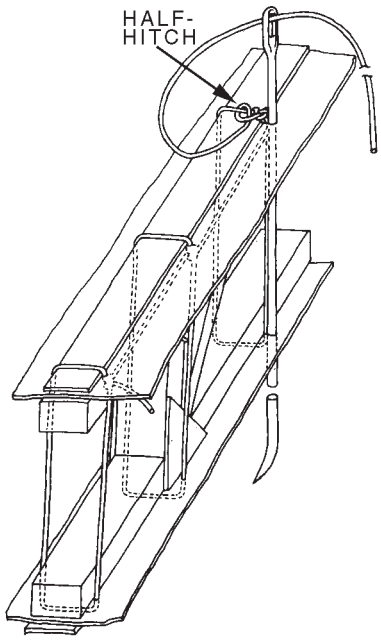


10. With all slack removed by pulling part C, hold the loosely formed knot with your thumbnail. Pull firmly on part D, perpendicular to the fabric surface, to secure the finished knot.



GO BACK TO STEP 3 - Repeat Steps 3 through 10 until you've completed the entire rib or you've come to the end of your length of lacing cord. In either of these cases, go to Step 11.

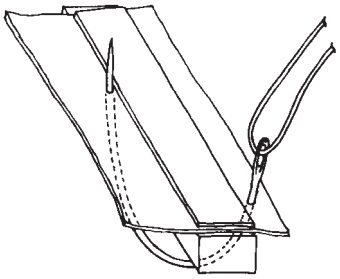
11. After completing an entire rib, tie off the last modified seine knot with a half-hitch.



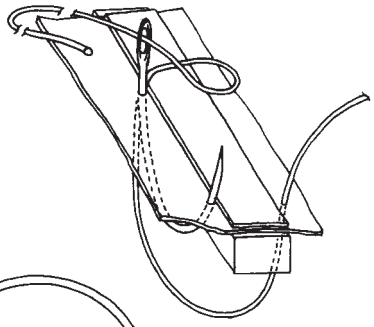
What if you run out of cord halfway through the rib? Tie it off with a half-hitch, and start again at the next set of holes with a starter knot and a new length of cord.

Sometimes you can't get through the entire wing to rib lace normally. Hidden structure, fuel tanks, etc. may preclude lacing around the whole rib.

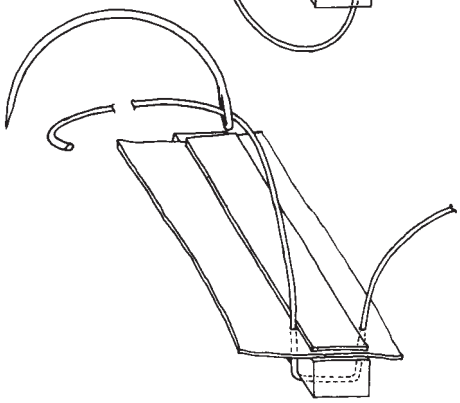
In this case, you can lace to just the cap. Use a **curved needle** to tie a single starter knot.



A. Go in on one side of the rib cap, and come out on the other.



B. Go back in through the exit hole, then come out opposite the first entry hole.



C. Now you can tie a starter knot,

Other Mechanical Attachments:

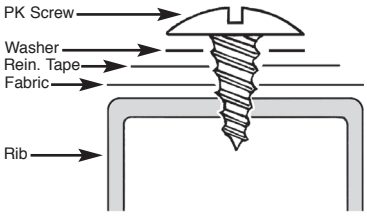
Pop Rivets

Fabric pop rivets are special broad head rivets sold by aircraft supply houses specifically for use on metal ribs. DO NOT attempt to use the hardware store variety!

Start with the reinforcing tape, as with rib lacing, and use the same spacing. If an existing rivet hole is wallowed out or damaged, drill a new hole half an inch or so away. For best results use a ½″ diameter .016″ aluminum washer under each rivet. Plastic washers tend to crack and fail with age.

Pop rivets are easy to install, but they're a real pain to drill out at re-covering time.

PK Screws



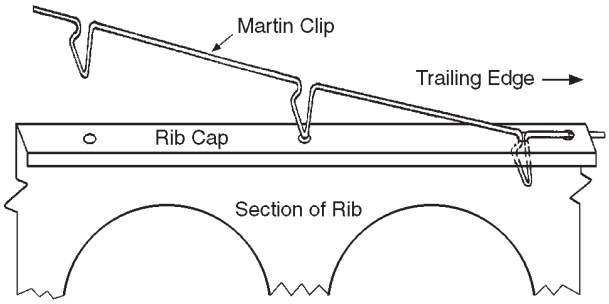
These are small self-tapping stainless steel sheet metal screws. You'll find them in a variety of certified aircraft that have metal ribs.

As with the pop rivets, start with the reinforcing tape and use the standard spacing. If an existing screw hole is wallowed out or damaged, drill a new one half an inch or so away. For best results use a ½″ diameter .016″ aluminum washer under each PK screw.

Don't use PK screws on wooden ribs. They can create a path that introduces moisture into the rib over the years.

Fabric Clips

Fabric clips are pieces of wire formed into a row of self-locking "barbs" that snap into holes or slots in metal ribs. Taylorcraft and Cessna use them, and they're available from your favorite supply house.



Clips are the hardest on ribs, particularly if someone tries to yank off the old fabric while the clips are still in place. This can easily ruin an entire set of ribs. And because the spacing of the barbs is unchangeable, you can't just drill a new hole to replace one that's damaged. If you need to use clips, find out all you can about your particular clip system before you make an expensive mistake.

Finishing Up

When you are finished rib lacing or installing mechanical attachments, you need to clean the ribs of all wax and fingerprints, and fill the reinforcing tapes with **Poly-Brush**.

- ❒ Use some reducer on a clean rag to remove the excess wax that balled up around the rib laces. It does.
- ❒ Get out your **Poly-Brush** can and a narrow brush. Brush **Poly-Brush**

into the reinforcing tapes until they soak up enough **Poly-Brush** to turn them pink and fill them up entirely. It usually takes at least four coats to fill them. A 2″ brush held sideways works nicely for this job. Be careful about brush marks or ridges that may form at the sides of the brushed area. Feather out ridges before they dry.

It is important that you fill reinforcing tapes with Poly-Brush. If you don't, they act like sponges under finishing tapes, robbing the finishing tapes of the Poly-Brush they need for good adhesion.

Inspection Hole Reinforcements

It's obvious that you'll need access to parts of your airframe once covered. Pulleys, bellcranks, brake master cylinders, and places that require frequent inspection all need to be accessible. You certainly don't want to omit this step and then have to cut into your nice new paint job later.

You need to have a good idea of where these access holes need to be. Studying the old covering before removal is one way, or you could look at a covered airplane like your own and make a "map" of where you need to put the access holes. Shining a strong light through the translucent fabric helps, too. Access holes are usually put on the underside of the wings and fuselage. By the way, it's hard to have too many access holes. Over the years, you'll regret the ones you decide to leave off.

Easy access is achieved through reinforced holes in the fabric, each with a removable cover. CAB plastic reinforcing rings (also called inspection rings) are available from Poly-Fiber distributors. They're a standard size, 3 9/16″ ID. This is big enough to get your hand through. The aluminum inspection hole covers that snap over them are also available from our distributors.

Once you've figured out where the access holes should be located, they are simple to install.

❒ Cement the rings directly onto the fabric with straight **Poly-Tak** cement. Clean up any cement that drips or oozes with MEK.

Don't cut the centers out of the holes until the airplane is finished and painted. Even then, don't cut them out until you need access. Some may never need to be cut.

To make sure the rings stay on, you'll apply a **"doily,"** a circular piece of fabric, over each one with **Poly-Brush.**

❒ Make a simple frame of scrap wood, about 3' by 3' square.

❒ Cement or staple some Poly-Fiber **Uncertified Light fabric** to the frame.

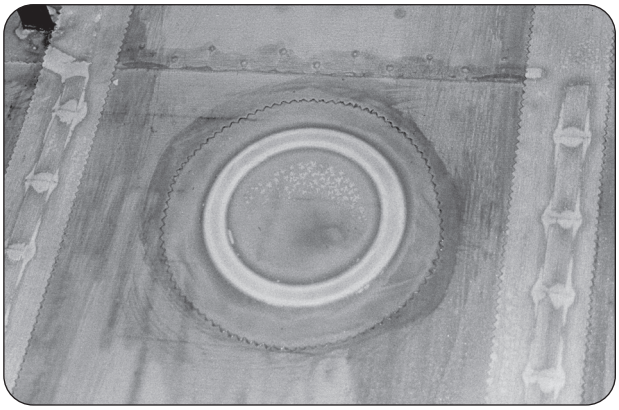
❒ Tighten the fabric at **250°**.

❒ Take the fabric off the frame, and draw **6½″ circles** on the fabric with a **soft lead pencil**. Gallon cans are good patterns. Carefully cut out the doilies with **pinking shears**.

This pre-shrunk **Uncertified Light fabric** makes beautiful smooth doilies that mold easily around the reinforcing rings. If you use thicker scrap fabric that is wrinkled to begin with, it'll look terrible when applied, and you'll have to spend an inordinate amount of time smoothing out the wrinkles.

Poly-Fiber style Uncertified Light 1.7 oz fabric works great for doilies. Medium is OK, too, but doesn't mold as tightly.

❒ Apply each doily by brushing a wet circle of **Poly-Brush** inside and outside the ring, big enough to wet out the doily. Lay the doily over the ring. With a dry brush (meaning not much **Poly-Brush** on it), work the doily into the wet **Poly-Brush**. The best bond is achieved when the wet **Poly-Brush** soaks upward into the weave of the doily fabric.



❒ When the **Poly-Brush** dries, brush another coat over it. Be careful not to leave brush marks or ridges.

By the way, buy about twice the number of aluminum reinforcing hole covers you need. When you paint your airplane, lay out all the covers and paint them, too. Store those you don't immediately use. You'll appreciate having a bunch of spares already painted in future years.

Finishing Tapes and Gussets

Finishing tapes are simply pre-cut strips of Poly-Fiber fabric. These tapes are used to cover cemented or sewn seams, or to provide an extra layer of cloth over areas that need reinforcement. All Poly-Fiber tapes are pinked, cut in a zig-zag pattern.

"PINKED TAPES? Why can't I use straight-edge tapes?"

OK, let's set the record straight. During WWI, the edges of aircraft tapes were unravelled by hand to leave a crude fringe. The idea was to give a nice transition from fabric to threads to promote adhesion when they were doped in place. But unravelling the edges of the tapes was a real pain and it took a lot of time.

So they got smarter and figured that if tapes were cut with pinked edges, you get the same good adhesion with less labor. Pinking also kept the cotton from unravelling. So pinked tapes came into vogue in the twenties.

Straight-edge tapes came only with the introduction of polyester fabrics. Since polyester could be heat slit, it was an easy way to make a tape.

The problem with straight-edge polyester tapes is the ridge formed at the edge when they're heat slit. That ridge gives no transition to the tape and, in fact, **promotes** peeling over the years.

Pinked tapes have 41% more edge area to help adhesion. They're cut with a knife that leaves no ridge and, by golly, they are historically correct.

So all Poly-Fiber tapes are pinked!

Kinds of Tapes

WEIGHT: Tapes come in two weights, light (1.7 oz) and medium (2.6 oz). Both light and medium weight tapes are legal to use interchangeably over any of the Poly-Fiber fabrics.

Lightweight tapes are easier to bend around corners. They also mold down to the surface more readily than do medium weights. Medium-weight tapes have more body and are appropriate for working airplanes or those that will see a lot of snow or ice.

CUT ANGLE: There are straight-cut and bias-cut tapes. **Straight tapes** are self explanatory. They are long, straight strips of fabric. Some catalogs call them linear. **Bias tapes** are cut from long tubes of sewn fabric. The weave of a bias tape is aligned at 45° from the edge. If you pull the bias tape, it gets narrower, like the old Chinese finger puzzle, and forms itself perfectly around curves with no wrinkles. Bias tapes are used ONLY to go around curves like rudders or wing-tip bows.

WIDTH: Tapes come in a variety of widths, all with different uses.

Straight Tapes -

❖ 2″ tapes are the standard width for ribs and longerons. You can use 2″ tapes legally on the whole airplane, but it looks pretty strange. Anyway, you'll use a lot of 2″.

❖ 1″ tapes are used for narrow fuselage stringers.

❖ 3″ tapes are used for leading or trailing edges of wings and tail feathers.

❖ 4 or 6″ tapes are used for leading edges of wings.

Bias Tapes - This is tricky, when you pull a bias tape around a curve, it gets about ⅓ narrower.

❖ A 3″ bias will pull to 2″ wide when applied.

❖ A 4″ bias will pull to slightly less than 3″.

DO NOT ATTACH TAPES WITH POLY-TAK! Tapes should be attached only with Poly-Brush. Poly-Tak cement dries too brittle for a flexible bond on tapes. DO NOT MIX POLY-TAK WITH POLY-BRUSH!

Let's Tape!

Tapes are applied in this order.

1. Fabric gussets.

2 Tapes that are oriented CHORD-WISE, into the slipstream (like tapes over ribs).

3. Tapes that are oriented SPAN-WISE, across the slipstream. (like leading edge tapes).

The Three Basic Steps in Taping

1. Thin the **Poly-Brush** 3 to 1. Precoat the fabric with **Poly-Brush** where the tape will lie. Let it dry.

2. Install the tape with a very wet coat of **Poly-Brush** (3 to 1). Let it dry.

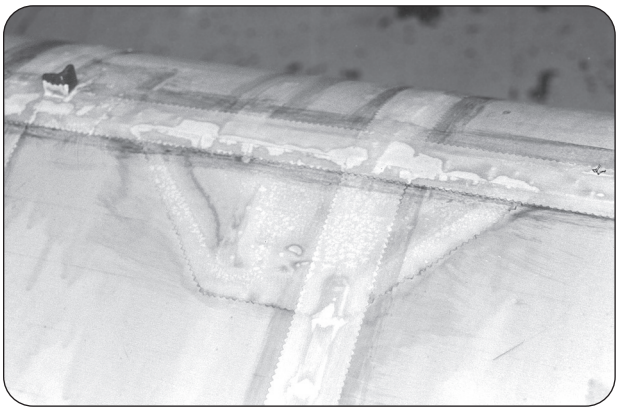
3. Brush a final coat of **Poly-Brush** (3-to-1) over the dry tape.

Make sure you feather out any ridges or built-up edges of Poly-Brush. While still wet, brush them out quickly, being careful not to leave any brush marks. All ridges and brush marks will always show.

Fabric Gussets

A **fabric gusset** is simply a piece of pre-shrunk fabric cut to shape to fit over any oddly shaped place you want to reinforce.

An example would be a gusset cut to fit over a strut fitting protrusion. This gusset would have a neat hole trimmed exactly to go over the end of the protrusion. The gusset, however, would be big enough to cover the elongated hole left in the wing fabric after heat tightening around the base of the protrusion.



Or you might choose to cut a custom shaped gusset to cover an odd shaped hard panel underlying the fabric. Gussets are sometimes easier to cut than trying to make tapes work over odd shapes.

Remember the previous section on installing reinforcing rings? Smooth, professional gussets are cut from pre-shrunk **Uncertified Light fabric** exactly like inspection ring doilies.

❒ Hold the pre-shrunk fabric over the area you want the finished gusset to cover. Trace the shape with a **soft pencil** and a straight edge. Oversize the gusset at least ⅜″ around its perimeter.

A gusset or tape that is used to reinforce a hard surface underneath fabric needs to have at least ⅜″ extending past the edge of the hard surface onto the adjacent fabric. After all, the reason to put a tape or a gusset over the hard surface is to keep the edges of the hard surface from chafing through the fabric. You need at least ⅜″ of fabric overlap for a good Poly-Brush cement bond.

❒ Trim with pinking shears and attach with **Poly-Brush**, as you did with the doilies,

❒ Brush a wet coat of **Poly-Brush**, and lay the gusset into it. Work out bubbles with a dry brush.

Chord-Wise Tapes

Let's put on the tapes over wing ribs.

❒ Get out the **Poly-Brush** bucket and fill it with **Poly-Brush**, thinned three to one. You will use only a 2″ brush for taping.

Pre-coating: the Hidden Secret to Adhesion

Before you lay any tapes, make sure you brush a stripe of **Poly-Brush** over the area where the tape will go. This pre-coating insures that there'll be enough vinyl to give a good stable bond between the tape and the fabric. Use a 2″ brush. Make sure you don't leave a ridge of **Poly-Brush** at the edges.

❒ For a first class job, draw lines with a pencil and straight edge in the areas where the tapes are to be applied. This not only gives you a reference line to tape to, but a guide for putting down a neat pre-coat of **Poly-Brush**.

You have **two options** when trimming and applying rib tapes.

1. You can use one tape long enough to wrap around the whole wing, top and bottom.

2. Or you can cut separate bottom and top tapes and butt them together at the leading edge.

Let's do one of each.

ONE-PIECE FINISHING TAPE

❒ Cut a 2″ tape long enough to hang over the trailing edge an inch or so, wrap around the whole wing, and have some extra extending past the bottom trailing edge.

The plan is to attach the tape to the top of the wing first. At the leading edge, roll up the excess tape and clip it with a clothes-pin to keep it off the ground. Later, when you turn the wing over, you'll unroll the tape and **Poly-Brush** it to the bottom.

❒ To apply the tape, brush a very wet stripe of **Poly-Brush** over the area we previously precoated. It helps to have those straight pencil lines as a guide.

Don't skimp on the **Poly-Brush**. You have to work fast, yet get a lot on. If you're working by yourself, you might consider giving yourself more time by brushing only as far as you can reach and apply the tape in stages. Most of the time, however, you should be able to do the whole top section of the tape if you work fast.

❒ Lay the tape into the wet stripe of **Poly-Brush**. It should immediately soak up into the tape. Wipe the brush dry and use it as a tool to press the tape into the stripe of **Poly-Brush**. The dry brush can also be used to work out any big bubbles. Work fast and get the brush out of there before the **Poly-Brush** starts to dry. If you fiddle with it too long, you'll leave noticeable brush marks.

"OH NO! There are bubbles around the rib laces! I can't get all the air out! It didn't form down over those areas! Before I could work them all out, the Poly-Brush dried!"

Don't panic. This is perfectly normal. What appear to be air bubbles over the rib laces (or rivets or screws) are really the natural fairing tendency of the tape as it angles off the protrusion of the lace. You'll never get all these faired areas perfectly cemented down in the **Poly-Brush**. People go to great lengths to try to get these "bubbles" out, but to no avail. Don't worry about them. When the silver **Poly-Spray** covers them later, you'll never know they were there.

What *is* important is to make sure that you have at least ⅜″ to ½″ of the edge of each tape firmly wetted out and cemented with Poly-Brush.

From the pinked edge in, the first ½″ of the tape should look pink and well attached with no dry areas or voids.

You'll always have some wrinkles or bubbles in tapes when you apply them. Don't worry, they will ALL come out later with heat from your iron.

Don't fiddle around with small wrinkles or bubbles in the wet tapes. You're bound to leave brush marks. We'll fix them all later with the iron.

As the Poly-Brush dries, it'll no longer look uniformly pink under the tape. **Poly-Brush** dries with a mottled, splotchy look. Perfectly normal. If you started with a really wet layer of **Poly-Brush**, you did it right.

❒ As you did on the top, brush a very wet stripe of **Poly-Brush** onto the previously precoated areas, unroll the tapes, and apply them to the bottom of the wing.

❒ Also as with the top of the wing, lay the tape into the wet **Poly-Brush**. Use the brush to press the tape into the **Poly-Brush**. Work fast and get the brush out of there before the **Poly-Brush** starts to dry.

You may notice some wrinkles in the tape as it wraps around the leading edge. This is really quite apparent on tapered-wing aircraft. Again, don't fiddle with them now. The iron will smooth them out later.

TWO-PIECE FINISHING TAPE

A two-piece tape is butted together at the leading edge.

❒ The easiest way to do this is to apply all the tapes on one side with a bit of overhang at the trailing and leading edges. A good guide for the overhang at the leading edge is your old wing center chalk line you used when you applied the wing fabric. Apply the tapes so they are cemented slightly past this line with about an inch of dry tape overhanging to use as a handle.

❒ Trim the tapes on the wing center chalk line with a fresh straight razor. Remember, hold the razor firmly on the line, and pull the tape into the blade. **Don't slice with the razor or you'll cut the fabric below!**

❒ When you apply the tapes on the other side of the wing, trim them the same way. This neat butt seam will never show when the leading edge tape is placed over it.

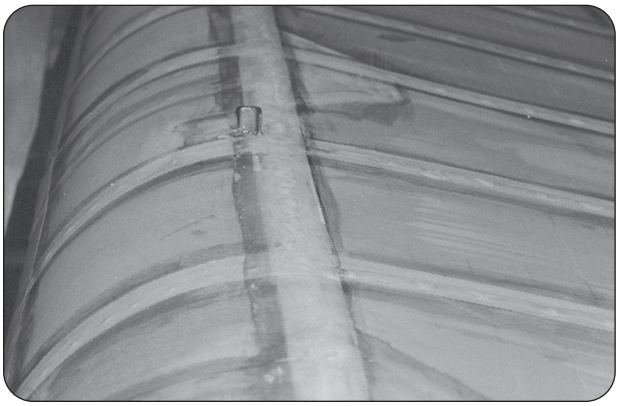
❒ Trim the trailing edge tapes by cutting them off flush at the trailing edge when they are dry.

❒ After 30 minutes or so, when all the tapes are dry, brush another coat of 3-to-1 thinned **Poly-Brush** over them. Watch out for brush marks, and be especially careful not to let noticeable edge build-ups of **Poly-Brush** occur. Feather out **Poly-Brush** edges with the brush before they dry.

Span-Wise Tapes

The long tapes over the leading edge, trailing edge and spars go on next.

Here's a span-wise tape installed along a spar.



❒ First, smooth out all imperfections where the long tapes will lie with a **225°** to **250°** iron. Glue lumps, fabric wrinkles, and other ugly spots will all iron out with enough patience and pressure from the tip of the iron. Don't get lazy here and decide that since another tape is applied over imperfections that they won't show. Trust me! They most assuredly will. Now is your chance to get them out!

Long tapes should never be aligned by eye. Use a chalk line. Straight tapes are the trademarks of good workmanship.

❒ **Pre-coat** and apply long tapes just like all others. Brush an additional coat over them when they're dry.

Leading edge tapes are **Poly-Brushed** to the wing in two operations.

❒ Precoat the leading edge with your thinned **Poly-Brush**, making a nice wet stripe that extends 2″ above the center line and 2″ below it. Your 4″ finishing tape will be set into this stripe.

❒ When the **Poly-Brush** dries, snap a fresh chalk line along the leading edge, 2″ above the center line.

❒ Brush more **Poly-Brush only** onto the area between the center line and your new upper chalk line. Leave the area below the center line dry. If you're working by yourself, do only 2 or 3 feet at a time. Don't rush. Remember, Leroy's gonna sight down every one of your tapes!

❒ Align the upper edge of the tape with the new chalk line as you work it into the wet **Poly-Brush**.

NEVER USE AN IRON HOTTER THAN 225° ON A TAPE! Tapes are raw fabric and are not pre-shrunk. If you so much as touch them at 250 degrees, they will shrink about 5%. The end result will be a curved tape. Ugly.

❒ When the entire upper half of the leading edge tape is attached and

dry, heat-form the tape by rolling it around the leading edge with a **225° iron,** working the lower half into the **Poly-Brush** precoat.

❒ Apply a wet stripe of **Poly-Brush** to the lower leading edge. Work the tape you just heat formed into the **Poly-Brush** with a dry brush.

❒ Finally, brush another coat of 3-to-1 thinned **Poly-Brush** over the entire tape. Watch out for brush marks, and be especially careful not to let noticeable edge build-ups of **Poly-Brush** occur.

The trailing edge tape is installed in the same manner, using a chalk line to keep it nice and straight.

Bias Tapes

Let's put a bias tape over the curved wingtip bow.

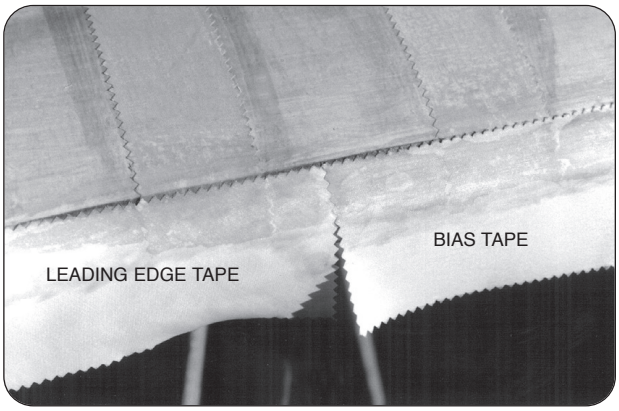
We'll assume you used a 4″ tape on the leading edge and a 3″ tape on the trailing edge.

Remember, a bias tape shrinks about a third when it's pulled. So to plan professional join-ups with the leading and trailing edge tapes, do it this way.

Start by overlapping or butting the leading edge 4″ tape with a 4″ bias tape. When we pull the bias, it will shrink to about 3″ to match the 3″ trailing edge tape.

❒ Roll out enough bias tape to curve around the entire tip bow. Bias tapes have sewn seams about every 5 feet, so cut your tape off the roll right after a sewn seam to give you a full 5 feet before another seam appears. Lay the bias tape out on the workbench, and **with a pencil** draw an exact centerline along its entire length.

❒ Without pulling on the bias tape, apply **Poly-Brush** to the first 3″ or so of the tape where it will meet or overlap the leading edge tape. Match these tapes very carefully.



❒ Line up the pinked edges of both tapes on either the top or bottom of the butt seam, since it probably won't join perfectly on both top and bottom surfaces. Pick the side you want to be perfect. On high-wing airplanes it will probably be the bottom half, since that's the edge that always shows.

❒ Clamp the **Poly-Brushed** area of the bias, or hold it with your fingers until

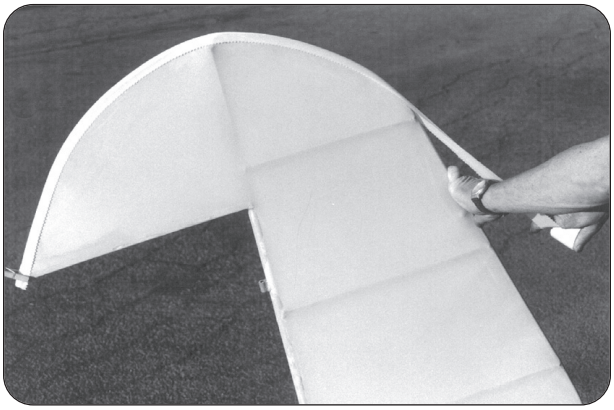
the **Poly-Brush** sets and it stays in place. Roll the extra bias up, or drape it over the wing while the first 3″ dries.

When it is really dry (give it an hour to be safe), you are ready to pull the bias around the tip bow. Bias tapes need to applied all at one time, you can't pull only short sections of the tape. So you'll have to work fast.

❒ Pre-coat as always. When dry, apply a really wet coat of **Poly-Brush** around the whole tip bow. Work fast, but be neat.

❒ Now pull the bias around the tip bow. This photo actually shows a bias tape being pulled around the top of a rudder, but the idea is exactly the same.

Use the pencil centerline to keep the tape centered on the bow. Keep pulling until you have no wrinkles and the tape lies perfectly flush. If you let the pencil center line slip up or down on the bow you'll have more tape on one side than the other.



The 4″ bias should pull down to about 3″ to match the trailing edge tape.

Different Surfaces

When you have to attach tape to two different surface types, such as over fabric and a metal gas tank, use **Poly-Tak** under the tape over the metal, and **Poly-Brush** under the tape over the fabric.

Aircraft with Big-Engine Modifications

If you are taping an aircraft with a big engine mod, you should consider some alternatives. Remember that the fabric on a 180-horse Super Cub is structurally not much different than a 65-horse J-3, and that fire-breathing Super Cub is going to create a whole lot more slipstream vibration than the J-3. Increased vibration can cause early paint cracking problems.

You can prevent early paint cracking by using wider tapes in the slipstream area or, in some cases, double taping.

If you have any questions about your specific hot rod, call us at the factory before you tape. We can give you some suggestions to prevent early paint cracking.

Sun Shrinking

If you plan to paint your airplane black, olive drab, or any really dark shade, you may have a real problem with the tapes shrinking in extreme temperatures when left outdoors. Remember, tapes are made from raw fabric with no pre-shrinking. Lightweight tapes are particularly susceptible to this if they don't get enough **Poly-Brush** when applied.

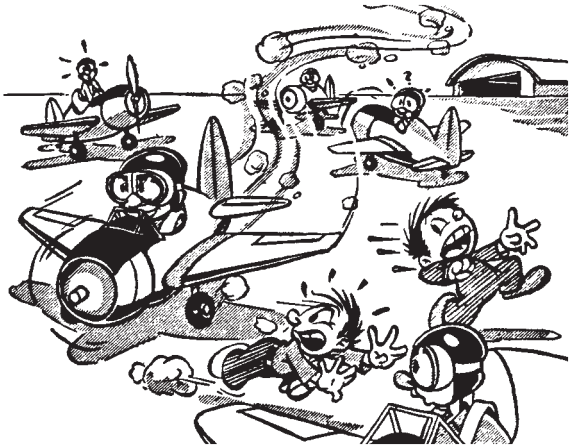
The dark shades of paint can generate skin temperatures as high as 210° on a

desert ramp. This is not a big problem in Boston, but if you live in Phoenix, pay attention. Light colors don't have this problem.

The best prevention is to use plenty of Poly-Brush when you apply the tapes. Pre-coat, apply with ample **Poly-Brush**, then apply another coat over the top. This usually keeps the tapes where they belong for their entire service life, no matter what color you paint your airplane.

Another trick is to pre-shrink the tapes at 250° before you apply them. You only need to do this for surfaces exposed to direct sunlight, and it is probably overkill, but you are going for perfect, right? Tension the tapes by clamping them to the workbench and iron them over smooth cardboard. If you don't tension them while pre-shrinking, they'll wrinkle and deform.

OK... back to work.



Drain Grommets

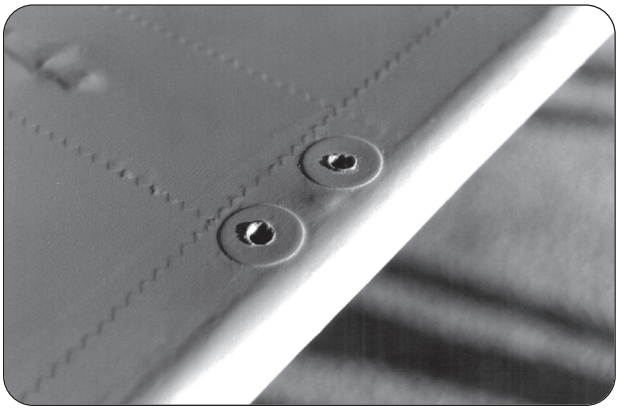
Airplanes get water in them, and that water needs to get out. Rain and condensation can introduce significant moisture into a tube and rag airplane.

Each bay of a wing, tail feather, or fuselage must be allowed to drain. Look at the structure and think about where water will collect. Common sense will tell you where the drains should go. Put a drain hole at the lowest point of each collection bay on the bottom of the surface. Most wings, for instance, will have a drain next to the outboard side of a rib at the trailing edge in each bay. Some wings have a drain hole on each side of the rib at the trailing edge.

Drain holes need to be at least ¼″ in diameter. They are usually reinforced by cementing a drain grommet directly over the fabric then cutting or melting out a hole.

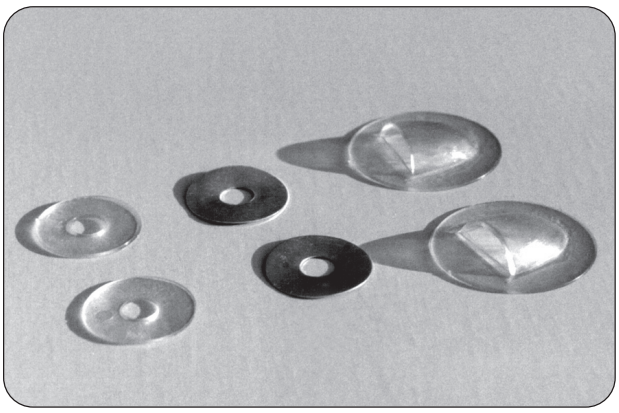
Use only **Poly-Tak** cement to apply drain grommets.

You can make a mini-doily about 2″ in diameter called a dollar patch, and apply these over the drain grommets. Cut them out with pinking shears.



This is a good idea in propwash areas. Melt out the center with a soldering iron when the dollar patch is dry over the drain grommet.

Drain grommets come in three types:



1. **Plastic grommets**. These glue well, but can get brittle over the years.

2. **Aluminum grommets**. These have the longest service life, but need dollar patches in propwash areas.

3. **Seaplane grommets**. These are plastic and have a little vented hood over them that helps siphon water out. To install them, melt the hole FIRST, then glue on the seaplane grommet. PLACE THE OPENING AFT! If you use dollar patches, be sure to cut holes for the vents.

Our STC allows for melted holes alone with no drain grommet. The only stipulation is that the melted drain hole needs to go through TWO LAYERS of fabric, that is, fabric with a tape over it. Handily, most of the areas you want to place a drain hole have tapes over them. Use a metal drain grommet as a melting guide to insure a smooth, even hole.

Heat Smoothing

Here's where the REAL advantages of Poly-Fiber vinyl coatings show up.

LEROY SAYS you need to buy at least a gross of sandpaper to have a good dope and fabric job. NOT SO. You can do gorgeous work in preparing your Poly-Fiber covering job for a big trophy at Oshkosh with an iron, and skip lots of sanding.

This is different from nitrate/butyrate dope jobs. You can only do so much to dope with an iron, You have to sand away imperfections. But in the Poly-Fiber system, both the fabric and the vinyl **Poly-Brush** are affected by heat. The iron's heat replaces most of the sanding.

YOU CAN'T SAND POLY-BRUSH! It's too rubbery. If you *must* sand, you have to wait for the silver Poly-Spray, which is sandable.

Dried vinyl products, like **Poly-Brush** and **Poly-Tak**, start to soften at about **200°**. That means you can soften drips, glue bumps and runs at this temperature. You can actually iron out a dried **Poly-Brush** drip, or you can soften a lump of **Poly-Tak** under fabric, and iron it smooth.

If you turn the iron up to **225°**, you'll have enough heat to heat-form the fabric, as well as soften the vinyl products. **So 225° is the magic temperature to fix all imperfections.**

Use both the big and little iron for this process, but MAKE SURE THEY ARE CALIBRATED!

WARNING! IF YOU USE ANYTHING HOTTER THAN 225°, IT CAN SHRINK AND DEFORM YOUR TAPES!

With both irons, smooth out every imperfection you can find. Use lots of pressure. The tip of the big iron really does good work if you press HARD! The little iron is handy for hard-to-reach places. You should spend a couple of hours on each side of the wing. When you think you have caught all imperfections, and it feels really smooth, go over it all again.

You can fix almost any blemish with an iron, something you can't do with any other system, so you should take full advantage of it. If you rush through this now, you'll kick yourself for years to come.

Imperfections You Should Fix

❒ **Wrinkles.** Press with the tip of the iron really hard. Even those little crease wrinkles can be smoothed out. Soften them up with a little MEK. When the MEK has evaporated, go at them again with the tip of the iron.

❒ **"Bubbles,"** or areas in tapes and fabric that don't appear to be well stuck down. **225°** does two good things to bubbles. First, it shrinks those fabric bubbles until they're flat. Second, it re-softens the **Poly-Brush** under the bubbles. When the **Poly-Brush** re-dries, it cements the bubbles down. A bubble always looks much lighter than the pink-looking areas of fabric around it. Once you use the iron on the bubbles, they will be as firmly adhered as any pink area; they just won't have the same color.

Test it with your finger after you iron it flat. It should be firmly stuck down. Remember, don't worry about the natural fairings around rib laces. They only look like bubbles. Don't waste your time ironing them; you will never see them when the silver **Poly-Spray** is applied.

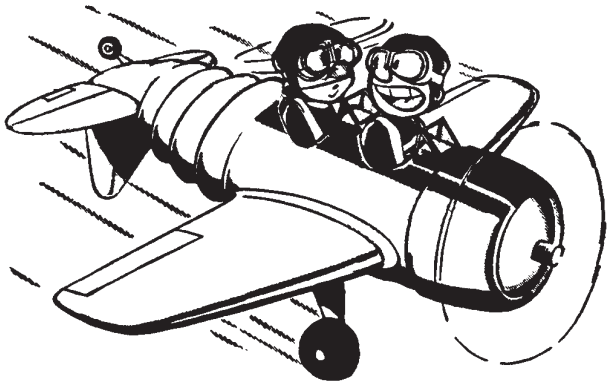
❒ **Lumps. Poly-Tak** sometimes balls up into lumps when it dries off the brush as you apply it. Use heat and pressure to re-soften and smooth out the lumps left from the cementing stages.

❒ **Curled Up Pinks On Tapes.** Pinked "ears" will often curl up when the **Poly-Brush** dries. Iron them flat with the **225° iron**. They will heat-form right into the softened **Poly-Brush** below, and lay flat and smooth. Iron them now and you won't have to sand them later. Go over EVERY tape for a nice job. Let your fingers tell you when they are nice and smooth. REMEMBER, **NO MORE THAN 225° ON TAPES OR THEY WILL LOOK LIKE COKE BOTTLES.**

Some Other Tricks

If you were sloppy with the **Poly-Brush** and have a lot of dried drips or runs, use some reducer on a rag to wipe them off now. You can do the same to level really big ridges of **Poly-Brush** next to the tapes. Don't use MEK; it is a bit too powerful and could take off all the underlying **Poly-Brush**. Be careful how much reducer you use and how hard you wipe. You could wind up plowing rag marks into the surface if you get too aggressive.

Do all the heat smoothing you possibly can now. Once we start spraying, it'll be too late. Don't rush! This is your opportunity to do it right.



Snap rolls! Ya like 'em?

6. Control Surfaces & Fuselage

Ailerons

Ailerons are really just little wings, so nothing is different, except that their narrow width gives you the option to use one piece of fabric instead of two.

Start by cementing the fabric to the trailing edge. Then wrap it across the bottom, all the way around the leading edge, and back to the trailing edge. Cement it with a 1″ overlap at the trailing edge, as you did on the wing itself.

You don't need to cement the fabric to the leading edge; there's no seam. The fabric will be plenty stable when you heat shrink it and apply a coat of **Poly-Brush**. You'll find that the **Poly-Brush** will soak through the fabric on the leading edge and produce a cementing effect similar to **Poly-Tak**.

Tailfeathers

Elevators, rudders, and stabilizers are covered the same basic way you covered the wing, except you'll use **1″ fabric-to-fabric overlaps** everywhere.

Most tailfeathers are made of tubing. Most of these tubes are ¾″ or thicker. All overlaps will be done over this tubing. Depending on the width and shape of your tailfeathers, you can cover them with one piece of fabric or two. We'll discuss using one piece of fabric for each tailfeather part. Using two pieces is done just the way you did the wings.

Let's Take It Step by Step

Each of the tailfeather components has a straight edge with hinges sticking out from it.

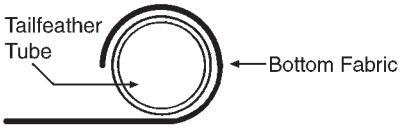
We'll use an elevator as an example.

❒ Start by laying out flat on a large work table enough fabric to cover the elevator. Rest the elevator on its straight hinge edge in the middle of this fabric, with its trailing edge sticking straight up in the air. The idea is to make a "clam-shell" of fabric that will close over both sides of the elevator, pivoting on the leading edge tube. Using a **soft lead pencil,** carefully mark the hinge areas onto the fabric.

❒ Remove the elevator, and make small cuts in the fabric at the marked locations to allow the hinges to stick out through the cuts. This allows the fabric to lie flat along the leading edge tube. Cement the fabric to the leading edge tube.

❒ **Heat-form the bottom fabric around the tube** before you cement

it, providing *at least* a 1″ overlap area, exactly as you did with the wingtip bow. Doing the bottom first will leave the trimmed edge of the top fabric down low where it won't show as much later.



Remember to leave about an inch slack in the fabric.

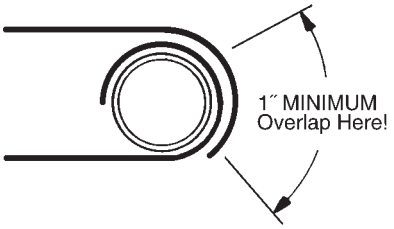
❒ **Brush Poly-Tak onto the tube** where fabric will attach, then lay the fabric into the wet cement. Use your finger to **force the cement up through the fabric** until it wets out the surface. Make sure it penetrates the fabric. If you can, form and cement the fabric even further into the inside of the tube, as the illustration shows. This way, even more of the seam will be hidden.

❒ **Trim this seam neatly** with straight lines and no ravels. Clean up any excess **Poly-Tak** spills or oozes with MEK.

❒ Once you have one side heat formed, cemented, and trimmed, smooth up the cemented area with a **250° iron.**

❒ Heat-form the top part of the fabric around the tube and cement it as shown in the next drawing.

Don't forget! A Poly-Tak bead works well before trimming your cut line.

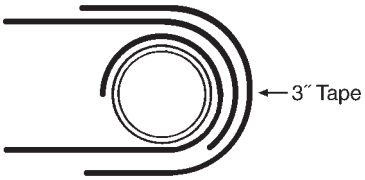


Leave at least a 1″ overlap over the first piece.

❒ **Trim** this seam neatly with sharp scissors. Don't use the razor blade here. There's too much chance of slipping and cutting the layer of fabric beneath. Make your trim cuts nice and straight with no raveled edges.

❒ **Cement** the top fabric into place. Clean up any excess **Poly-Tak** spills or oozes with MEK.

❒ **Cover the overlap with 3″ tape. Use bias on curved areas.**



Again, pre-coating is the secret to adhesion. Before you lay on any tapes, brush a **stripe of Poly-Brush** over the area where the tape will be applied. Use a 2″ brush. Make sure you don't leave a ridge of **Poly-Brush** at the edges. **Let this dry for 15 minutes.**

When your 3″ tape is ready to install, **brush a very wet stripe of Poly-Brush** over the pre-coated area. Don't skimp on the **Poly-Brush**. Work quickly. You may find it best to work in sections, applying only

as much **Poly-Brush** as you can get the fabric into before it dries.

Lay the tape into the wet Poly-Brush. Wipe the brush dry and use it as a tool to press the tape into the stripe of **Poly-Brush**. The dry brush can also be used to work out any big bubbles. Work fast and get the brush out of there before the **Poly-Brush** starts to dry.

Fuselage

You absolutely need some safe, reliable means of turning the fuselage while you're covering it. Sawhorses aren't recommended for this, especially if you're going to use an envelope. More about this later.

Build this handy fuselage turning jig we showed you earlier in the manual. As you can see, it's just 2-by-4s, and it bolts right to the firewall. It can be turned to give you access to all sides of the fuselage. Use this jig with a padded sawhorse to support the tail.

There are two main methods of covering your fuselage – the **blanket** and the **envelope**. We'll discuss both.

Option One: Blanket Method

The term "blanket" simply means a rolled-out length of fabric. It can be all one piece, or two or more pieces **sewn** together.

Once again, you'll use the same basic procedures you used on your wings and controls to cover the fuselage. But unlike the wings and control surfaces, there are wide variations in fuselage designs, and that calls for careful planning if you're going to use the blanket method.

Think of the fuselage as a series of flat planes. After all, to this point, that's pretty much what you've been covering on the rest of the airplane.

The basic idea is to cover those flat planes by rolling out fabric in a series of blankets joined by 1″ overlap cemented seams. Since a fuselage is usually made of tubing, most of your seams will be done exactly as was described in the tailfeathers section.

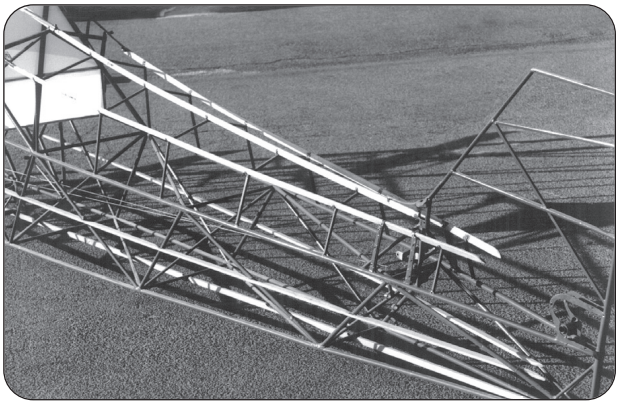
There are some constants to keep in mind when you make your plan:

1. The fabric is **70″ wide**. That is the maximum "reach" of the fabric you have to play with.

2. The fabric can only be joined with a cemented seam **over structure.**

"Structure" in a fuselage is defined as longerons or cross tubes only. Formers and stringers don't count.

Look at this uncovered J-3 fuselage.



Notice the three wooden stringers on the top of the fuselage aft of the cabin. You can't create cemented seams over those stringers.

So you'd get out your tape measure and see where 70″ fabric would reach between real structures, in this case the longerons. It turns out that there are four longerons stretching down the longest part of the fuselage in a box structure. Cutting to the chase, you would plan to cover the fuselage in three main sections: the top and two sides – from longeron to longeron. A separate belly piece should be attached first, wrapping around the two lower longerons.

Luckily, some airplanes have a real structure tube running right down the spine of the fuselage from the cabin to the vertical fin. That makes it easy. Here you can start with a 1″ overlap over the spine tube, and then use two 70″ pieces of fabric, one for each fuselage side.

These two pieces drape from the center spine tube down each side, and wrap around the lower longerons. So much for planning. Let's talk about some unique things about cementing fabric to a fuselage.

Imagine that you're installing a piece of fabric straight down a slab-sided fuselage. You roll out the fabric, clamp it in place, and begin gluing.

But where do you start? You start at the front, and work aft. You begin cementing at a cross tube up by the firewall, or perhaps where the boot cowl will end. The way you cement fabric to this tube is different and critical. Here, it is impossible to have a fabric overlap. There will be nothing to overlap it with. You are at the start point, so this cement bond has to be extra strong.

To make it so, scuff-sand the primer or paint, then **pre-coat** the tube with one coat of **Poly-Tak** and let it dry. Then **heat-form** the fabric carefully around the tube to get as much fabric as possible wrapped around that tube. Trim and cement it.

Use this procedure for all your front tube starting places. In fact, you should pre-coat all longerons and tubing that will have a wrap-around bond.

Sometimes, you must start front-end cementing on some fairly lightweight fuselage structures, not on nice thick tubes. For example, you might have to begin with the channel that holds the windshield, or in a skylight well. **Make absolutely sure you get a good strong**

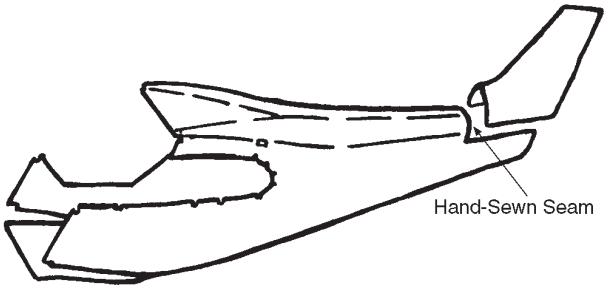
bond on these top cabin structures. After all, the slipstream will be constantly trying to peel away these areas. And if the fabric peels here in flight, it can give you serious control problems by blanking out the elevators. No fun at all.

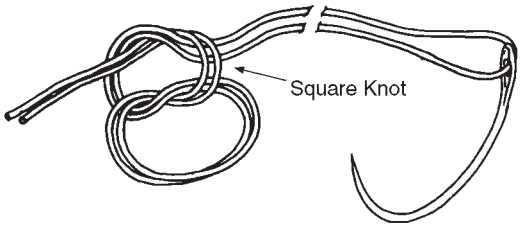
Many airplanes have mechanical attachments for the fabric in these areas. If so, replace them exactly as they were originally manufactured.

Sometimes You Have to Sew

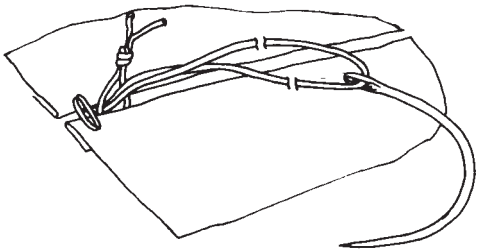
There are times when a cemented seam won't work. Our J-3 is a good example. After you cover the fuselage with overlapping seams over the long-erons, you still have that big fin sticking up at the tail. It's easy to cover the fin with two separate pieces of fabric with cemented seams. But what about where the fin fabric joins the fuselage fabric? There's no structure under that seam, so you can't cement it. It has to be sewn, and usually requires a hand-sewn seam.

Sewing it is no big deal. Use a curved needle and doubled **Poly-Fiber hand sewing thread.** Pin the fabric together first with T-head pins, then sew as shown below. Remove the pins as you close the seam by sewing.

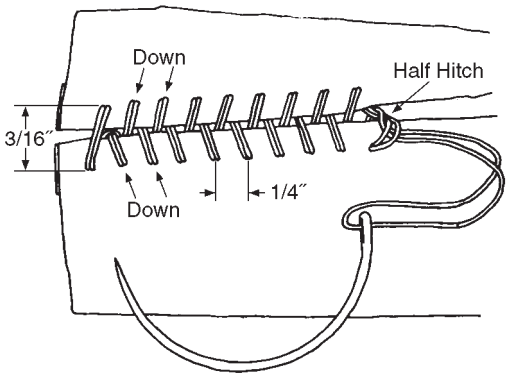




❒ First, tie the thread ends together in a square knot.



❒ Then make one stitch from bottom, to top, and back to bottom. Pass the needle through the tied loop.



❒ Push the needle down through the lower piece of fabric, up through the space between the two pieces, and then down through the upper piece. This is called the "baseball stitch" for obvious reasons.

❒ Every ten stitches or *less*, work out the slack and secure the seam with a half-hitch. The end of the seam is tied off with two half-hitches in opposite directions, forming a square knot, topped with a single half-hitch.

Sewn seams are reinforced with a minimum 2″ tape, centered over the seam.

Option Two: Buy a Fuselage Envelope, or Make Your Own

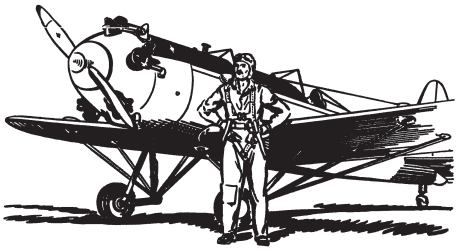
An envelope is just a big "slip cover" or "sock" that has one end open so you can slip it over the fuselage.

Many people make their own envelopes or partial envelopes for all aircraft components. If you have a sewing machine that can handle **Poly-Fiber machine sewing thread,** you can sew your own envelope. See the appendix on sewing and envelopes.

Most people, however, buy a commercially made envelope. These envelopes are available from most Poly-Fiber distributors. Fuselage envelopes are made from time proven patterns and usually fit pretty well. Most have that "extra inch" of fabric built in to allow for shrinking.

If an envelope doesn't fit, it's usually a problem with the fuselage, not the envelope. Over the years, a fuselage may be repaired many times after damage. If it's not welded or repaired in a jig, its dimensions and alignment can change significantly.

You start by turning the envelope **inside out** so the sewn seam is hidden. Then you slip it on and clamp it in place. The front is wrapped and cemented to front structure using the pre-coating method described in the blanket method.



The envelope may have a separate belly piece. If so, the the belly piece is installed first with 1″ overlaps. This way, the edges of the envelope fabric are hidden underneath the fuselage.

Now that you have read about fuselage covering with both envelopes and blankets, the decision is yours. We find, however, that well-made commercial envelopes for fuselages are almost always time savers compared to piecing the fuselage together with the blanket method. They cost more than using blankets, but the result is clean and professional.

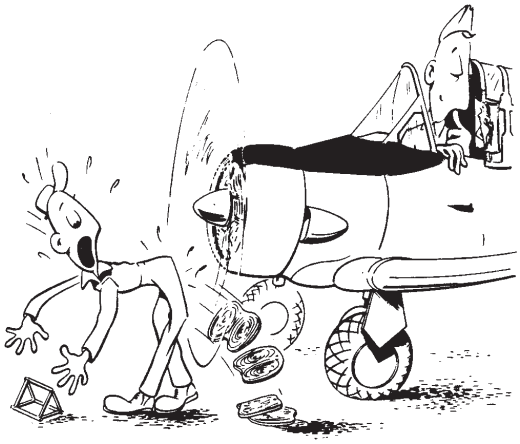
Final Steps!

Now that your control surfaces and your fuselage are completely covered with fabric, there are some more steps to complete before it's time to crank up the spray gun.

- Heat tighten all the fabric, just as you did on the wing.
- Cut the fabric to accommodate any protrusions.
- Brush on the first coat of **Poly-Brush.**
- Apply any reinforcing tapes needed.
- Do any rib lacing necessary.
- Install inspection hole reinforcements and drain grommets.

- Apply finishing tapes and gussets.
- Spray on two more coats of **Poly-Brush**.

These steps are all done exactly the way you did them on the wing. See now why we took you all the way through the wing first?



When running engine up to high power, be careful to have stick back and brakess applied.

Notes

7. Spraying Poly-Brush

First Spray Coat of Poly-Brush

Ok, the hard work is done. Once you have everything cemented, laced, and ironed, then it's just you and your spray gun.

Go back and review the information on spray equipment. Whether you are using a compressed air system or an HVLP setup, make sure you have a professional, capable system to spray your airplane. You need a rig that is easy for you to operate, easy to keep clean, and easy to understand.

Everything you do now will be in the public (and your) eye forever. It's not time to spoil all your good work with a cheap spray rig, or one you don't know how to use.

Learning to Spray

It never ceases to amaze us how many people pull the trigger on a spray gun for the first time in their lives when it's *pointed at their pride and joy airplane project!*

Most folks never even think about practicing. It looks like it's so easy... and so much fun!

We strongly suggest you practice first. Get some cardboard boxes, old interior wall paneling, an old door, anything. Practice on them before you even think about spraying your airplane. Invest in an extra quantities of whatever you are about to spray, with its proper reducer. Learn on the old door, not on your wing. Watch how it sprays, how it flows out, how it dries. See what it takes to make it run on a cardboard box. Then practice applying it lightly so it doesn't run.

Learn everything about your spray rig, particularly how to clean it. Practice with its adjustments while it is pointed at a cardboard box.

Experience has shown us that the builder/owner of an airplane can do a much better job spraying his own project than almost any "expert." Even professionals can ruin jobs. Most professionals, particularly auto body men, are used to only one or maybe two paint systems. They probably know nothing about your paint, and may have never sprayed anything like it before. Often, they see dissimilarities as problems, and don't take time to read or learn how to use the "airplane" paint right. They also want to get your airplane in and out of their shop fast. There isn't time for them to learn something new or troubleshoot.

The builder, on the other hand, has plenty of time and a deep desire to do a good job. That's what makes homebuilders or restorers unique. **So we encourage you to paint it yourself**.

Look at the cost, too. Even if you have to buy a complete spray outfit, it will probably cost you less than what a professional is going to charge you, and when your airplane is painted, you get to keep the equipment and your new painting skills. Even complete HVLP systems are a bargain compared to a professional's fee.

You only need two things to be a good painter. The ability to read directions, and the wisdom to practice.

How long should you wait between sprayed coats?
As a rule of thumb, try to spray only two coats a day of any product: **Poly-Brush, Poly-Spray**, or any of the topcoat paints. Under the best of circumstances, this would be one coat in the morning, one in the afternoon. This allows the solvents in the sprayed coats time to evaporate. Yes, you can "ram it and jam it" with multiple coats one right after the other as Leroy recommends, but this almost guarantees problems; as solvents accumulate without ample drying you get wrinkling, splitting, cratering, etc.

Plan your work so you have multiple parts ready for spray at the same time. Two coats a day on multiple parts is efficient and moves you through your spraying with ample drying time and minimum problems.

If you need more help or encouragement, call us at 800-362-3490. We will tell you more and help you head off problems before they occur.

OK... back to work.

Prepare the Poly-Brush

❒ Start by straining the **Poly-Brush** with 60x48-mesh paint strainers. These are finer mesh than hardware store strainers and are optimized for our products. Poly-Fiber paint strainers are available from all of our stocking distributors.

❒ Thin the **Poly-Brush** three parts **Poly-Brush** to one part reducer. If you are spraying in "normal" temperatures (below 85°), then use the **R 65-75 Reducer**. If it is hot, use **RR 8500**.

DON'T SPRAY IN DIRECT SUNLIGHT! The sun will elevate the surface temperature and make the product dry too fast.

DON'T SPRAY IN THE WIND! You'll pick up all the trash in the world. You can also overcool the drying product.

DON'T SPRAY BELOW 55°! You might have to wait till spring for it to dry.

DON'T SPRAY ABOVE 95° OR IN HIGH HUMIDITY! If you do, you will need to add BR-8600 Blush Retarder. See the info on Blush Retarders in the painting chapter for a full explanation.

OK... Now Start Spraying!

❒ Start by spraying a **medium coat**. The idea is to spray an even, level coat of **Poly-Brush** over the whole surface.

❒ Wait at least **two hours,** then spray another coat. This time put on enough product to look wet and shiny. **WATCH OUT! TOO MUCH WILL RUN.**

Keep some reducer and a brush handy. If you get runs, lightly brush them out with reducer while the surface is still wet. Don't wait too long, or you will leave brush marks.

Poly-Brush is pretty transparent and hard to see when you are spraying. For this reason, you must have a good light source, and you should **look into the glare** of that light to see how heavily the product is going on. If you look straight at the sprayed-on **Poly-Brush** without looking through the glare, you won't be able to tell what you are doing.

A good coat of **Poly-Brush** will look wet and shiny on application and will have a deeper pink color than the brushed-on first coat. When it dries, it will look plastic with a gloss.

TROUBLESHOOTING

"The Poly-Brush sprays filaments like "cotton candy" or dries rough and dry."

Excessive heat or inadequate thinning is causing the **Poly-Brush** to dry before it hits the surface. Make sure you reduced it three to one. Add two ounces of **BR-8600** Blush Retarder per quart of reduced **Poly-Brush**.

If you're using an HVLP system, make sure you add another length of hose. HVLPs can produce high temperatures that dry the product before it hits the surface you are spraying. Another 25 feet of hose will cool down the air before it gets to the gun.

If you live in Phoenix and it is August, try again in the cool of the morning.

"It ran! What do I do now?"

While spraying, keep some reducer and a brush around. If the run is still wet, quickly brush it out. If the run dries, wipe it off with some reducer and a rag, but be careful not to plow the surface with rag marks. Respray over the wiped area. Forget about sanding it. YOU CAN'T SAND POLY-BRUSH. IT'S TOO RUBBERY.

"I have pinholes in the tapes and over the leading edges."

See the section on pinholes in the **Poly-Spray** section. These pinholes were caused by insufficient filling of the fabric or tape weave. In other words, you didn't use enough **Poly-Brush** in the initial brushed-on coat. Spraying in direct sunlight can also help cause pinholes.

To fix them at this point, rub with a soft cloth and some reducer. The rubbing action will soften the **Poly-Brush** and force it into the unfilled weave. Re-spray with **Poly-Brush** thinned 3 to 1 with 2 oz of **BR-8600** Blush Retarder added.

"Some of the 'ears' of my pinked-edge tapes popped up after spraying."

The solvents in the fresh **Poly-Brush** caused them to release from the **Poly-Brush** and curl up. Iron them back down with a **225° iron**. But be careful; you can

leave iron marks in the **Poly-Brush** at this stage if you use a lot of pressure on the iron.

Second Spray Coat of Poly-Brush

A second spray coat of **Poly-Brush** gives additional fill and flexibility to the job without adding excessive weight. This is the time to be sure that you have completely filled the weave, not when you are spraying **Poly-Spray**. Additionally, it further encapsulates the whole surface in a flexible, lightweight coating and helps keep tapes and gussets in place for years.

Spray the second coat of Poly-Brush exactly as you did the first.

If your part has been stored in the first brushed-on coat of Poly-Brush for a long time (a year or more), you will need to soften and open up the Poly-Brush before reintroducing additional coats. Wash the surface with 310 Alkaline Cleaner diluted in 20 parts water, then spray with Poly-Brush reduced 50:50 before adding the first sprayed-on coat of 3:1 Poly-Brush.

8. Poly-Spray UV Protection

Silver Poly-Spray Performs Two Important Functions:

1. **Most importantly, to block the UV rays of the sun.**

2. **To provide a sandable fill coat for the topcoat that follows.**

Let's Discuss the Effects of Ultra-Violet Radiation on Polyester Fabric.

Over the years, we've done extensive lab and practical testing to see how polyester fabric stands up to weather. Unlike cotton, polyester does not rot. The biggest danger to polyester is the UV radiation from sunlight.

If you hang a piece of raw polyester fabric outside for a year, **it will lose about 85% of its strength**. It will become fragile enough to poke holes in with your finger. If you leave it there long enough, it will fall apart.

On the other hand, if you cover that fabric with something that mechanically **blocks the suns rays** from getting to it, it loses no strength at all. The simplest and lightest way to block UV radiation is to spray the fabric with a coating of vinyl filled with aluminum powder… **Poly-Spray**.

The idea is to put on enough **Poly-Spray** to keep any light from shining through the fabric. When you have enough silver **Poly-Spray** to block the light, you have just enough to do the job. You can easily test this by holding a 60-watt light bulb on the outside, next to the fabric. Look through a cut out inspection hole and see if the light is blocked. If not, you need more.

Before you think you've got a great idea and stick that lightbulb inside the fuselage to check the Poly-Spray coating, use your head! Make sure the bulb is caged and protected. The inside of that fuselage is full of solvent fumes. If you should accidentally break the bulb, the dying filament will ignite those fumes and turn your newly covered airplane into a bomb!

We say that three cross coats of **Poly-Spray** is enough to do the job. However, if you do a lot of sanding, you might take off more than you should.

Whatever you sand off, you need to put back on to ensure UV protection.

How About Those Chemical UV Blockers?

You may have heard that you can skip the three cross coats of **Poly-Spray** by just adding a UV blocker to the topcoat paint. If it was that easy, that's what we would recommend for the STC system. Chemical UV blockers as additives are

only partially as effective as the mechanical "sheet of aluminum." Our real-world tests of UV blockers alone without any **Poly-Spray** shows that the blockers are much less effective than aluminum. In other words, if you skip the **Poly-Spray** and rely on UV-blocked topcoat paint, the fabric will deteriorate pretty fast.

LEROY SAYS just skip the silver coats and use black latex house paint. Black paint in general isn't a bad idea, but that paint will weigh the same as a couple of coats of silver, is incompatible with anything else, and will eventually delaminate and crack off. Bad idea.

You may note that we sell a UV blocker additive to go in our **Poly-Tone** vinyl paint. We did this for ultralighters who just couldn't afford the weight of three cross coats of **Poly-Spray**. But we want you to know that UV blockers do not replace a silver barrier and only partially do the job.

We also sell clear **Aero-Thane** as an alternative UV blocking topcoat for ultralights. Clear **Aero-Thane** was designed to go over nylon sailcloth wing covers. It too gives you only partial protection from UV and is certainly not an alternative to **Poly-Spray**.

There is no free lunch!

If you are covering a ultralight or a microlight, we suggest a little compromising. Apply what ever **Poly-Spray** you can on the top surfaces, and use a UV blocker in the final paint. But try to get *some* silver between the airplane and the sun. Perhaps you could leave off the full IFR panel, GPS, moving map display, and HUD from your ultralight. That should save enough weight to put on some silver. Because without silver, fabric deteriorates real fast, even if always hangared.

OK... back to work.

Get Ready to Spray

Poly-Spray is always thinned, four parts **Poly-Spray** to one part reducer. Use **R 65-75 Reducer** in normal temperatures, and **RR 8500** above 85°.

Observe the same spraying rules you did with **Poly-Brush:** out of the sunlight, out of the wind, and between 60° and 95° in the lowest humidity the season allows.

The basic plan is to **spray two cross coats** of **Poly-Spray**, sand them, then follow with **one last cross coat** of **Poly-Spray** which is *not* sanded.

"What's a cross coat?"

A cross coat is one pass of the gun north-south, followed by another pass of the spray gun east-west. The direction really doesn't matter as long as it's two perpendicular passes, but as you can see a cross coat is really two coats of paint.

So when we recommend a total of three cross coats of **Poly-Spray** you are really making six passes, putting on six coats.

THREE CROSS COATS is what it takes to block UV. If you do much sanding after putting on two cross coats, you'll have to spray back what you sanded off.

What Does All This Stuff Weigh?

When we talk about spraying three cross coats of silver, everybody suddenly wants to calculate weight and balance. Relax.

Years ago, we stripped the Grade A cotton and dope off a J-3 Cub and weighed it. 75 pounds. When we re-covered the Cub with our medium-weight fabric and put on eight coats of Poly-Fiber, we got a total covering weight of about 60 pounds. So the Poly-Fiber system is a weight saver, even with three cross coats of **Poly-Spray**.

The idea is to put on just enough to get the job done and no more. Three **Poly-Brush,** three **Poly-Spray**, two of either **Poly-Tone** or **Aero-Thane** paint.

LEROY SAYS a good fabric job is one where you can't see the weave of the fabric and tapes. He says you should keep on spraying until you have a slick surface. WRONG! If you do that, you can get your fabric job weight up to about 90 pounds or more in a hurry!

LeRoy forgets to mention that about three years from now it will all crack and look terrible. Save yourself a lot of trouble. Leave all that extra stuff in the five-gallon bucket it came in. If you want a slick smooth surface, consider a composite airplane. Fabric covered airplanes will *always* show weave and tapes when done correctly.

OK... back to work.

Mixing and Straining

The solids in **Poly-Spray** can settle in the can in as little as a month. This is perfectly normal for high-solids vinyl coatings. You must, however, thoroughly mix them back into suspension before you use the **Poly-Spray**.

Start by blading up the "mud" in the bottom of the can with a wooden stir stick. Don't use anything metal. If you scratch the lining of the can, you can start corrosion in the can.

Open the 5-gallon pail, blade up the mud, and put the top back on. Roll the pail down the street a couple of times to get it thoroughly mixed.

WARNING: Don't use your electric drill with a mixing attachment. The sparks from the brushes in the electric drill can ignite the solvent fumes coming off the paint. Not a pretty sight.

Better yet, put the **Poly-Spray** on a double-action paint shaker for 5 minutes. I know, you don't have one. But your local hardware store does. It's well worth the trip. If you don't get it back into suspension before you spray it, all the good stuff will be at the bottom of the can, not on the airplane.

You might never pass the lightbulb test for UV protection that way.

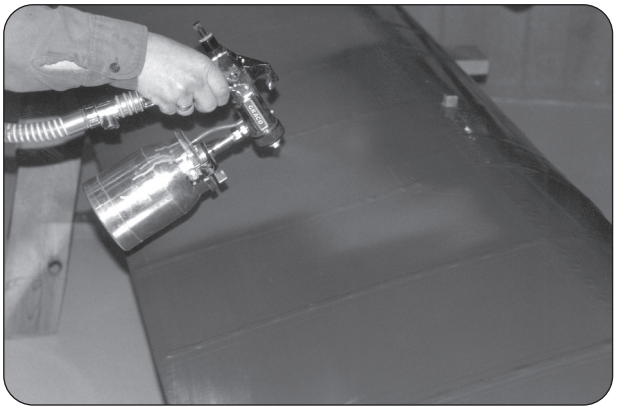
Strain the **Poly-Spray** through one of our 60 by 48 mesh paint strainers before you reduce and spray it. If you don't strain

it, the big particles of silver will go right through your gun, requiring unnecessary sanding.

Don't go wild with straining. You don't need to strain it through anything finer than our 60 by 48 mesh strainers. If you use any finer mesh, you'll strain out all the silver!.

1st Coat of Poly-Spray

Spray **Poly-Spray** the same way you sprayed the **Poly-Brush.** You'll notice that this silver stuff is much easier to spray. You can see what you're doing. Take care, though, not to get fooled looking directly at the silver, continue to find the glare in the liquid to see how wet you're putting it on. Spray the east-west part of the cross coat, then go immediately north-south.Unless you're in a great



rush to get your beauty to Oshkosh, don't try to do everything in one day. A maximum pace is one cross coat in the morning, one in the afternoon. Pushing it more can give you problems overloading the fabric and tapes with solvents. After all, it takes time for the solvents to evaporate. If you push it, you invite pinholes and delaminated tapes. If you only spray one cross coat a day, or a week, that's fine.

If you have to pause for a week or so between coats, no problem. If you go a month or more, lightly sand the silver **Poly-Spray** with 400-grit sandpaper. Or wash the surface with **Poly-Fiber 310 cleaner** diluted in 20 parts water, let dry and spray a light coat of pure **R 65-75 Reducer** to soften and open up the surface.

In Between Coats: Always wipe down the entire surface using a rag slightly damp with **C-2210 Paint Cleaning Solvent,** then let it dry for two hours to allow the solvents to evaporate before spraying the next coat. This mild solvent will not affect the **Poly-Spray**, but will remove all finger oils and contaminates that have settled on the drying surfaces. In fact, get into the habit of using **C-2210** between all sprayed coats from now on. It's great insurance against **fisheye,** which is caused when the fresh coating crawls away from an oily contaminate.

WARNING! Do not slop on C-2210 with a wet rag, then immediately spray. This will leave a residue of C-2210 that could harm the sprayed product. Use a slightly damp cloth, and allow time for the solvents to evaporate before spraying.

Always ground controls being wiped with C-2210 with a grounding wire, especially in conditions of low humidity. Sparks from static electricity can ignite C-2210! If you are spraying on a day when you get doorknob sparks when you walk across the carpet, it is MANDATORY that you GROUND THE PARTS before using C-2210.

Tack cloths are handy for gently wiping the surface to pick up last minute dust. If you wipe with **C-2210** and follow with a tack cloth, you're doing everything you can to clean the surface.

"What if my Poly-Spray dries rough like an eggshell?"

Poly-Spray dries with a smooth, semi-gloss texture. If it looks rough with a sandpaper or eggshell-like finish, it is because the **Poly-Spray** dried in the air before it hit the surface. Dry particles do not flow out.

✔ Make sure you're thinning it 4 parts **Poly-Spray** to 1 part reducer.

✔ If you are, and it still looks rough, increase to 3 parts **Poly-Spray** to 1 part reducer.

✔ Move the gun closer to the surface.

✔ Add **BR-8600 Blush Retarder** to slow down the drying of the **Poly-Spray**. Use about 2 fluid ounces per quart of thinned **Poly-Spray**.

✔ Put a sealed can of **Poly-Spray** in a refrigerator overnight. Chilling the product can delay drying, sort of like blush retarder. Don't put open **Poly-Spray** right next to the cold cuts or milk.

✔ If you live in Phoenix, don't spray on an August afternoon.

It's truth time! That first coat of Poly-Spray is going to reveal all your sins.

The silver color will highlight all the imperfections in your past fabric work. You may wish you had a time machine, to go back to the heat-smoothing step.

Top Two Imperfections and How to Fix Them

1. Pinked "Ears" Curling Up on Tapes. You'll find some pinks that were missed when you were heat smoothing. Or perhaps the solvents in subsequent coats lifted them.

TO FIX: Use a **225° iron** with a piece of plastic oven cooking bag or parchment paper as an ironing shield. If you iron directly on **Poly-Spray**, it melts the vinyl and gets silver on the iron. Worse, it leaves iron track marks in the **Poly-Spray**. Messy. Better yet, get a thin piece of sheet Teflon from a local plastics supply store to use as an ironing shield. That keeps the **Poly-Spray** pretty much intact.

If you "John Wayne" it with the bare iron, you'll probably have to sand the iron marks out with 320-grit paper before you spray more **Poly-Spray**.

2. Pinholes. Pinholes are created when solvents collect in unfilled weave, then escape with enough force to blister or pop through a wet spray coat applied over them.

The root cause of pinholes is always unfilled weave. This is why we stressed using a lot of **Poly-Brush** in earlier steps. If the weave is properly filled, there will be no pinholes.

Pinholes are always more prevalent on fabric overlying hard surfaces like leading edges. They are also common on tapes that were applied with insufficient

Poly-Brush. If the tapes are not filled, pinholes show up.

If you did everything right in previous steps and used all the tricks we suggested, you probably have few pinholes.

TO FIX PINHOLES: The idea is to try again now to fill the voids in the weave. This is done with **Poly-Brush only. Poly-Spray** has too many solid fillers to penetrate the weave. If you keep spraying **Poly-Spray** over unfilled pinholes, nothing is gonna get fixed.

Recipe: Mix 3 parts **Poly-Brush** to 1 part reducer, and add 2 fluid ounces of **BR-8600 Blush Retarder per quart.**

Now sand off the little blisters that formed around the pinholes with 320- or 400-grit sandpaper. This opens up the top of the voids. Wipe clean with **C-2210 Paint Cleaning Solvent.**

Brush this recipe above into the pinholed areas. The idea is to fill the unfilled weave, and a small fine bristle brush is ideal. You can work the area with a finger or a soft rag, but you risk leaving marks in the drying **Poly-Brush** if not careful. The blush retarder is added to slow down the drying of the thinned **Poly-Brush** to prevent brush, finger, or rag marks. Use common sense; don't make a mess in the **Poly-Brush** as it dries.

You can't spray the Poly-Brush to fill the voids. A spray gun, even at 42 PSI, won't get into the little voids.

When the **Poly-Brush** has thoroughly dried, spray more **Poly-Spray** over the top, and sand with 320-grit. If you have brush marks, fill with more **Poly-Spray** and sand them out.

Hopefully, the next coat of silver **Poly-Spray** you apply over the offending areas will show no pinholes.

2nd Coat of Poly-Spray

After at least two hours, apply one more cross coat of **Poly-Spray**. Check again for pinholes or pinked ears lifting. Fix as above if necessary. This second cross coat should give you a good build up of silver.

Take time to check with a 60-watt light bulb for UV blocking. Cut out a small area in an inspection hole in the bottom of the wing and hold the light over the top of the wing. Look in through the hole to see how the UV blocking is progressing. When you see no light, you have enough **Poly-Spray**, You can also put a 60-watt drop light inside the fuselage and check.

BE CAREFUL! The inside of that fuselage is full of solvent fumes. If you should accidentally break the bulb, the dying filament will ignite those fumes and turn your newly covered airplane into a dangerous bomb!

Sanding

All sanding should be done with 320 or 400 wet or dry sandpaper. Wet sanding works best. Get a bucket of clean water, and change it often. A sponge works great for picking up the wet residue left on the surface after sanding.

You **must** remove **all** the residue. If you let it dry on the surface, it will become a shear point for anything you spray on top. In other words, the next coat will not stick if you don't clean up the sanding residue.

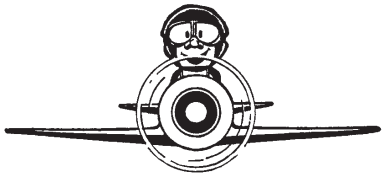
If you cut the fabric or a tape, it will have to replaced! Stay away from rib laces and rivet heads!

You Sand Two Areas ONLY:

1. **LARGE AREAS OF OPEN FABRIC.** Sand only where needed. Particles of silver can occasionally spit out of the spray gun. This is also the time to sand away brush marks or ridges left from taping.

2. **PINKED EDGES OF TAPES.** If you have any ears standing up now, or raised tape edges, sand them out. Now that you have some sandable **Poly-Spray** on the surface, you can work them down with sandpaper.

Any Poly-Spray you sand off will have to be replaced. You have to have enough silver to block UV. If you really get after it, check often to see if you have sufficient silver. Poly-Spray is a great sanding base, but you MUST PUT BACK WHAT YOU SAND AWAY.



DO NOT SAND OVER RIB LACES, RIVET HEADS, OR SMALL PROTRUSIONS IN THE FABRIC! Two passes with 400-grit sandpaper can cut the fabric over a rib lace!

3rd Coat of Poly-Spray

Spray this coat as smoothly as possible. We want a smooth, unscratched surface to underlie the topcoat paint. Sanding scratches can telegraph right through paint, so **don't sand this coat.**

Give it a final check for UV, and then you're done. **We say that 3 cross coats is usually sufficient for good UV protection.**

LEROY SAYS to keep right on spraying. He says you can never have too much silver. He recommends at least six coats. According to him, a good dope and fabric job is one where you can't see the weave of the fabric or the tapes when you're done. So he says to pile it on to hide those tapes.

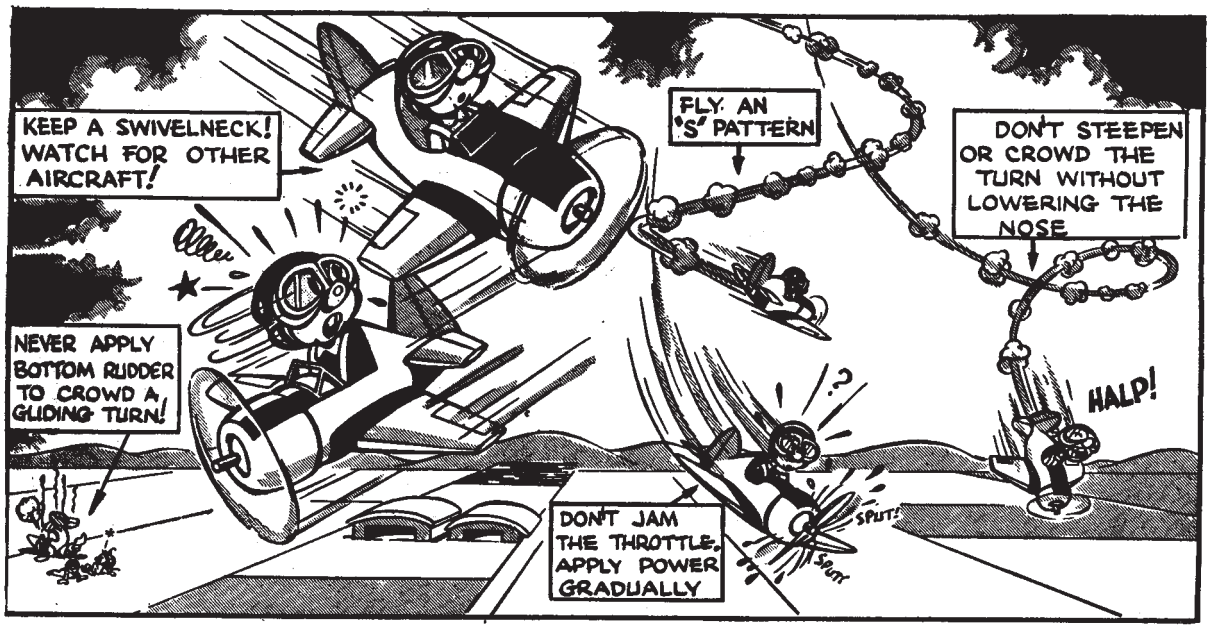
BALONEY! These ideas came from Grade A and dope. Since the cotton only lasted a few years outdoors, Leroy and his buddies didn't care about cracks. The cotton had to be replaced before the cracks even developed, so it didn't make much difference. Some dope jobs had 40 coats of hand rubbed dope! The finish would put a Glasair to shame. That is, for about three years before it all cracked off!

Today's fabrics will last many decades if properly applied. If you pile on the coatings, those coatings will crack while

the fabric lives on indefinitely underneath. No matter how flexible the coating, they all react the same if applied in excess: they crack.

So use only what is recommended. If you have the UV blocked and the surface is smooth and ready for paint, quit. And yes, you'll see every tape and the weave of the fabric after painting. THAT, in fact, is the hallmark of today's quality fabric job. Not "Leroy's hidden tapes."

And you'll be much happier five years or so down the road.



9. Color Coats

Premature failure of cover jobs is often caused by brittle automotive paint cracking over Poly-Brush and Poly-Spray. When these brittle paints fail, they take subcoatings with them, exposing the fabric to UV damage. To comply with the STC, you must use only Poly-Tone, Aero-Thane, or Randolph Ranthane over fabric components.

Your Painting Expectations

Before getting started, you need to take stock of your expectations for your paint job. Lately, airplane folks have been influenced by the quest for the perfect finish, now rampant in auto sports. Everything on four wheels these days must be ultra-shiny and perfect. Beats me why.

Recognize at the start that there is a fundamental difference between cars and fabric-covered airplanes. Cars have metal or composite structures that don't move or flex to the degree that fabric does. Your fabric-covered airplane will flex an infinite number of cycles in its 20- or 30-year service life. So will its paint.

Additionally, you probably plan to park it outside in Miami in the summer, fly it IFR to Anchorage in the winter, and operate it in rock riverbeds and wilderness strips.

Let's also factor in some historical perspective. The production airplanes of the '20s and '30s did not have wet-look, high-gloss finishes. Nor did military aircraft. When used normally, classic dope dried to a semi-gloss finish. That's the way fabric covered airplanes looked in those years.

Sure, a few had dazzling finishes of 40 coats of sanded, rubbed-out color dope. But those finishes lasted only a few years before they cracked and ringwormed, and the average aviator couldn't afford them or be bothered with their expensive repair. In the real aviation world, fabric covered airplanes looked respectable in semi-gloss dope finishes. Besides, in those years, they were built to fly, not to compete in paint finishing contests.

Start by asking yourself how you really plan to use your airplane. Will it sit inside in a carpeted, heated hangar surrounded by trophies? Will it fly as a working airplane? Do you anticipate repairs? Or do you want it to exclusively pose for photos?

You really have one basic choice when you select paint: normal gloss with easy repairability, or wet-look high-gloss with limited repairability. Keep this in mind as we go through the actual painting process.

OK... back to work

The Basics: Equipment, Cleanliness, and Mixing

Earlier in this manual we tried to convince you that you were probably the best person to paint your airplane. We still maintain that the money you spend on contracting an "expert" to

paint your airplane is better spent on good equipment to use yourself.

Your desire to do a good job and willingness to practice will deliver the paint job you want. But you can't be impatient, you have to teach yourself to paint only by spraying paint. This takes practice and experimentation, on boxes, old doors or paneling, not on your airplane.

Equipment

Let's assume you have a good spray rig. **If it runs off compressed air, it should have the following:**

✔ A storage tank big enough to give uninterrupted air.

✔ Filters and water traps.

✔ A spray gun with a needle, nozzle, and air cap recommended for the type of paint you choose.

✔ At least 40 PSI delivered **at the gun**.

✔ If you're using a pressure pot, NEW HOSES!

If it's a turbine-powered HVLP it should have the following:

✔ At least two lengths of hose to cool down the turbine outlet temperature.

✔ The proper needle, nozzle, air cap combination for your paint.

Airless sprayers and rented rigs are usually dirty and nothing but trouble. Get the right equipment and learn how to use it.

Cleanliness

Clean your rig after every use.
We mean field strip it and clean the gun every time. If you get lazy, you'll start spraying flecks of dried paint. You may think it's dust. It isn't.

Let's also assume that you took our advice and plan to practice spray the paint you're going to use. Yes, that means you have to invest in some additional paint.

Now the question is WHERE are you going to paint?

We can tell you where **NOT TO PAINT:**

✘ Outside in fog or high humidity.

✘ Outside In direct sunlight.

✘ In the wind.

✘ In a dusty place.

✘ Around wet floors. (Leroy wets his shop floor).

✘ In a place with poor lighting.

✘ In a place where engines are regularly run.

✘ In a rented or borrowed spray booth where you can't take your time or leave parts until they are really dry.

✘ In an unprotected garage next to your wife's car.

The answer is simple: **build your own "poor boy" spray booth.** It's easy to build, and you can add all the improvements you want.

Start by building a square frame out of wood or PVC pipe. This frame should be big enough to go all the way around a wing or fuselage with room to walk and maneuver the spray gun.

Hang the frame from your shop ceiling,

or better still, put it on pulleys so you can raise and lower it.

Cover the roof and sides with cheap plastic sheeting stapled or taped to the frame. Tape the sheets together with duct tape.

Rig up some shop lights or moveable light stands from scrap wood and sawhorses. Make sure you're not generating sparks, and shield the bulbs with chicken wire to prevent breaking.

If you really want to get fancy, add a big air conditioner filter at one end and an exhaust fan on the other, blowing out of the booth, to give filtered intake and an exhaust airflow. Make sure the fan has an enclosed motor with no chance of sparking. An explosion could ruin your whole day.

If you're unsure, leave out the fan, and quit spraying when the booth is full of overspray. It will settle in minutes, and you can go back to work.

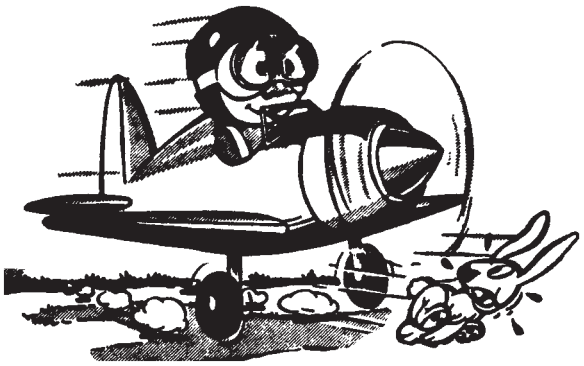
When you're through with all your painting, you can throw the whole spray booth away, or donate the frame and stuff to your EAA chapter.

Mixing

Mixing paint is critical. The number one reason for "paint that doesn't match" is that it wasn't properly mixed before spraying.

If you don't get all the pigments into suspension before spraying, the paint won't be the color you want. **Paint settles, and must be shaken, period**.

Take it to the hardware store and put it on a double-action paint shaker for five minutes. **You can't shake it by hand.** That doesn't hack it. Use the paint within a week of shaking.



Always filter paint before you spray it. No exceptions.

Gloss, Temperature, and Drying Time

These rules apply to **Poly-Tone; Aero-Thane** and **Ranthane** dry consistently glossy.

- The **slower** paint dries, the **glossier** the finish.
- The **faster** paint dries, the **flatter** the finish.

The standard drying temperature for most paints is 77°. If you go up 10°, it dries in half the time. Up 20°, it dries in a fraction of the time.

If you go down 10°, it doubles the drying time; down 20°, it significantly lengthens the drying time; down 30°, and it may not dry till spring.

It follows, therefore, that if you control

the temperature, you can change the glossiness of your paint. Most of us don't have that luxury. It costs money to air-condition or heat a shop.

But there are additives and reducers that control drying time chemically. Let's talk about them:

Reducers, Retarders, Accelerators, and Rejuvenators

Reducers

REDUCER is a fancy name for a thinner. We have two reducers; both are named after the recommended temperatures for their use.

R 65-75 is our standard reducer; it's designed for use in cool or moderate temperatures, 65 to 75°.

RR 8500 is our high-temperature reducer, designed for use in temperatures above normal, above 85°.

Retarders

A **RETARDER**, also known as a blush retarder, is a very slow-drying solvent that is used as an additive to slow down drying.

"Blush" is a phenomenon that occurs in high humidity. As solvents evaporate from drying paint, the surface temperature of the paint is reduced significantly. If the air is humid, the water condenses on the drying paint causing a milky looking layer of water known as blush.

Blush is bad news in dope, but Poly-Fiber vinyl products hardly ever blush. And even if they do, you can easily wipe off the blushed coating with reducer and a rag and respray when it's less humid.

Better yet, you can add some **BR-8600 Blush Retarder** to the paint and go right on spraying in moderate humidity.

Blush retarder slows down the drying. That in turn keeps the paint from cooling as much and stops blush.

As you can see, blush retarder is also helpful in slowing down drying time to **improve paint gloss**.

In fact, the difference between our two reducers is very simple. RR (**R**etarder **R**educer) **8500** is basically **R 65-75** with blush retarder added to it. That's what makes it dry slower in high temperatures.

Accelerators

An **ACCELERATOR** is an additive that *speeds up* drying time. We don't worry about this in vinyl **Poly-Brush**, **Poly-Spray**, or **Poly-Tone** paint, because vinyl dries fast enough even in low temperatures.

But we do make accelerators for use with our epoxy primers and varnish. These products sometimes need help drying in cool conditions.

Rejuvenators

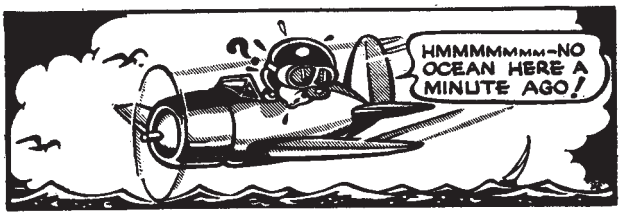
A **REJUVENATOR** is a product that is used to soften aged, dried paint. All paints have plasticizers added to enhance flexibility. They evaporate over time. When they do, aging paint can get brittle and crack. Even vinyl products can get brittle, especially if exposed to years of dry heat.

A rejuvenator is simply a powerful solvent that has a new plasticizer mixed into it. When you spray rejuvenators

over old products, the solvent carries the plasticizer into the paint to restore suppleness.

Rejuvenators *do not* fill large cracks or restore faded color. But they do add years to finishes by restoring flexibility. New topcoat paint is usually applied over rejuvenated areas. Vinyl **Poly-Tone** paint can be rejuvenated. Enamels and polyurethanes, including our **Aero-Thane,** cannot.

For specific instructions, check Appendix G, "Rejuvenating Fabric."



Do Not Use These Paints Over Fabric!

Enamels

Enamels work great over hard surfaces like primed aluminum or fiberglass, but they crack in short order over fabric. Enamels used to be popular over butyrate dope and cotton, so Leroy may recommend them. But **don't do it**! Enamel begins to crack over polyester fabric within a year.

Synthetic Enamel, Lacquer, or Epoxy Paint

All these crack over fabric and should never be used.

Butyrate Dope

Butyrate dope is incompatible with vinyl Poly-Fiber coatings. Butyrate will shrink over the vinyl sub-coats and eventually delaminate in big sheets. As ever, **don't mix dope with Poly-Fiber.** Dope works great over dope and nothing else.

Automotive Polyurethanes or Polyurethanes Made for Metal or Fiberglass

Premature failure of cover jobs is most often caused by brittle automotive paint, cracking over Poly-Brush and Poly-Spray. When these brittle paints fail, they take subcoatings with them, which exposes the fabric to UV damage. TO COMPLY WITH THE STC, YOU MUST USE ONLY POLY-TONE, AERO-THANE, OR RANTHANE OVER FABRIC COMPONENTS.

OK, these paints are wonderful for cars, boats, metal airplanes, RVs, etc. Imron, Ditzler, PPG, DuPont Centari, Alumigrip, Sterling, etc. are excellent paints. They come in beautiful colors and have deep metallics, pearlescents, and other effects that are dazzling. We recommend them highly on anything *except* fabric-covered aircraft.

Twenty years of observation have shown that all these excellent paints will crack in 1 to 10 years on fabric-covered airplanes.

All automotive polyurethanes have additives to thicken them. These silica thickeners make them easy to apply, hard to sag and run, and gives them a beautiful gloss. But these additives also make these urethanes brittle when their plasticizers evaporate. Plasticizers eventually evaporate from all paints, and the hotter and drier the climate, the faster they evaporate. Remember, you can't rejuvenate polyurethanes. Once they crack, that's it.

What About Flex Agents?

Paint salesmen will tell you that their polyurethane will work fine over fabric if you add their flex agent.

These flex agents showed up about the time Detroit started painting their car bumpers. They are designed to allow the paint to flex when your teenager hits curbs. Hopefully, that is not a lot of flex cycles, and they weren't designed for a lot.

How many flex cycles does your aircraft fabric go through every time you start the engine? Or when you fly for an hour? How many on a 180 SuperCub with a constant-speed prop?

Car paint salesmen have no idea what you're doing to your fabric hour after hour, year after year. Your fabric flexes an infinite number of cycles in its service life. Obviously, the paint must flex, too, or it will crack.

The sad story we hear most on our technical support line is *"I bought an airplane painted with automotive urethane. It's 5 years old and it's cracking. How do I repair it?"* The answer is simple: you don't. You'll have to live with it until you're willing to re-cover.

In all fairness, we *have* seen some automotive urethane finishes that have survived over fabric without cracking. They're usually on aircraft that are based in cool, wet climates and are always hangared. But they seem to be the exception. Odds are that automotive urethanes will eventually crack. Wish it wasn't so, but it is.

Clear Coats

Clear coats work fine on automotive finishes. When used over aircraft paints however, they can promote the growth of an ugly fungus or mold between the clear coat and the colored paint.

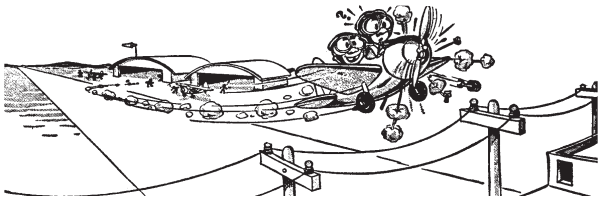
As you might expect, flexible aircraft paint like our vinyl **Poly-Tone** is full of plasticizers. These plasticizers are organic and make great food for fungi and molds.

Add some entrapped water vapor from spraying in humidity, put the big greenhouse of a clear coat over the top and, *voila!* A fungus festival!

Fungicides don't help. Your white airplane will turn brown, and you'll be unhappy. **Don't use clear coats.** Fungus stains don't really happen with great frequency, but even a couple of instances is too much, particularly if it's your airplane.

If you want more gloss, there are several ways to do that, explained further on in the section on **Poly-Tone.** Clear coats are not the way to do it.

Clear coats applied over urethane aircraft paint like our **Aero-Thane** are absolutely unnecessary. **Aero-Thane** has a wet-look gloss that is not improved by clear coating. All that clear coating adds to **Aero-Thane** finishes is weight and expense.



What Paint Do We Recommend?

We recommend **Poly-Tone**, our vinyl-based semi-gloss paint, or either **Aero-Thane** or **Ranthane,** our two wet-look high-gloss paints. Before we get into a discussion, look at this general comparison:

Parameter	Poly-Tone	Aero-Thane or Ranthane
Gloss	Semi gloss	Wet look
Over Fabric	Great	Great
Over Primed Metal and Fiberglass	Mixed results	Great
Ease of Application	Piece of cake	Easy with practice
Repairability	Simple	Requires more work
Flexibility	Great	Great
Rejuvenate?	Yes	No
Chemical Resistance	No	Yes
AVgas Resistance	Yes, but don't soak	Yes
Toxicity	No problem; use a respirator	Mist is toxic to breathe; fresh air respirator mandatory

Poly-Tone

Poly-Tone is made of the same vinyl-based resin as **Poly-Brush** and **Poly-Spray**. You use the same old reducers, **65-75** or **8500.** We simply pigment it to make it a paint.

It follows then that **Poly-Tone** bonds chemically to **Poly-Spray**. If you use **Poly-Tone, every layer of the Poly-Fiber system bonds and "melts" together into one consistent coating**. Over the years, this is a great advantage in resisting delamination.

You also know that **MEK** washes off **Poly-Brush** and **Poly-Spray**. It also washes off **Poly-Tone.** This means true ease of repair. If you want to get down to bare fabric to glue in a patch, you simply wipe off ALL the coatings with MEK and start again. Makes a quick, simple repair.

Poly-Tone also blends right into itself when you re-spray over repaired areas. You can see no over-spray halos or luster differences.

Before Spraying

Wipe with C-2210 Paint Cleaning Solvent to get rid of finger marks and surface impurities. This prevents fisheye. Use only a damp rag, don't flood it on. Let the C-2210 evaporate fully before spraying, usually a couple of hours. Follow with a tack rag to get that last-minute dust.

Reducer

Always thin 4 parts Poly-Tone to 1 part reducer. Use either R 65-75 or RR 8500, depending on temperature. **Don't use MEK. Do not use any substitute reducers. There are none.**

Shaking

Take the paint to your hardware store and shake it on a double-action paint shaker no more than one week before spraying. If you don't, the result may not be the color you ordered.

Filtering

Filter the thinned paint through a 60 by 48 mesh filter. Don't use a finer filter; you'll strain out the pigment.

Spraying

Poly-Tone sprays like **Poly-Spray**. It's dead easy.

Start by spraying the edges of the wing or tail feathers. If you spray paint on the edges first, the resulting overspray on the main surfaces will be covered by the subsequent coats applied on the main part of the surface. If you do the edges last, you'll blow overspray all over your beautiful surfaces.

Start with an even medium coat on the main surfaces. Look into the glare of the lights to see how much paint you're putting on. Don't push it. If you really flooded it, it'll run.

Try to spray just enough to uniformly wet the surface without flooding. Trend toward the cautious side. You can always spray more paint; runs require sanding.

If you do get a run, quit for the day on that surface and let it dry overnight. Next day, sand with 320- or 400-grit sandpaper and spray it again.

Allow at least two hours between coats. Two coats may do it for you; three at the most. If you have a smooth job that covers well, quit. Remember, the objective is to use the minimum coating to do the job and no more. Lots of paint, even **Poly-Tone,** will crack if it's piled on.

Under Yellow & Red Poly-Tone

Spray **one even coat of white Poly-Tone** to turn the dark silver **Poly-Spray** white. This old trick will give you better coverage and a much brighter red or yellow when you finish.

Want Glossier Poly-Tone?

Remember the things you *can* control:

✔ Spray only when it's cooler but, hopefully, above 60°.

✔ Chill the **Poly-Tone** overnight in the refrigerator.

✔ Add **BR-8600 Blush Retarder**. Start with two fluid ounces per quart. See if that's glossy enough for you. If not, add two more fluid ounces.

Be careful. Much beyond four fluid ounces per quart will drastically slow the drying time. That will increase the chances of runs, as well as picking up airborne trash and dust.

It also can take so long to dry that the wet solvents can soak your tapes and glue joints. The result can be popped fabric seams or tapes that float off the surface! You'll hate that!

Use your head, particularly if your shop is already cool. Make incremental changes, a little at a time. Spray a test area to check gloss and drying speed. Don't experiment on a whole wing or fuselage. As temperature changes, use more or less retarder.

Polishing Poly-Tone

Poly-Tone can be hand rubbed out

with a rag and white automotive polishing compound. This works great, but takes a lot of elbow grease.

A far easier way is to use a quality variable speed automotive buffer with a foam pad. Use only foam pads.

Go to an automotive paint store and buy liquid buffing compounds as used on automotive paint. Start with a medium compound, then follow with fine or anti-swirl. 3M and Meguiars make a variety of fine products. AVOID "MIRACLE" POLISHES THAT CONTAIN SILICONE. For instance, never use Armor All; paint will never stick to the surface if you have to repair it later.

Be very careful when polishing over rib laces or rivet heads. Even with a foam pad, an aggressive buffer at high speed can rub off the fabric on high spots. Use only a variable speed buffer, go slow, and be real careful until you get the hang of it.

Waxing

Wax **Poly-Tone** to increase the gloss after buffing and for protection. Use a quality automotive Carnauba-based paste wax. Again, avoid any miracle waxes with silicone.

Taping for Trim

✔ Wait at least 12 hours for the **Poly-Tone** to dry.

✔ Use the best grade paper masking tape available.Use Kraft paper, NOT newspaper, on large areas.

✔ Pull the tapes as soon as the trim paint dries to the touch. Don't allow the tapes to stay on for long periods or they could imprint the paint below.

Poly-Tone Over Metal

Poly-Tone has had mixed success over primed metal and fiberglass. Sometimes it lasts for years, sometimes it peels off in months. **Poly-Tone** is optimized for fabric, although many builders choose to use it on metal for its ease of application and ability to melt into previous coats.

The good news is, if it comes off, it's really easy to put right back on. So some builders find it convenient to just use **Poly-Tone** for everything. If they have to respray a cowling every few years or so, so be it. **Poly-Tone** is the easiest paint to apply we know of, and it blends to a perfect match.

Two Ways to Help Poly-Tone Stick to Metal or Fiberglass

1. Prime with **EP-420 primer**. Scuff-sand the primer with 400-grit sandpaper to give tooth adhesion. Spray **Poly-Tone** over the scuffed primer.

2. Prime with **EP-420 White Primer.** Let dry for a week. Lightly scuff-sand or use an ultra-fine Scotch-Brite pad. Spray a new coat of **EP-420 White Primer.** When the primer is still drying, spray on one wet coat of **Poly-Tone** directly into the tacky primer. The **Poly-Tone** melts into the soft primer. Don't let the primer get dry before you spray the **Poly-Tone.** Tacky is just right. Let this coat of

Poly-Tone and primer dry for 4 days, sand out minor defects and put on a final coat of **Poly-Tone.** This method takes some planning. You need to have ready the primer catalyst and **E-500 Epoxy Reducer,** as well as your **Poly-Tone** and either **R 65-75** or **RR 8500 Reducer.** To pull this off, you need two quart spray cups, one for the primer and one for the **Poly-Tone.** You won't have time to do any cup washing. As soon as the primer goes on, flush the primer out of the spray gun with **E-500 Epoxy Reducer** and get the cup with the strained, thinned **Poly-Tone.** Spray the **Poly-Tone** when the primer is tacky to the touch and does not transfer to your finger. Allow to dry thoroughly.

If You Don't Want to Use Poly-Tone Over Metal, Then What?

Use Either Poly-Fiber Enamel, Aero-Thane, or Ranthane

Poly-Fiber Enamel

Poly-Fiber **Enamel** is a one-part, air-drying alkyd enamel coating available in 50 colors to match **Poly-Tone** and **Aero-Thane.** It air dries to a high gloss similar to **Aero-Thane** polyurethane, but it is not as chemically resistant.

It is intended as a topcoat paint over metal or composite surfaces that have been primed with **EP-420 Epoxy Primer. Do not use enamel over fabric or on structures that will be covered with fabric cemented with Poly-Tak adhesive. Poly-Tak will lift enamel.**

Surface Preparation for Enamel
Surfaces must be dry and free of oil, dirt, wax, grease, and silicone. Contamination may cause fisheyes and craters. Remove oil, wax, grease and fingerprints with **C-2210** Paint Surface Cleaner. Remove silicone residue from polish with **310** Alkaline Cleaner diluted with 20 parts water. Epoxy primer aged over two days should be lightly scuff sanded with Scotch-Brite Pads or 320-grit wet-or-dry sandpaper to provide tooth adhesion. Allow the **C-2210** to dry at least 30 minutes; then wipe surfaces lightly with a clean tack rag immediately prior to painting. Any surface irregularities, heavy sanding scratches, or dust particles may be telegraphed thru the high-gloss finish. Freshly painted surfaces should be protected from dust and bugs until dust free (about 40 minutes).

Enamel Preparation
Pigments may hard settle after three months storage. We recommend inverting cans every 30 days to avoid pigment compaction. Pigments hard settled in extended storage should be dislodged from the bottom with a tool, then dispersed thoroughly by agitating with a double-action paint shaker for 15 minutes minimum. Filter through our Poly-Fiber 60x48 paint filter cones before using.

Spraying and Thinning Enamel
Enamel may be sprayed with any equipment rated for lacquer and enamel. Clean the equipment with Poly-Fiber **Enamel Reducer** or **Methyl Ethyl Ketone.** First, try spraying directly out of the can without thinning. If orange peel results, thin 5 parts enamel to 1 part Poly-Fiber **Enamel Reducer**. Spray three coats for good coverage allowing one hour drying time between coats.

The Down Side of Enamel
Enamel is right out of the 1930s. It is a low-tech paint that has none of the advantages of today's polyurethanes like **Aero-Thane** or **Ranthane**. The only reason it remains in demand is that it does not require a fresh air respirator as do polyurethanes, and there are still folks who are not about to change what they have been doing for 40 years. The bad news is that you really only have one shot to spray enamel; for best results, you have to put on all three coats in one day. Here is the problem: if you spray two coats in one day and then wait a few days to spray another, the last coat will usually wrinkle the first ones. Enamel is not solvent resistant, so the solvents in the last coat may wrinkle the initial ones, particularly if the last coat is heavy.

It won't wrinkle if you spray it all in one day with about an hour between coats.

You can see that this wrinkling could be a problem with trim painting. For instance, if you painted your cowling white and you wanted to put on a red stripe later, you'd have to be very cautious about how much red you apply for the stripe. For best results, wait at least a week for the white to dry; longer is better. Lightly scuff sand the area where the trim stripe will be applied, and spray just enough red to get the color you want, no more. If you can get the trim stripe done in one coat, so be it; don't risk multiple heavy coats.

Enamel Maintenance
Keep your enamel clean by washing the surface with **310** Alkaline Cleaner diluted with 20 parts water. You can wax it with 100% carnauba wax. No silicone polishes, please!

Matching Gloss

The problem with using enamel is that it is shinier than **Poly-Tone.** If you paint just the doors of your airplane with enamel, the gloss contrast between the doors and the **Poly-Tone** on the adjacent fabric will be apparent. This is probably the way antique and classic aircraft looked when originally manufactured. However, you can more closely match gloss by using our flattener.

Poly-Fiber Flattener is a special liquid blend used to make paint look flat by degrees, depending on how much is added. We have determined the right amount of flattener to add to enamel to make it closely match the gloss of rubbed-out **Poly-Tone.**

Each can of flattener has specific instructions on how many fluid ounces to add to enamel to match the **Poly-Tone** gloss.

For example, to flatten enamel to semi-gloss, mix 1 part Poly-Fiber **Flattener** with 4 parts enamel. For full military flat, mix 1 part Poly-Fiber **Flattener** with 2 parts enamel. Shake well before spraying.

The advantage to using **Poly-Tone** on fabric and flattened enamel on metal is that you have selected the optimum paint for each sub-structure. You're combining long life for the metal with repairability for the fabric.

This system works well to replicate an historically correct dope-like finish on fabric for antiques and classics with the added benefit of true longevity.

Using Our Two Polyurethanes – Aero-Thane and Ranthane – Over Fabric, Metal, or Fiberglass

Aero-Thane and **Ranthane** are our wet-look, high-gloss polyurethanes. **They cover fabric, metal and fiberglass equally well.** If you want a high-gloss finish, you can use either one on your whole darn airplane.

Aero-Thane and Ranthane are offered in the same colors as Poly-Tone.

Aero-Thane and **Ranthane** are the most durable paints you can use on metal or fiberglass. Because they are two-part cross-linked paints, they stick forever to primed aluminum and fiberglass. They're also excellent for primed 4130 steel tubing before covering. They will last longer than enamel, are chemically resistant, and they're practically bulletproof.

Earlier, we cautioned against using brittle automotive polyurethanes over fabric. **What makes ours different? It's simple: we leave out the filler materials that make other polyurethanes brittle.** We use only high-grade resins, plasticizers, and pigments. **The primary design priority in ours is long-term flexibility.**

For over 20 years, we've seen the wisdom of that design decision. **Aero-Thane** and **Ranthane** simply do not have the cracking problems of most polyurethanes when applied according to directions. Anybody willing to read the directions on the can or in this manual can do a beautiful job. Guys who already "know it all" are in trouble. In fact, we find that the guys who do best with ours are those who have never sprayed any polyurethanes.

Our biggest problems come from the "highly experienced" auto body painters who are only used to spraying high-build automotive polyurethanes loaded with fillers.

The only real advantage to using fillers is they make paint easy to apply. The thicker the paint when it flows out, the less chance of runs and sags. You can pile on automotive urethanes from the first coat on with no problems. They are easy to apply and look great from the first pass of the gun. But they get brittle!

Not so our **Aero-Thane** and **Ranthane**. The only difference to applying ours, as opposed to other polyurethanes, is that **you must use a different technique**. Big deal. Once again, if you can read directions, you can do a great job.

HERE ARE THE DIRECTIONS:

Apply Aero-Thane and Ranthane in medium coats. Each coat must be allowed to tack up before any more wet paint is sprayed on top. Each tacky coat holds the next wet coat.

Basically, that's it!

Lung Protection

WARNING. You MUST wear a FRESH AIR SOURCE RESPIRATOR when spraying all polyurethanes, ours included. The respirator rated for organic solvents or lacquers you used in earlier stages of this job is

NOT SUFFICIENT. The catalyst in polyurethanes contains poly-isocyanides, as in CYANIDE! Read that POISON!

Breathing the spray mist without protection can cause severe sickness or death. And the effects are cumulative. You may get away with it for awhile, but one day it will catch up with you.

YOU MUST:

- **Wear gloves, long sleeves, and long pants.**
- **Use spray-proof goggles. Keep it off your skin and out of your eyes.**
- **Use a respirator that has a forced air source of clean air, free from spray mist. These are available from aircraft supply houses and are worth every penny.**

Before You Spray

Scuff-sand primed metal or fiberglass with 400-grit sandpaper. **Poly-Spray** should be as smooth as possible. Wipe all surfaces with **C-2210 Paint Cleaning Solvent**, and follow with a clean rag. Remove dust with a tack rag. Ground small parts to prevent static electricity.

Wait!

Make sure the primer or **Poly-Spray** you'll be spraying over has had time to wick off all its solvents. This usually takes **four days** in normal temperatures. If you push it, the solvents will be trapped under the **Aero-Thane or Ranthane** and will cause blisters.

Spraying Yellow or Red

Spray one even coat of white **Poly-Tone** over the **Poly-Spray** to turn the surface white. This will really help the color coverage of the **Aero-Thane or Ranthane** and give a rich, bright final color.

Shake Well

Shake the paint on a double-action paint shaker for five minutes within a week before using.

Straining

Strain the paint through a 60 by 48 mesh paint strainer before mixing it with catalyst.

Mixing & Thinning Aero-Thane

Adding Catalyst

Aero-Thane is packaged in ¾-filled cans. The catalyst that accompanies the kit is exactly enough to fill the paint can to the top if you poured them together. A gallon kit includes a ¾-filled can of paint and a quart of catalyst.

MIX RATIO: 3 parts paint to 1 part catalyst. In small amounts, use a soup ladle for ease of measuring.

Carefully inspect the catalyst before using. Don't use catalyst that had an unusually swollen can, is milky or stringy. Good catalyst should be thin and clear. After you use the catalyst, put the lid on tightly and inspect it before each use. Humid air ruins catalyst. Use it, then cap it tightly.

Mix the catalyst with the paint, and let it "cook" for 20 minutes before spraying.

Once you catalyze (add the catalyst), you have about 5 hours before the paint starts to crosslink and thicken. Be smart. Mix up only what you need.

If it starts to get stringy in the cup, you're all through with that batch.

You can keep catalyzed **Aero-Thane** in the freezer overnight to preserve it. Keep it away from the ice cream. Let it come back up to room temperature before spraying. Don't force it back with heat.

Thinning Aero-Thane

- ❒ Thin the catalyzed **Aero-Thane** three parts paint to one part **UE-820** Reducer.
- ❒ Test spray something other than your airplane and let it dry. If there is orange peel, add small amounts of **UE-820** Reducer above the 3-to-1 ratio until the orange peel flows out. You can go up to about 3 to 2, but at this level be wary of runs.

Spraying Aero-Thane

- ❒ Spray a light color coat, enough for gloss and color, but not enough to run.
- ❒ WAIT until this coat is tacky and transfers no color to your finger. Should take 20 minutes at 77°, longer at cooler temperatures. Don't let this first coat dry completely.
- ❒ Spray another medium coat of paint. This coat should flow out and look wet; again, don't flood it on.
- ❒ Now spray a final wet coat for fill and color. Do not flood it on!

That's a total of three coats, wet, but not enough to run. These are normal coats, not cross coats.

Mixing & Thinning Ranthane

Adding Catalyst

The mix ratio for **Ranthane** to **AU-CAT-2X1** Catalyst is two parts paint to one part catalyst. Note that this is a different catalyst and mix ratio than **Aero-Thane**, so don't mix them up. **Ranthane** is packaged in fully filled cans, so a gallon of **Ranthane** requires 2 quarts of **AU-CAT-2X1** Catalyst; a quart of **Ranthane** requires 1 pint of **AU-CAT-2X1** Catalyst.

For best results, catalyze in small amounts using a soup ladle or containers of equal volume.

Carefully inspect the catalyst before use. Moisture and humidity can ruin catalyst, making it turn milky, stringy or thick. Don't use catalyst that exhibits these defects; make sure it is perfectly clear. Cap unused catalyst tightly to prevent contact with humid air.

After adding the catalyst, let the catalyzed paint sit for 20 minutes induction time before adding thinner.

Thinning Ranthane

Thin the catalyzed **Ranthane** three parts paint to one part **G-4200** Reducer. This is the ***only*** reducer you can use.

Test spray something other than your airplane, and let it dry. If orange peel occurs, add small amounts of **G-4200** Reducer above the 3-to-1 level until the orange peel disappears. You can go up

to about 3 parts paint to 2 parts reducer, but at this level watch for runs.

Spraying Ranthane

Simply spray two coats (not cross coats), allowing the first coat to tack up before spraying the second. That's it.

Common Aero-Thane and Ranthane Errors

1. **Flooding on the first coat.** Car painters are notorious for this one. If you do this, it will all run off onto the floor and all over your shoes.

2. **Spraying wet paint into wet paint.** Another guaranteed way to get runs. This also keeps the paint from covering well. **You must spray only into *tacky* paint!** Here's the typical scenario. You're doing great. No runs so far, and you're starting your third coat. You just finish a pass when you look back down the surface and see a spot you missed. So you give it a quick squirt, just a little to cover the spot. **It runs!** A wet coat sprayed into a wet coat that hasn't yet become tacky will simply wash away the underlying coat. Wet paint sprayed into wet paint has nothing to hang onto. It could take 50 gallons to paint a Cub this way.

   Your complaint over our Tech Support Line will be that our paint does not cover, or we forgot to add something. We will refer you back to the paragraph above!

Fixing Problems

✔ **RUNS:** Quit what you're doing and let the whole thing dry for about four days minimum. A week is better. You have to let the paint fully cross-link before you spray more over the top of it or it could wrinkle. When a week is up, sand out the runs and respray.

✔ **ORANGE PEEL:** Turn down the air pressure on your gun. Increase the reducer. You can go up to 3 parts paint to 2 parts reducer.

✔ **GRIT IN THE PAINT:** First check for gun cleanliness. If you're sure it's not coming from the gun try filtering the paint twice.

The Respray Time Window

It takes a full week at 77° for our paint to fully crosslink. While it may appear to be fully dry, it's still cooking and is actually pretty fragile.

If you plan to spray in stages, you must wait at least four days, preferably the full week if you can, to allow full cross-linking. In other words, if you only partially finish a surface and you must quit for the day, the safest thing is to wait a week to apply the next coats. Lightly scuff-sand with 400 paper before respraying.

If you don't wait, the underlying coats will wrinkle.

Taping for Trim

✔ Buy the best tape available. Fine-line polypropylene tape is available from Poly-Fiber distributors and auto paint stores. Paper tape is OK, but get the best you can. Use Kraft paper; DO NOT use newspaper!

✔ Wait at least 12 hours before taping for trim with **Aero-Thane** or **Ranthane**; more is always better; don't

rush it. For best results, do a tape test. Put a piece of tape on some part of the airplane that won't show. Leave it on for a reasonable period of time that will replicate the time you think your tape and masking paper will be on the airplane during the real taping. Pull the test tape and inspect for tape tracks or other damage to the paint. If there are no problems, proceed; if there are problems, wait.

✔ After spraying the trim, pull the tapes off as soon as the paint dries tack free, usually an hour or so will do it.

✔ If the base coat of paint has been on for a week or more before you put on your trim, scuff sand the base coat to give tooth adhesion for the trim paint. Be careful not to fuzz up the trim tape or the paint will bleed under it.

Matching Gloss

Like enamel, wet-look **Aero-Thane** and **Ranthane** are shinier than **Poly-Tone.** If you paint the metal or fiberglass parts with **Aero-Thane** or **Ranthane,** the gloss contrast between those parts and the **Poly-Tone** on the adjacent fabric will be apparent. This is probably how antique and classic aircraft looked when originally manufactured. You can more closely match gloss by using our flattener.

For directions on flattening., see Flattener in Appendix J, *Product Profiles.*

The advantage to using **Poly-Tone** on fabric and flattened **Aero-Thane** or **Ranthane** on metal is that you have selected the optimum paint for each sub-structure You're combining long life for the metal with repairability for the fabric.

This system works well to replicate an historically correct dope-like finish on fabric for antiques and classics with the benefit of true longevity.

Appendix A: Ultralight & Very Light Aircraft

"What's the lightest way to cover an experimental aircraft using Poly-Fiber?"

A comparison of the actual weights of fabrics and their coatings gets you the answer to this question. Perception can lead you astray here.

A J-3 Cub is good baseline for comparison. Everybody knows how big a Cub is. A Cub has 731 SQUARE FEET OF FABRIC! In 1946, the Cub rolled out of the factory wearing 75 lb of Grade A cotton and yellow dope.

This chart shows what happens to a Cub when we substitute some of our Poly-Fiber fabrics using the full Poly-Fiber system (eight coats).

J-3 Cub - 731 Sq Ft - Various Covering Systems

Fabric And Coating System	Weight Sq./Ft	Fabric Weight	Coating Weight	Total Weight
Cotton and Dope (Original)	1.64	23 lb	52 lb	75 lb
2.6 oz Poly-Fiber	.94	13.5 lb	29.5 lb	43 lb
1.7 oz Poly-Fiber	.72	8.5 lb	24.5 lb	33 lb

Let's assume that an ultralight or very light aircraft is smaller than a Cub with just 500 square feet of fabric instead of 731. Using our 1.7 oz fabric system, the numbers look like this:

Ultralight - 500 Sq Ft

Fabric And Coating System	Weight sq/ft	Fabric Weight	Coating Weight	Total Weight
1.7 oz Poly-Fiber	.72	6 lb	17 lb	23 lb

For this 23 pounds, you have the ability to tie the airplane down outside for its entire service life. Your very light airplane will have the same service life as a certified airplane covered under our STC.

Since the most important factor in determining life span for fabric is **UV protection,** the full system with all the silver **Poly-Spray** applied will give the maximum protection available for any type aircraft.

Many ultralighters leave off the silver coats to save weight. Chemical UV blockers are added to the top coat paint in an effort to provide UV protection.

No substitute will ever be as effective as three cross-coats of silver. Leaving off the silver is the best example of throwing out the baby with the bath water we can think of.

If you are positive you need to save every ounce of weight and are not concerned about long-term UV blocking, we suggest the following:

Poly-Fiber Ultralight System:

- ❐ Use Poly-Fiber **Uncertified Light** fabric. (1.7 oz.)
- ❐ Cement with **Poly-Tak**.
- ❐ Brush or spray on one coat of **Poly-Brush**, thinned 3 parts **Poly-Brush** to 1 part reducer.
- ❐ Spray on two coats of **Poly-Tone** paint, thinned 3 parts paint to 1 part reducer. ADD POLY-FIBER **UV BLOCKER** TO THE **POLY-TONE.**

POLY-FIBER UV BLOCKER comes in 8 oz cans. If you add 4 oz of **UV Blocker** to 1 gal of paint, you get *some* UV protection. Our tests show it's better than nothing, but way less effective than 3 cross-coats of **Poly-Spray**.

Understand that **there is no free lunch.** If you use this reduced-coat ultralight system, the finish is certainly not going to be as good as with the full system. And again, it does not offer complete UV protection.

We estimate that this system will have a total weight of about 12 pounds. That's about 6 pounds for the fabric and 6 pounds for the coatings. You're saving 10 to 11 pounds of weight at the expense of long-term UV blocking.

Perhaps leaving out that "glass cockpit" and the GPS would be a better weight-saving solution.

As a compromise, put SOME silver on it, perhaps one or two coats on at least the upper surfaces.

❒ If you can live with a silver or blue plane, skip the three cross-coats of **Poly-Spray** and use three coats of **Poly-Tone 220M Nevada Silver, Poly-Tone 222M Rancho Silver, or Poly-Tone 318M Piper Trainer Blue** top coat paint. These three colors have the same aluminum pigment as **Poly-Spray** and will give your ultralight fabric full UV protection.

That's it!

Avoid suspicious-looking clouds whenever possible.

Remember!

Painting with thick high-gloss polyurethanes can add a *tremendous* amount of weight. The most illogical "weight-saving" systems we have seen are those with no silver and a topcoat of heavy automotive polyurethanes.

Automotive polyurethanes sprayed for high gloss can *double* the weight of the entire covering job. You can easily add 15 to 20 pounds of wet look, pearlescent, neon purple paint that provides almost **zero** UV protection.

It will look like a championship street rod for about a year; then you will get to recover it. **Bad idea.**

Appendix B: Envelopes & Sewing

Envelopes

Think of an envelope as a huge sock, or a slipcover to simplify the covering of a fuselage, a wing, and tailfeathers. Envelopes are sewn on three sides, with an open seam to allow you to pull it on.

After envelopes are slipped on, they are cemented closed at the open seam. Heat shrinking and **Poly-Brushing** then holds the envelope firmly in place. It is not necessary to cement around the entire perimeter of the frame as done with the blanket method.

Envelopes are sold by most aircraft supply houses. Quality envelopes come from proven patterns, most fifty or more years old. If they don't fit, it's usually the fault of a bent or modified airframe rather than the envelope.

To Install an Envelope:

❒ Turn the envelope inside-out so the sewn fringe is on the inside.

❒ Pull the envelope over the part. There should be about an extra inch of fabric at the perimeter.

❒ Straighten the fringe on the inside of the envelope. If you let the fringe bunch up or snake back and forth, you will see it forever.

❒ Clamp the envelope in place with spring clamps or clothespins.

❒ Cement one side of the open seam to the aircraft structure with **Poly-Tak**. Cement the other to make a closure with at least a one inch overlap.

❒ Take the clamps off one side at a time, and heat shrink at 250°, **STARTING OVER THE SEAM**. If you shrink from the seam out, the seam stays straight. On the other hand, if you go first to the center of the part to shrink, it will pull the seam toward the iron and leave snaking, off-centered seams.

❒ Shrink the whole envelope from the seams out at 250°. Then repeat at 350°.

❒ Brush on **Poly-Brush**, and follow the normal Poly-Fiber sequence. You must put a finishing tape over every sewn seam in the envelope.

Envelope Pros and Cons

PROS:

❖ Huge time savers on fuselages. Fuselage envelopes usually are pulled on from the tail. The separate belly piece is cemented into place first, wrapping around the lower longerons. Then the sides are wrapped around the longerons with 1″ overlaps, and the edges end up hidden on the fuselage bottom.

❖ Envelopes take the fitting and planning time out of fabric installations.

CONS:

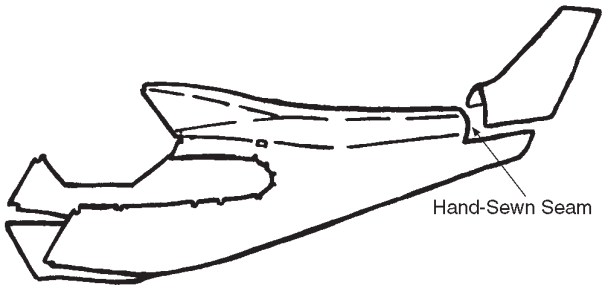
❖ Lots of fiddling with inside fringes.

❖ Wing envelopes usually have chordwise sewn seams. These seams do not fall over ribs. This gives extra seams to worry about shrinking straight and taping. Some manufacturers offer spanwise seams.

Sewing

There is little need for sewing when covering with Poly-Fiber. The only time a sewn seam is required is when fabric must be joined over an open area with no adequate sub-structure underneath. This rarely happens.

The illustration below shows the one instance in Cub and Aeronca type fuselage where sewing is required. Here there is no substructure where the fuselage fabric joins the fin fabric. Thus, a sewn seam is required.



There are two kinds of sewn seams approved with our STC, hand sewn and machine sewn.

Hand-Sewn Seams

The instance above is a good candidate for a hand-sewn seam.

❒ Start by folding the edges of the fabric on both sides of the seam at least ⅜″ to the inside of the seam.

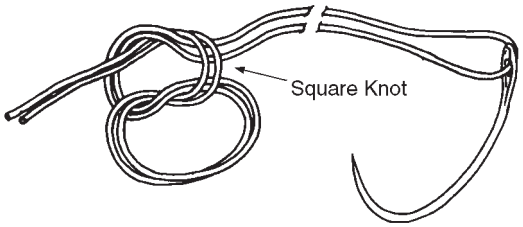
Use an iron to crease this ⅜″ fold. This folded part will give two layers of fabric at the edge for extra strength.

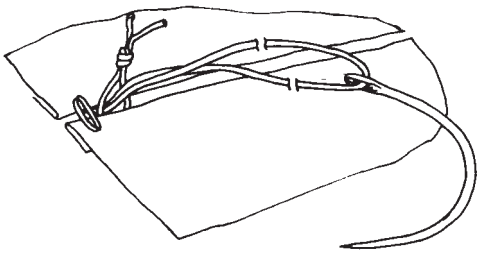
❒ Temporarily join the seam with T-head pins. As you sew, you pull out the pins just ahead of your stitching.

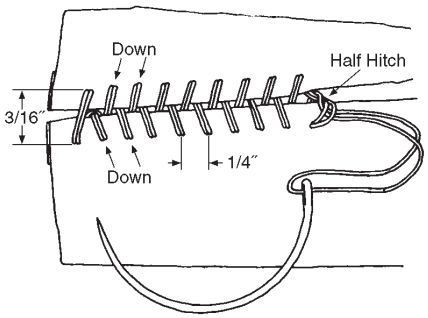
Use only 15 lb Poly-Fiber hand-sewing thread, doubled. A 3 or 4″ curved needle works great.

❒ Sew with a baseball stitch with a maximum of ¼″ spacing. The sewing holes must be a minimum of 3⁄16″ from the edge of the seam.

See the illustrations below:





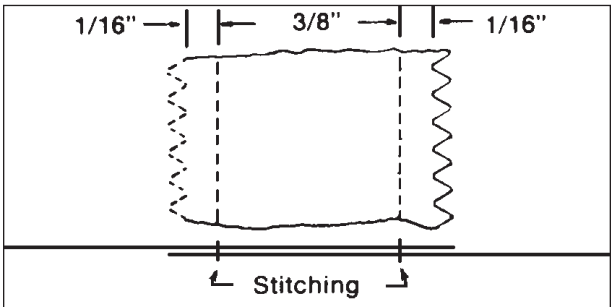


❒ When the sewing is over, heat shrink normally and put a 2″ finishing tape over the seam.

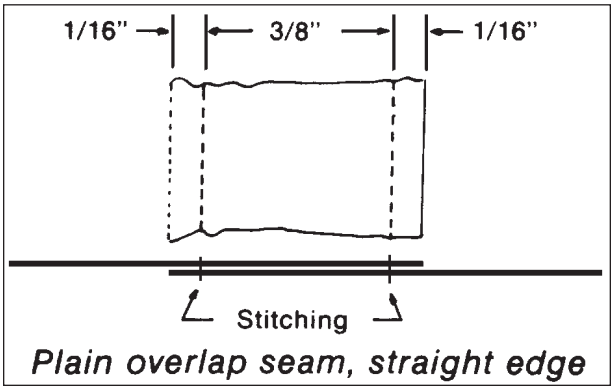
Machine-Sewn Seams
Most of us will never need to machine sew anything. If you have a sturdy sewing machine and have the skill and interest to sew your own seams, read on.

Always use only **Poly-Fiber 10 lb machine thread**. Do not use cotton thread or upholstery thread; they will rot in short order.

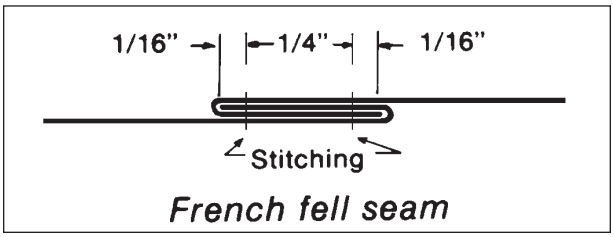
The following seams are approved for sewing aircraft fabric:



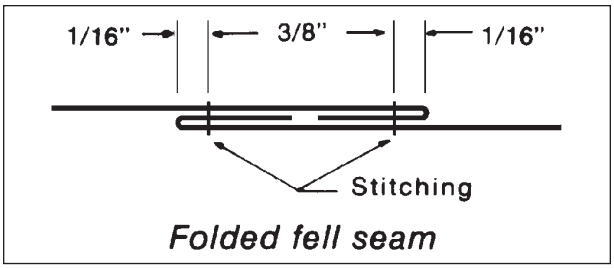
Plain overlap seam, pinked edge



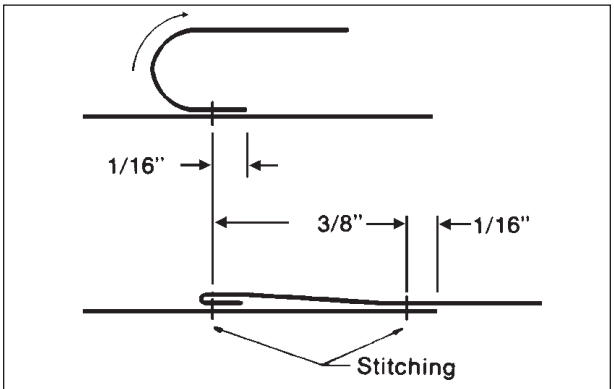
Plain overlap seam, straight edge



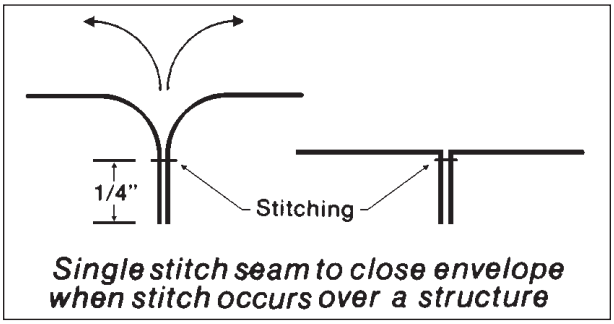
French fell seam



Folded fell seam



Modified folded fell seam sewn in two steps



Single stitch seam to close envelope when stitch occurs over a structure

All sewn seams must be covered with at least a 2-inch finishing tape.

Make Your Own Envelope!
There's one time you may be interested in sewing. If you wish, you can sew your own simple fuselage envelope. Here's how:

❒ Unroll a single piece of fabric long enough to stretch from the rear of the fin to the forward cabin area.

❒ Clamp this fabric to the fin and continue clamping down the fuselage to the front of the cabin. Clamp around

a forward fuselage tube by the boot cowl where you would normally cement the fabric to the frame at the front of the fuselage.

❒ If this is going to work for you, this one piece of fabric should be wide enough to cover the distance from the top of the fin to the lower fuselage longerons, as well as the whole cabin area from top to bottom. In other words, you should be able to cover the whole side including the fin with one 70-inch-wide piece of fabric.

❒ Unclamp the top part of the fabric and lay it over the centerline of the turtleback. Most airplanes have a flimsy wooden stringer here as the top "spine." **Remember, you can't make a cemented seam over a stringer,** it must be a longeron. That's what all this sewing is about.

❒ Trace this spine with a **lead pencil.** This will be the pattern for a single seam we will sew to join our envelope at the top.

❒ Unclamp the fabric and lay it on the floor. Put a duplicate piece of fabric the same length directly over it. Pin the two pieces together with T-Head pins.

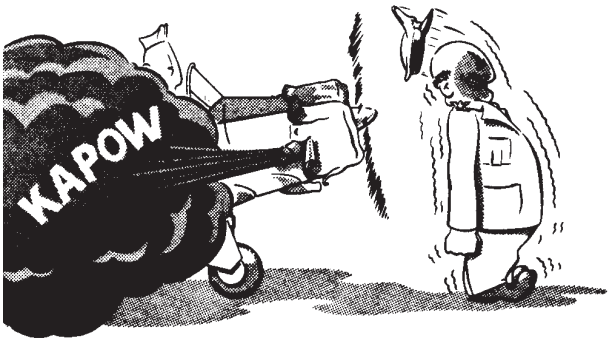
❒ Sew the two pieces together at the pencil line using one of the seams illustrated above. Or take it to a commercial seamstress. Make sure you bring the Poly-Fiber machine sewing thread.

❒ Cut out the excess fabric on the top side of the spine seam. Turn the envelope inside out and drape it over the fuselage. Hopefully, it lies smoothly over the fin and has a straight seam all the way up the turtleback over the spine. It should be long enough to drape over the fuselage sides below the lower longerons.

❒ Make a belly piece and cement it to the lower longerons with 1″ overlaps.

❒ Cement the side pieces to the belly with 1″ overlaps. Finally, cut out the window areas and cement as appropriate to the cabin areas.

There are other instances where you may choose to sew. As long as you use one of the approved seams and use Poly-Fiber machine sewing thread, you can make whatever your sewing skills allow.



Avoid making abrupt mixture changes, especially on the ground.

Appendix C: Concave-Bottom Wings

Concave-bottom wings require a different sequence of steps.

The basic plan is to rib lace earlier than normal in order to hold the fabric into the concave lower shape while heat shrinking.

If you cover a concave wing following the steps in normal sequence, the heat shrinking at 300 or 350° will pull the fabric off the lower ribs. You'll wind up with a flat plane on the lower surface rather than the desired concave curve, and your bottom fabric won't be attached to anything.

Follow These Steps

❒ Before you attach any fabric, brush the LOWER rib capstrips *only* with two coats of **Poly-Tak** cement. Let the **Poly-Tak** dry.

❒ Now attach the upper and lower wing fabric exactly as described in the main section of this manual.

❒ If you are planning to rib lace (and we STRONGLY encourage you to do so), *do not* cement the fabric to the top surface ribs.

❒ Mix a solution of **Poly-Tak** thinned 1 to 1 with MEK. Brush this into the fabric over the *bottom* rib capstrips.

This solution will soak through the fabric and soften the **Poly-Tak** previously applied to the bottom rib capstrips. This will cement the fabric to the concave bottom curve of the ribs.

❒ After the **Poly-Tak** has thoroughly dried, heat-shrink the fabric on both the top and bottom of the wing at 250°.

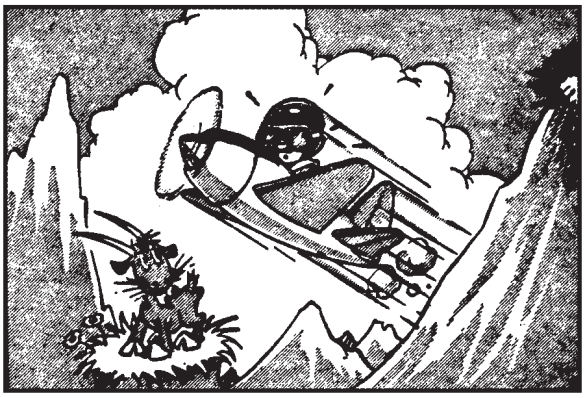
DO NOT GO ANY HIGHER THAN 250°! If you do, you will almost certainly pull the fabric away from the cement!

❒ Do not apply **Poly-Brush** yet! Put on the reinforcing tape and rib lace the entire wing.

❒ When finished rib lacing, heatshrink at 350°, or 300° if recommended by your kit manufacturer.

❒ The rib lacing will hold the fabric to the concave lower wing shape.

❒ NOW apply **Poly-Brush**, tape, and get back in the normal sequence.



Appendix D: Covering Plywood Surfaces

Fabric covering over sheet plywood has been a popular way of adding strength and hiding wood grain since the '20s. Bellancas and Mooneys are known for their fabric-over-wood construction.

Any Poly-Fiber fabric can be used to cover plywood. **Uncertified Light**, our 1.7 oz fabric, is the most popular choice for its smooth finish and workability.

Prepare the Surface

❒ Fill low spots and imperfections in the wood with Poly-Fiber **SuperFil**. Sand smooth.

Varnish

❒ Varnish over the wood and **Super-Fil** with **EV-400 Epoxy Varnish.**

Combine one part **EV-410 Catalyst** to two parts **EV-400 Epoxy Varnish**. Let this soup "cook" for 30 minutes. Filter through a 60 X 48 paint filter. Thin two parts catalyzed varnish to one part **E-500 Epoxy Reducer**.

❒ Brush or spray two coats of varnish. Allow the first coat to dry to the touch before spraying the second. If you let more than 4 days go by between coats, lightly scuff-sand the first coat.

For best results, let the varnish dry for a full 7-day cross-linking cycle before you try to put any **Poly-Brush** or **Poly-Tak** over it. If you try it earlier, the varnish may wrinkle or lift.

Poly-Brush Alternative to Varnish: **Poly-Brush** can be used as a wood sealer, but it doesn't provide the long-term protection of epoxy varnish. If you skip varnish, you can brush **Poly-Brush**, thinned two parts **Poly-Brush** to one part reducer, directly into the bare wood. Two coats should do it.

Pre-Coat With Poly-Brush

❒ Brush one coat of **Poly-Brush** reduced 3 parts **Poly-Brush** to 1 part reducer over the varnished or **Poly-Brush** sealed surfaces. Allow to dry. Spray on another coat, thinned 3 to 1. This pre-coat will help fabric adhesion and prevent pinholes.

Apply Fabric

❒ Cement the fabric exactly as described in the main section of this manual. There is no difference to cementing fabric over wood; all overlaps and heat forming techniques remain the same.

Heat Shrink

❒ **Start** with the iron at 225°, NO HOTTER! The idea is to only take the wrinkles out of the fabric. If you go to higher temperatures, you could pull the fabric out of the natural wood depressions. This bridging could give unwanted air pockets under the fabric.

If 225° leaves some wrinkles, selectively go up to 250°. Be careful not to cause bridging.

Poly-Brush

❒ Thin **Poly-Brush** one to one with reducer. Brush it over the fabric. The thinned **Poly-Brush** will soak

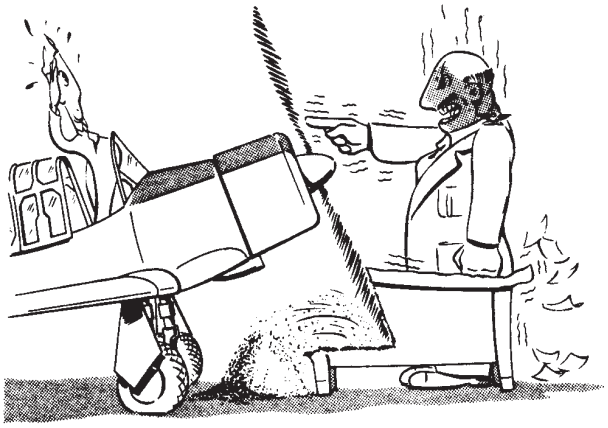
through and reactivate the precoated **Poly-Brush** below.

If any bridging is apparent, wait about 30 seconds for the **Poly-Brush** to get tacky, and brush again over the depression. The tacky **Poly-Brush** should stick the fabric down into the depression.

If the worst occurs and the fabric will not stay in a deep depression, slit the fabric carefully with a razor to cut the bridge. Patch later with a piece of fabric or tape and **Poly-Brush**. Careful filling and preparation should avoid this from ever happening.

Tape and Poly-Spray

❒ Continue the process as written in the main part of this manual.



It's always a good idea to make sure your brakes are in working order before taxiing.

Appendix E: Airworthiness Limitations

1. As a minimum, fabric and coatings must be inspected once a year as part of the aircraft's annual inspection.

2. If for any reason the fabric's integrity is questioned, the fabric must have a breaking strength of 56 pounds per inch or more to be airworthy.

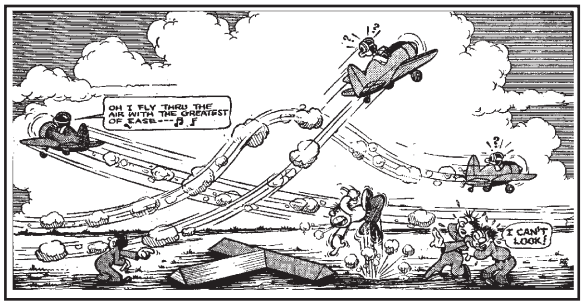
3. This 56 pounds per inch minimum is required for fabric manufactured to the standards of FAA Technical Standard Order (TSO) C-15 d/AMS 3806c. The following Poly-Fiber fabrics are manufactured to TSO C-15 d:

   - Poly-Fiber Medium-2 – (2.6 ounce/sq. yard)

   - Poly-Fiber Heavy Duty-2 (3.4 ounce/sq. yard)

4. Inspection procedures:
   See Appendix F, *Inspecting Fabric and Coatings* of this manual for complete inspection procedures.

5. The Airworthiness Limitations Section is FAA approved and specifies maintenance required under Secs. 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.



Appendix F: Inspecting Fabric & Coatings

Poly-Fiber fabric and the coatings and paint applied to it must be inspected each year at annual.

The core concept is that the paint and coatings should remain in good shape to protect the underlying fabric, so the condition of the paint and coatings is important. The age of a cover job is irrelevant; good jobs easily last 25 years, some much more than that. If the job was done correctly with plenty of UV blocking silver, it will last indefinitely, well past the time when a smart owner will want to uncover the airplane to see the state of the airframe under the fabric. Remember that UV radiation is the only thing that can degrade polyester Poly-Fiber fabric; it's not affected by gasoline, fungus, rot, or weather extremes. So if you want to protect the fabric, you have to have a "sheet of metal" between the fabric and the sun. That sheet of metal is, in fact, the aluminum flake in **Poly-Spray.** The bottom line is: if there is sufficient aluminum to block and reflect the passage of light, it also blocks the passage of damaging invisible UV radiation.

Inspection Procedures:

Here are the steps an experienced IA will take. If he is unfamiliar with inspecting fabric, show him these procedures:

1. Inspect the general condition of the paint and coatings.

   If the fabric is flexible and resilient when pushed hard with a knuckle, Good!

2. Find a way to view the fabric from the inside out. On fuselages, this can be done by removing sufficient interior components to see the inside. On wings or some tailfeathers, this can be done by removing an inspection cover so you can see the inside surface of the fabric. Have an assistant hold a 60-watt shop light one foot from the outside surface to simulate sunlight. As you view the fabric from the inside, there should be enough silver **Poly Spray** so that no light is visible from the shop light held a foot off the surface outside.

   If the coatings and paint block the light, Good!

BASED ON PASSING THESE TWO TESTS ALONE, THE IA COULD HAVE CONFIDENCE THAT THE FABRIC IS AIRWORTHY.

The Problem Scenarios:

1. The paint and coatings are brittle, cracked, and ring wormed. They readily crack when pushed with a knuckle: Bad!

   Consider rejuvenation (**Poly-Tone** only; you can't rejuvenate polyurethanes). Rejuvenation softens and adds service life.

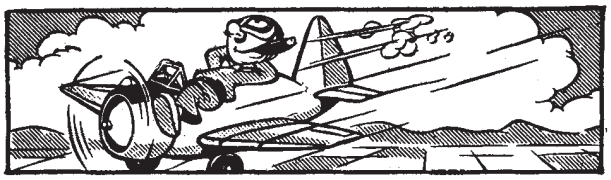
BUT, as long as there are no big chunks out of the paint, and there is no sun-exposed fabric, the airplane is still airworthy, but should be monitored for problems continually until the next annual inspection.

2. Big chunks out of the paint and coatings, advanced peeling, sun-exposed fabric: Really Bad!

   The IA can use a Maule Fabric Tester on the bare fabric as an aid to see if there is UV damage.

Warning: AC 43.13 - 1B states that a Maule Tester is not approved for determining airworthiness; it is only an aid. Also Maule Testers only give an accurate reading on bare fabric. It does no good to "punch" painted fabric; you are measuring the combined strength of the paint and fabric. The FAA only cares about the fabric. To use the Maule, push until it reads 56 pounds; no need to push further and punch a hole in the fabric unless the IA is seeking additional business repairing your unnecessary holes.

3. If the Maule Tester indicated that the fabric is questionable: do the "Hang It On the Wall" test. This is a simplified version of an FAA acceptable field test for fabric testing that is published in the fabric covering section of AC 43.13 - 1B.



The "Hang It On the Wall" Test

1. Cut a strip of fabric from a sun-exposed area of the aircraft (hopefully the top), four inches long by one and one-quarter inches wide. Clean all the coatings and paint off the fabric strip by soaking it in MEK or thinner.

2. Unravel a few threads from the side so it has a small "fringe." The unraveled fabric should be one inch wide.

3. Figure out a sturdy way to hang the strip on a wall; put an equally sturdy hook on the other end. An easy way to do this is to sandwich the fabric ends between two pieces of metal or wood held together with hardware. Strengthen the sandwich by wrapping and cementing one end around one of the pieces of wood or metal to prevent slippage.

4. Put a bucket on the hook and fill it with 56 pounds of sand, lead, gold, or anything heavy you can accurately weigh. Don't forget to account for the tare weight of the bucket.

If the fabric breaks with 56 pounds, it fails. Time to recover.

Note: Where does this 56 pounds come from? Poly-Fiber fabrics are manufactured to the standards of TSO-C-15d/AMS 3806C. Interestingly, this is the same standard used for Grade A Cotton, linen, or any fabric used in direct replacement. This document specifies how aircraft fabric should be manufactured, and all certified fabric used on aircraft is approved by FAA engineers based on these standards. TSO C-15d says that new aircraft fabric has to have a breaking (tensile)

strength when new of at least 80 pounds per inch. (Poly-Fiber is well over 102 pounds.) In service, the fabric is allowed to degrade to 70% of that 80 pounds, which works out to 56 pounds. So 56 pounds is the minimum allowable for airworthiness.

If for some reason the breaking strength is still in question, you may send the fabric to any certified testing facility to do an ASTM D5035 test on the fabric. Here at Poly-Fiber, 1-800-362-3490, we will do the test for you for a small fee.

Appendix G: Rejuvenating Fabric

One of the nice things about painting your airplane in **Poly-Tone** is that you can rejuvenate it.

To refresh your memory, rejuvenation is the process of adding fresh plasticizers to aging, brittle coatings.

All coatings lose their plasticizers in four or five years. The rate at which plasticizers leave is dependent on temperature and humidity. Airplanes outside in Phoenix can show signs of brittleness in 7 years. Those in Maine may last indefinitely.

There is no hard and fast rule about when to rejuvenate. Generally, hangared airplanes may be ready in 15 years. Those kept outside in 7 to 10. It really depends on the heat and humidity, like all evaporation. If the **Poly-Tone** seems brittle and small cracks start developing, it is probably time.

We can't help Leroy and his cronies who like to use enough **Poly-Spray** or **Poly-Tone** to "hide the tapes." There is nothing we can do for them. If you flood on the **Poly-Tone** against our advice and instructions in the painting section, it's gonna crack.

What Rejuvenation Does

1. Adds fresh plasticizer. This makes the coatings flexible and supple.

2. Softens and slightly flows the old coatings to allow hairline cracks to close and fill.

What Rejuvenation Doesn't Do

1. Restore color and gloss to faded paint.

2. Fill big cracks in the coatings.

The Steps

- ❒ Disassemble the aircraft, if possible. It's much easier to spray on sawhorses than upside down under wings.

- ❒ Wash the fabric thoroughly with one part **310 Cleaner** to 20 parts water to remove dirt, grease, grime.

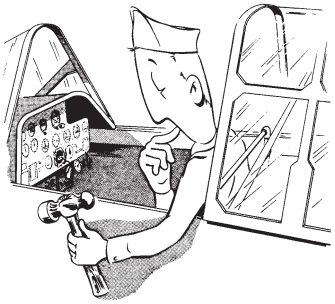
- ❒ Wet-sand the surface with 280-grit sandpaper. Flush all residue and dry with clean rags.

- ❒ Spray three coats of **RJ 1200 Rejuvenator** right out of the can. Wait 20 minutes between coats. The coatings are going to get very soft, so *don't touch them.*

- ❒ Let dry at least overnight.

- ❒ Fill small cracks with **Poly-Spray** and an artist's brush. If desired, spray two coats of **Poly-Spray** to give a good filling and sanding base. Sand as required.

- ❒ Spray **Poly-Tone** color.



Appendix H: Dealing with Stains

There are two kinds of stains that need attention on any kind of paint: **gasoline stains and bird droppings**.

Like dope, **Poly-Tone** is much more susceptible to staining than **Aero-Thane.**

We all know that aviation fuel has dyes for identification. If you get lazy and let fuel pool for days in fuel cap recesses, or keep putting off fixing that leaking quick drain, you can get staining.

The best prevention is to wipe fuel off when you see it, because if you let it accumulate, you can have problems.

The same for bird dooky. If you let the droppings sit for a few weeks on paint, you can get permanent staining. Particularly in berry season. They love them berries.

CAUTION: This mixture develops chlorine gas. Do not store in a sealed container. Discard after use. Keep out of eyes and skin. Pot life is two hours.

To Remove Stains

- ❒ First, try good old Clorox laundry bleach. Work it in with a sponge, and then flush with lots of water.

If that doesn't fix it, try this:

- ❒ Dissolve 1 level teaspoon of swimming pool granulated chlorine in 2 liquid oz of water. Let it sit 10 minutes.
- ❒ Add 2 liquid oz of MEK and 2 liquid oz of **BR 8600 Blush Retarder.**
- ❒ Soak the stained area for 3 to 5 minutes with a sponge or a brush.

Make sure your electrical system is on the top line before setting out on a flight.

Appendix I: Making Repairs

All Poly-Fiber repairs are done by cementing a patch over the damaged area with Poly-Tak cement.

There is no requirement in the Poly-Fiber STC to do any sewing.

The Rules Are Simple

❖ A hole 8 inches or less requires an overlap of at least 1 inch of patch material over 1 inch of old fabric. Finishing tapes are not required over the cemented seams unless the patch is on the top of a wing.

❖ A hole 8 inches or more requires an overlap of at least 2 inches of patch material over 2 inches of old fabric. Repairs 8 inches or more require at least a 2 inch finishing tape over the seams. These tapes should be centered over the seams of the patch.

Repairing Poly-Tone

❒ Trim the ragged parts out of the hole.

❒ Lay unshrunk patch material over the hole and trace the outline of the patch with a **lead pencil.** Make sure you have the required overlap. Square or rectangular patches look better. Cut out the patch with pinking shears.

❒ Mask off the area outside the patch. Leave an extra half inch or so of working room larger than the patch.

❒ Clean off all the coatings inside the masked area with MEK. Everything will wipe off readily, right down to the bare fabric.

❒ Cement the patch to the old fabric with **Poly-Tak**. Let it dry.

❒ With a 225° iron, heat-smooth the cemented areas.

❒ With a 350° iron, heat-shrink the area of the patch over the hole. This acts as a shrinking panel to re-tighten the fabric in the area of the repair. Use a piece of cardboard as a shield to keep the iron off the cemented areas.

❒ Brush on a coat of **Poly-Brush** and let it dry. Apply finishing tapes, if required, with **Poly-Brush**. Heat-smooth.

❒ Spray **Poly-Spray** to fill.

❒ Paint with **Poly-Tone.** You will find the **Poly-Tone** is easy to spot spray into the old paint with a good match unless the old paint is faded.

Band Aid Option

It is perfectly safe and legal to just scuff-sand the old **Poly-Tone** and then cement directly on top of the old paint without cleaning off all the coatings. It just looks pretty rough when finished. The **Poly-Tak** will hold just fine to the old **Poly-Tone.**

Major Repairs

Let's say you dinged a whole wingtip. After you replace the ribs and are through crying, you can make a fairly simple job of a big fabric repair job.

❒ Start at the last good rib *before* the damage and take off the old finishing

tapes with MEK. Cut the rib laces. Clean off at least two inches of fabric over the good rib with MEK, right down to the bare fabric.

❒ Cement in a whole new piece of fabric to cover the wingtip with a two inch overlap over the rib area. Heat shrink. **Poly-Brush**, rib lace, and tape. Put on **Poly-Spray** and color, and go fly. If you do it neatly, no one will ever know.

Repairing Aero-Thane and Ranthane

The big difference between repairing **Aero-Thane** or **Ranthane** and **Poly-Tone** is that you can't clean off paint with MEK (or anything else). Unless you can reach the *back* of the damaged fabric, from inside, then you'll have to *sand* off the paint coats.

If you *can* get to the back of the damaged fabric, here's how to do a next-to-invisible repair.

❒ First, mask around the damaged area on the outside. If you have, say, a 3″ hole to fix, mask a area that leaves an inch all around the 3″ hole. Apply the masking tape right to the **Aero-Thane or Ranthane**.

❒ Run a scribe around the edge of the masked area. You want to cut through the layers of finish, but NOT through the fabric.

❒ Use MEK to soften the **Poly-Brush** and **Poly-Spray** from the back side. When they have become soft, pry up an edge of the damaged paint on the outside and peel it away from the masked area

❒ Carefully cut a patch to fix exactly within the masked area. Cement it into place.

❒ Follow the standard repair sequence from this point on.

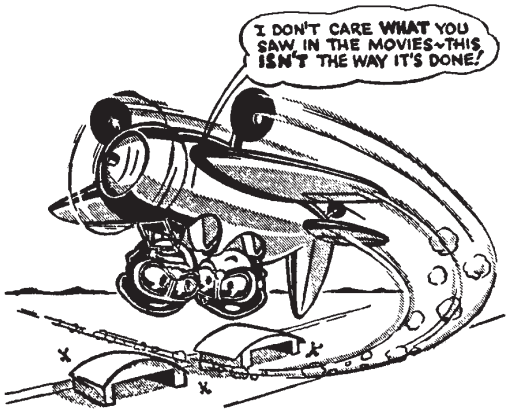
If you *can't* get to the inside…

❒ Mask off the area of the patch and sand off the **Aero-Thane** or **Ranthane** coats with dry 280-grit sandpaper.

❒ When you get down to the silver **Poly-Spray** below, get out the MEK and proceed as written above.

❒ When it comes time to respray the color coat of **Aero-Thane** or **Ranthane**, you can't spot spray it over just the repair. It won't blend in without a halo of overspray. Sorry about that.

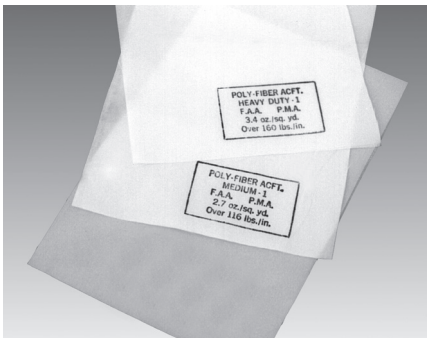
The best bet is to spray the whole panel the repair is in. For instance, if the repair is on a wing, mask and spray the area from rib to rib to match the paint best.



Notes

Appendix J: Product Profiles

POLYESTER FABRIC



Uncertified Light - Specially designed for covering plywood surfaces on any aircraft and for any ultralight aircraft that is not certified. Fabric is unstamped. **Not approved for certified aircraft.**

Medium - Heavier and stronger fabric styles for normal service on aircraft with a wing loading 9 lb per square foot and over.

Heavy-Duty - For more rigorous operations such as aerobatics, agricultural, bush aircraft, and former military aircraft.

Medium and **Heavy-Duty** fabrics are stamped with our trade name and the fabric style. Example, **"POLY-FIBER ACFT., MEDIUM-2, FAA PMA..."**

REFER TO CURRENT FABRIC PRODUCT DATA SHEET FOR A COMPLETE LIST AND DESCRIPTION OF ALL FABRIC STYLES CURRENTLY AVAILABLE.

POLYESTER FINISHING TAPES

Available in Light and Medium. All styles of linear and bias finishing tape may be used interchangeably on any fabric style.

Bias tapes (weave pattern 45° to the edge) are suggested for installation over compound surfaces such as around wingtips and tail surfaces. Bias tape will stretch to conform to the required contour without heat shrinking edges or cutting and notching to remove excess fabric. Stretching reduces the width about 35%, thus 3″ will pull to about 2″ width around a sharp contour, and 2″ will pull to approximately 1⅜″ width.

POLYESTER RIB LACE REINFORCING TAPE

A custom woven high-strength polyester filament twill tape with a paper-protected high-tack adhesive coating on one side for quick application and bonding during the rib lacing procedure. (Patent pending) Available in ¼″, ⅜″, and ½″ widths. Where additional width is required on wide ribs, two or more tapes may be positioned side by side.

POLYESTER RIB LACING CORD

Two styles of lacing cord are available, both impregnated with microcrystalline fungicidal wax.

1 - Standard round 4 ply, .035″ dia., 60 lb tensile strength. Packaged 600 yards per spool.

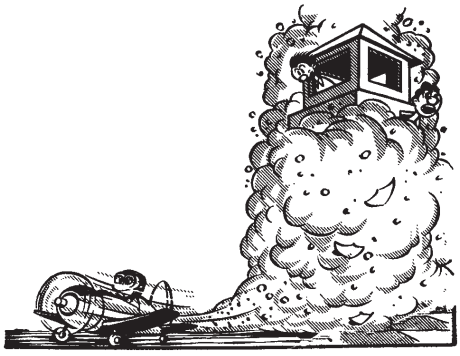
2 - Flat braided cord, .012″ thick x approximately .080″ width, 50 lb tensile strength. Recommended when the minimum rib cord protrusion is desired. Packaged 500 yards per spool

POLYESTER MACHINE SEWING THREAD

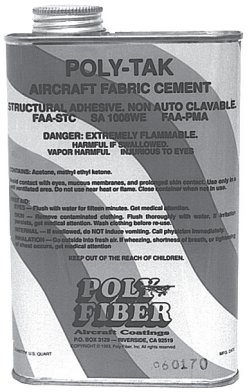
10 lb tensile strength, 4-ply thread. Packaged 500 yards per spool.

POLYESTER HAND SEWING THREAD

15 lb tensile strength, 3-ply uncoated thread. Packaged 250 yards per spool.



POLY-TAK FABRIC CEMENT



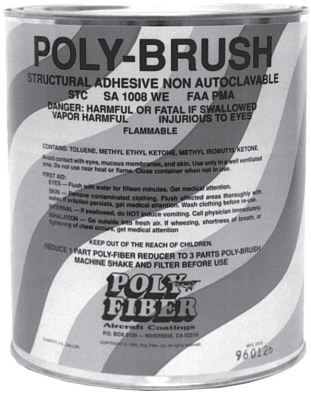
A high-strength, fast-drying, one-part cement manufactured from a proprietary formula especially to attach polyester fabric to an airframe. It is FAA approved with the Poly-Fiber STC for use in making a 2″ overlap cement seam on the wing leading edge and a 1″ overlap cement seam on the balance of the aircraft, regardless of the wing loading or maximum speed (Vne). **Poly-Tak** is also an excellent cement for cotton, linen, and glass fiber and will adhere to most surfaces for shear load bonding. Add Methyl Ethyl Ketone (MEK) when necessary to reduce viscosity due to solvent evaporation from an open container. Refer to the Poly-Fiber Manual for details on approved methods for cement seams.

SHELF LIFE: Guaranteed two years unopened in protected storage under 100°F. Not affected by freezing. Do not use if appears dark or whiskey colored. **Poly-Tak** should be clear. Discolored cement has been heat damaged.

Test adhesion of fabric to bare aluminum if storage temperature exceeds 100°F. for several months or guaranteed shelf life has expired.

PACKAGING: One-pint, one-quart and one-gallon 50 plate tin-lined cans. Do not transfer to unlined ferrous metal container for storage.

POLY-BRUSH



Poly-Brush is a high-solids, one-part, air-drying adhesive coating formulated for the first and second coats to penetrate and seal the fabric weave and attach all polyester finishing tapes and reinforcing patches. It provides twice the peel resistance as nitrate dope on polyester fabric.

Poly-Brush is thinned 3 to 1. We add a small quantity of red oxide pigment as a visual aid for application uniformity. The original untinted **Poly-Brush** is available on request and recommended in the cockpit or cabin areas where the backside of the fabric will be visible in normal operation. Red oxide tinted **Poly-Brush** will be shipped unless untinted is specified.

Refer to the Poly-Fiber Manual for detailed application instructions.

COVERAGE: Approximately 150 sq ft per gallon.

SHELF LIFE: Guaranteed four years unopened in protected storage. Avoid long-range storage above 100°F. Not affected by freezing.

PACKAGING: One-quart and one-gallon cans and 5-gallon pails.

POLY-SPRAY

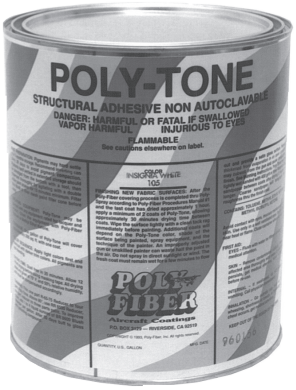
A high-solids, one-part aluminum-pigmented, air-drying coating used to protect the fabric from ultraviolet damage and as a sanding base to develop a smooth finish. Reduce 4 to 1 with Poly-Fiber Reducer. Refer to this manual for detailed application instructions.

COVERAGE: Approximately 200 sq ft per gallon.

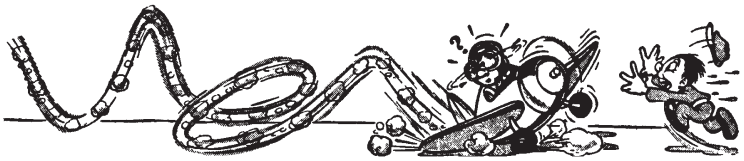
SHELF LIFE: Guaranteed four years unopened in protected storage. Avoid long-range storage above 100°F. Not affected by freezing.

PACKAGING: One-quart, one-gallon cans and five-gallon pails.

POLY-TONE FINISH



A durable one-part, air-drying flexible coating available in 50 popular aircraft colors. **Poly-Tone** is manufactured from the same generic class of petrochemical feed stock as **Poly-Tak, Poly-Brush**, and **Poly-Spray**, and is considered to be our "standard" pigmented finish for the Poly-Fiber covering process. The thermo-expansion



and elasticity are the same as all sub-coats, and there is no inter-coat adhesion problem if the surface is clean. **Poly-Tone** is non-shrinking, non-bleeding, fire-retardant, chemical-resistant, and is used on both metal and fabric. It air dries to a satin gloss finish and can be polished to a high luster equal in appearance to any cellulose dope, lacquer, or synthetic enamel finish.

INSTRUCTIONS:

PAINT PREPARATION: Pigments may hard settle after 3 months storage. We recommend inverting the can every 30 days to avoid pigment compaction. Pigments hard settled in extended storage should be dislodged from the bottom with a tool, then dispersed thoroughly by agitating with a double-action paint shaker for 5 minutes minimum. Filter thru 60x48 or finer mesh paint filter before using.

SPRAYING EQUIPMENT: Poly-Tone may be sprayed with any equipment rated for lacquer and enamel. Clean the equipment with Poly-Fiber Reducer or Methyl Ethyl Ketone.

COVERAGE: One gallon of **Poly-Tone** will cover approximately 200 sq ft with one coat.

COLOR SEQUENCE: Apply light colors first, then overcoat with darker trim colors. All pigments are non- bleeding.

DRYING TIME: Dust free in 20 minutes. Allow 12 hours drying before using masking tape. All drying times are given at 70°F and 50% relative humidity. Adding Blush Retarder will improve the gloss.

THINNING: Poly-Tone is always thinned 4 to 1 with Poly-Fiber Reducer **R 65-75** in normal 65°-75° weather or **RR 8500** Retarder Reducer in temperatures of 85° and up. Add Blush Retarder **BR-8600** as needed in hot humid weather. Using any other reducer or retarder may cause adverse characteristics.

FINISHING NEW FABRIC SURFACES: After the Poly-Fiber covering process is completed thru **Poly-Spray** according to the Poly-Fiber Manual, and the last coat has dried approx. 1 hour, apply a minimum of 2 coats of **Poly-Tone,** allowing at least two hours drying time between coats. Wipe the surface lightly with a clean tack rag immediately before painting. Additional coats will depend on the Poly-Tone color, shade of the surface being painted, spray equipment, and the technique of the painter. An improperly adjusted gun or unskilled painter can waste half the paint in the air. Do not spray in direct sunlight or in wind. The fresh coat must remain wet for a few minutes to flow out and provide a satin gloss surface. Material thickened from evaporation in an open container may cobweb from the gun and cause orange peel finish. See thinning instructions.

Poly-Tone may be lightly wet sanded with 400-grit or finer wet-or-dry sandpaper between coats after drying 2 hours or longer. Coarse sandpaper will telegraph the roughness through the finish coat.

FINISHING METAL SURFACES: We recommend stripping any old finish and repriming with **EP-420 Epoxy Primer**. Epoxy primer must be scuff sanded to provide tooth adhesion before re-coating with **Poly-Tone,** regardless of the cure time.

SHELF LIFE: Guaranteed four years unopened in protected storage. Avoid long-range storage above 100°F. Not affected by freezing.

PACKAGING: One-quart and one-gallon cans.

POLY-FIBER REDUCERS & RETARDERS

A blend of solvents used for viscosity and drying control of **Poly-Brush**, **Poly-Spray**, and **Poly-Tone.**

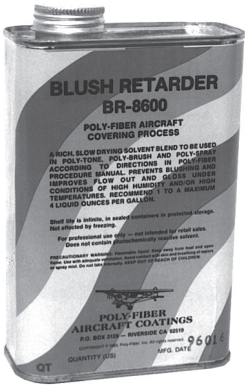
REDUCER, R 65-75 is the standard reducer recommended for viscosity control in normal temperatures 65° and 75°F.

RETARDER REDUCER, RR 8500 is recommended for use in temperatures above 85°F. to produce the proper coating flow-out and when needed, to avoid blush in warm, humid weather.

SHELF LIFE: Infinite, unopened in protected storage. Not affected by freezing.

PACKAGING: One-quart, one-gallon cans, and 5-gallon pails.

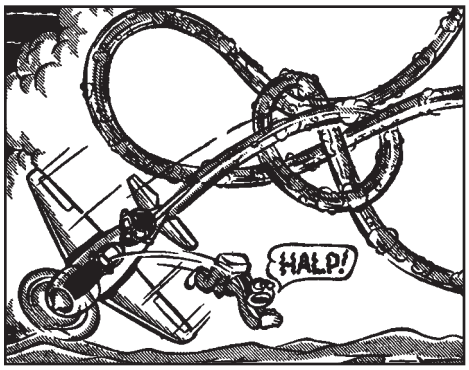
BR-8600 BLUSH RETARDER



A rich, slow-drying solvent blend to be used in **Poly-Tone, Poly-Brush**, and **Poly-Spray**, according to the directions on the labels. Prevents blushing and improves flow-out and gloss under conditions of high humidity and/or high temperature. We recommend 1 to a max of 8 liquid oz per gallon.

SHELF LIFE: Infinite, in sealed containers in protected storage. Not affected by freezing.

PACKAGING: One-quart and one-gallon cans.



RJ 1200 REJUVENATOR

A proprietary formula containing the correct proportions of the same plasticizers used in the Poly-Fiber coatings with penetrating solvents to carry the plasticizers into the old coating and restore the original flexibility.

INSTRUCTIONS:

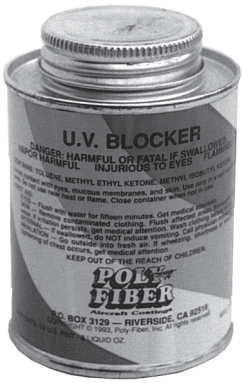
1. Wash the surfaces with 1 part **310 Cleaner** to 20 parts clean water to remove dirt, wax, silicone, and light oil.
2. Wipe with clean cloth dampened with **C-2210** Cleaner if needed to remove any further trace of oil. Shop towels furnished by towel rental services may be contaminated with silicone, which transfers to the surface being cleaned with the solvent. Use brand-new untreated knit type, lint free, polishing cloths available from most automotive supply stores.
3. Wet sand the surfaces with 280-grit wet-or-dry sandpaper and wash the residue off with clean water.
4. Apply a minimum of 2 to a maximum of 4 coats of **RJ-1200** Rejuvenator at 10 to 20 minute intervals. Thorough penetration and softening of Poly-Fiber coatings is important. Avoid rejuvenating in temperatures above 80° due to rapid evaporation of the solvents.
5. After the rejuvenated surfaces have dried to a firm film, two coats of **Poly-Spray** may be applied if the surface condition warrants additional filling or sunlight blockage for fabric protection. If small cracks in the old finish are visible after the **Poly-Spray** coat has dried to touch, they may be sealed with **Poly-Spray** using a small soft brush. Applying additional coats of **Poly-Spray** and sanding with 400-grit paper after each coat has dried is optional and will depend on the surface condition.
6. **Poly-Tone** finish may be applied as soon as the rejuvenator and **Poly-Spray** have dried print free. **Aero-Thane** finish should not be applied until the new surface has thoroughly dried 48 hours to 1 week, depending on the temperature. If slow solvents in the rejuvenator (or any coating) are trapped under solvent-resistant, catalyzed finish coatings, there is a possibility of small blisters forming later under the finish coat in areas over metal structure such as wing leading edges and large structural tube or stringer areas. Trapped solvent vapors will escape through the backside of the surface in open fabric areas. Heat lamps to accelerate drying of any coating can also generate vapor blisters.

COVERAGE: Approximately 300 sq ft per gallon.

SHELF LIFE: Guaranteed four years unopened in protected storage. Avoid long-range storage above 100°F. Not affected by freezing.

PACKAGING: One-quart and one-gallon cans and 5-gallon pails.

ULTRA VIOLET BLOCKER



Used as an additive to **Poly-Tone** paint to partially block UV radiation. Does NOT replace **Poly-Spray** as a full UV blocker. Do NOT use with **Aero-Thane**.

Should only be used in the most weight-restrictive ultralight applications. IT IS NOT A SUBSTITUTE FOR **SILVER POLY-SPRAY** and is much LESS effective.

DIRECTIONS: Mix well, scraping the bottom of the can to ensure dispersion. Solids will settle during storage.

Quarts. Add 1 fl oz, and shake well.

Gallons. Add 4 fl oz, and shake well.

SHELF LIFE: Four years, unopened. Must be shaken and redispersed after storage.

PACKAGING: Half-pint cans (8 fl oz).

ENAMEL

A one-part, air-drying alkyd enamel coating available in 50 colors to match **Poly-Tone** and **Aero-Thane.** It air dries to a high gloss similar to our **Aero-Thane** polyurethane, but is not as chemically resistant as **Aero-Thane.** Intended as a topcoat paint over metal or composite surfaces that have been primed with **EP-420** Epoxy Primer. Do not use Enamel over fabric or on structures that will be covered with fabric cemented with **Poly-Tak** adhesive. **Poly-Tak** will lift enamel.

INSTRUCTIONS:

SURFACE PREPARATION: Surface must be dry and free of oil, dirt, wax, grease, and silicone. Contamination may cause fisheyes and craters. Remove oil, wax, grease, and fingerprints with **C-2210** Paint Surface Cleaner. Remove silicone residue from polish with **310** Alkaline Cleaner diluted with 20 parts water. Epoxy primer aged over two days should be lightly scuff-sanded with Scotch-Brite

Pads or 320-grit wet-or-dry sandpaper to provide tooth adhesion. Allow **C-2210** to dry at least 30 minutes; then wipe surfaces lightly with a clean tack rag immediately prior to painting. Any surface irregularities, heavy sanding scratches, or dust particles may be telegraphed thru the high gloss finish. Freshly painted surfaces should be protected from dust and insects until dust free (about 40 minutes).

ENAMEL PREPARATION: Pigments may hard settle after three months storage. We recommend inverting the can every 30 days to avoid pigment compaction. Pigments hard settled in extended storage should be dislodged from the bottom with a tool, then dispersed thoroughly by agitating with a double- action paint shaker for 15 minutes minimum. Filter thru our Poly-Fiber 60x48 paint filter cone before using.

SPRAYING & THINNING ENAMEL: Apply with a spray gun. For Best results apply over **EP-420** White Epoxy Primer. Enamel may react with one-part primers like zinc chromate. Enamel is normally a slow-drying paint that can remain tacky for long periods in high humidity. For best results, spray two to three coats twenty minutes to an hour apart.

CAUTION: All coats should be sprayed on the same day, and then set aside to dry. Enamel is an alkyd resin developed with 1930s' technology. Unlike today's polyurethane or acrylic paints, delays beween coats can result in wrinkling of the surface. This most often occurs when a heavy coat is sprayed over earlier applications. For best results, spray two or three coats in one day, and consider the job complete. Trim colors of enamel can be applied over a dried enamel base color, but you must wait at least a week and apply trim in light coats, only enough to get the job done. Flooding enamel over enamel will always result in wrinking.

FLATTENING: For semi-gloss (to match Poly-Tone), mix 1 part Poly-Fiber **Flattener** with 4 parts Enamel. For full flat, mix 1 part Poly-Fiber **Flattener** with 2 parts Enamel.

COVERAGE: One gallon of Enamel will cover approximately 200 sq ft with one coat.

COLOR SEQUENCE: Apply light colors first and overcoat with darker trim colors. All pigments are non-bleeding.

DRYING TIME: Dust free in 60 minutes. Allow 24 hours drying before using masking tape. All drying times are given at 70°F. and 50% relative humidity and must be compensated accordingly.

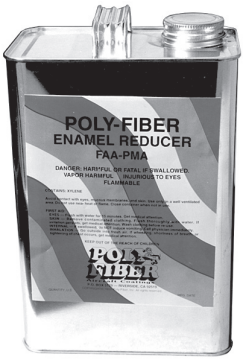
APPLICATION: Shake well and filter. Spray three coats for coverage. Allow 1 hour drying time between coats.

FINISH MAINTENANCE: Wash surface with 310 Alkaline Cleaner diluted with 20 parts water. Wax with 100% carnauba wax.

SHELF LIFE: Guaranteed four years unopened in protected storage. Avoid long-range storage above 100°F. Not affected by freezing.

PACKAGING: One-quart and one-gallon cans.

ENAMEL REDUCER



A blend of solvents used for viscosity and drying control of Poly-Fiber Enamel. Use according to directions on Enamel.

SHELF LIFE: Infinite, in sealed containers in protected storage. Not affected by freezing.

PACKAGING: One-quart and one-gallon cans.

AERO-THANE

A tough, flexible, solvent-, chemical-, abrasion-, and weather-resistant high-gloss, two-part polyurethane recommended as the best quality fabric finish over Poly-Fiber covering materials, and all primed metal and glass fiber composite components on fabric-covered aircraft. Also recommended to refinish suitably rejuvenated nitrate and butyrate dope-coated aircraft fabric surfaces, all old sound finishes on metal and glass fiber aircraft components, old finishes on glass fiber or metal boat hulls, automotive, truck and industrial equipment.

INSTRUCTIONS:

SURFACE PREPARATION: Surface must be dry and free of oil, dirt, wax, grease, and silicone. Contamination may cause fisheyes and craters. Remove oil, wax, grease, and fingerprints with **C-2210** Paint Surface Cleaner. Remove silicone residue from polish with **310** Detergent Cleaner diluted with 20 parts water. Epoxy primer aged over 2 days should be lightly scuff sanded with Scotch-Brite Pads or 320-grit wet-or-dry sandpaper to provide tooth adhesion. Wipe surfaces lightly with a clean tack rag immediately prior to painting. Any surface irregularities, heavy sanding scratches, or dust particles may be telegraphed thru the high gloss finish. Fresh painted surfaces should be protected from dust and insects until dust free.

PAINT PREPARATION: Pigments may hard settle after 3 months storage. Invert the can every 30 days to avoid pigment compaction. Pigments hard settled in extended storage should be dislodged from the bottom with a tool, then dispersed thoroughly by agitating with a double-action paint shaker for 10 minutes.

MIXING PROCEDURE: Add 1 part **U-865** catalyst to 3 parts **Aero-Thane** base (1 qt to ¾ gal). Stir thoroughly. Ratio must be accurate for best characteristics. Allow 20 minutes induction time before thinning.

THINNING: For standard suction guns (compressors), thin **Aero-Thane** 33%. An easy measurement is 3 parts catalyzed **Aero-Thane** to 1 part **UE-820** Reducer. For turbine-powered HVLPs, you may need to thin more, up to 40% (3:2 ratio). Filter through a 60x48-mesh or finer paint strainer cone.

APPLICATION PROCEDURE: Spray a light color coat, enough for gloss and color, but not enough to run. WAIT until this coat is tacky and transfers no color to your finger. Should take 20 minutes at 77°, longer at cooler temperatures. Don't let this first coat dry completely. Spray a medium coat of paint. This coat should flow out and look wet; again don't flood it on. Now spray a final wet coat for fill and color. Do not flood it on! That's a total of three coats, wet, but not enough to run. These are normal coats, not cross coats. Dry film thickness should be approx. 1.7 mils (.0017). Application in less than 55°F. temperature is not recommended. Do not spray in ambient air temperature above 95°F. due to accelerated polymerization caused by the heat, resulting in reduced gloss. Relative humidity above 80% accelerates polymerization and may reduce gloss if exposed before drying 12 hours.

COVERAGE: 1 gallon of catalyzed **Aero-Thane** polyurethane will cover approximately 225 sq ft with one coat.

POT LIFE: The sooner **Aero-Thane** is applied after the induction period the better the durability. Maximum pot life is 7 hours at 77°F. Discard materials when viscosity increases or becomes stringy when tested between the fingers. Do not add reducer to extend pot life after thickening occurs.

EXTENDED POT LIFE: The polymerization of the catalyzed **Aero-Thane** may be suspended 24 hours or longer by storing at 30°F. or less in a refrigerator. Warm to room temperature before spraying.

CLEAN UP: Use MEK or **UE-820** Reducer before material has started to polymerize in the equipment.

DRY DUST FREE: One hour at 77°F. and approximately 50% relative humidity.

DRY TO TAPE: 10 to 12 hours at 77°F. and approximately 50% relative humidity.

FULL CURE TIME: Seven days at 77°F. and approximately 50% relative humidity.

RECOATING: All surfaces which have cured more than two days should be scuff sanded to provide tooth adhesion for the new coat. Use Scotch-Brite No. 7448 pads or 400-grit wet-or-dry sandpaper. May be removed from metal surfaces with any commercial paint stripper.

SPOT REPAIRS: Areas to be refinished after repairs should be masked to a structural division line or seam or the overspray levelled with a "melt-in" by immediately mist coating the area with a mixture of 1 qt. **UE-820** Reducer to 1 oz **UR-826** Retarder.

SHELF LIFE: Guaranteed shelf life, unopened, in protected storage at room temperature is four years from date of manufacture. Avoid long-range storage above 100°F. Not affected by freezing.

COLORS: Available in all standard Poly-Fiber colors. **Aero-Thane** is designated by adding the letters "AO" in front of the color number. Example: AO-191 is Pontiac Red.

PACKAGING: One-quart and one-gallon kits only.

One-Quart Kit = ¾-filled quart base component plus ½ pint of catalyst.

One-Gallon Kit = ¾-filled gallon base component plus 1 quart of catalyst.

COMPANION PRODUCTS:
UE-820 Urethane Reducer
UR-826 Urethane Retarder
U-865 Urethane Catalyst

AO-100
CLEAR AERO-THANE

A tough, flexible, two-part clear polyurethane recommended to retain the original brilliance of polished aluminum. Not recommended when the aircraft will be exposed to severe environmental pollution.

INSTRUCTIONS:

PROTECTING DACRON ULTRA-LIGHT SAILS: Clear Aero-Thane is used to seal and provide UV protection for Stabilized Dacron or nylon ultralight fabric. Mix and thin **Aero-Thane** as instructed below and spray two or three coats over clean sails to provide UV protection. **Clear Aero-Thane** has UV blockers that protect sails and markedly extend their service life. **Clear Aero-Thane** will not change the appearance of the fabric or increase its gloss.

CAUTION: Clear Aero-Thane should not be applied over colored **PolyTone** or **Aero-Thane** to increase the gloss of those paints. **Clear Aero-Thane** is only to be used on ultralight sails; it is not suitable as a generic clear coat.

MIXING PROCEDURE: Add 1 part **U-865** catalyst to 3 parts **Aero-Thane** base (1 qt to ¾ gal). Stir thoroughly. Ratio must be accurate for best characteristics. Allow 20 minutes induction time before thinning.

THINNING: For standard suction guns (compressors), thin **Aero-Thane** 33%. An easy measurement is 3 parts catalyzed **Aero-Thane** to 1 part **UE-820** Reducer. For turbine-powered HVLPs, you may need to thin more, up to 40% (3:2 ratio). Filter through a 60x48-mesh or finer paint strainer cone.

APPLICATION PROCEDURE: Spray for best results. **Clear Aero-Thane** was meant to be sprayed; brushing or rolling may result in a rough finish. Spray when temperature is above 55°F.

COVERAGE: One gallon catalyzed **Aero-Thane AO-100** enamel will cover approximately 225 sq ft with one coat.

POT LIFE: The sooner **Aero-Thane** is applied after the induction period the better the durability. Maximum pot life is seven hours at 77°F. Discard materials when viscosity increases or becomes stringy when tested between the fingers. Do not add reducer to extend pot life after thickening occurs.

EXTENDED POT LIFE: The polymerization of the catalyzed paint may be suspended 24 hours or longer by storing at 30°F. or less in a refrigerator. Warm to room temperature before spraying.

CLEAN UP: Use MEK or **UE-820** Reducer before material has started to polymerize in the equipment.

DRY DUST FREE: One hour at 77°F. and approximately 50% relative humidity.

DRY TO TAPE: 10 to 12 hours at 77°F. and approximately 50% relative humidity.

FULL CURE TIME: Seven days at 77°F. and approximately 50% relative humidity.

SHELF LIFE: Guaranteed shelf life, unopened, in protected storage at room temperature is four years from date of manufacture. Avoid long-range storage above 100°F. Not affected by freezing.

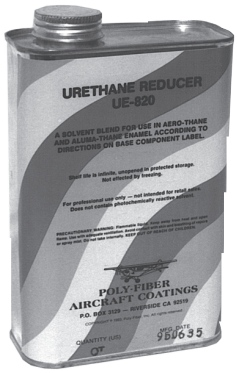
PACKAGING: One-quart and one-gallon kits only.

One-Quart Kit = ¾-filled quart base component plus ½ pint of catalyst.

One-Gallon Kit = ¾-filled gallon base component plus 1 quart of catalyst.

COMPANION PRODUCTS:
UE-820 Urethane Reducer
UR-826 Urethane Retarder
U-865 Urethane Catalyst

UE-820 URETHANE REDUCER

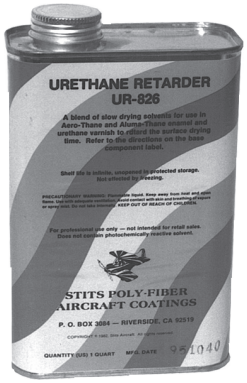


A solvent blend for use in Aero-Thane according to directions on base component listing.

SHELF LIFE: Infinite, in sealed containers in protected storage. Not affected by freezing.

PACKAGING: One-quart and one-gallon cans.

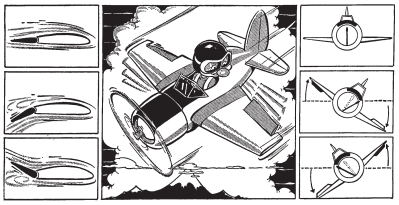
UR-826 URETHANE RETARDER



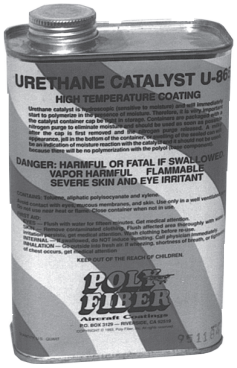
A blend of slow-drying solvents for use in Aero-Thane and UV-550 Urethane Varnish to retard the surface drying time. Refer to the directions on the base component listing.

SHELF LIFE: Infinite, in sealed containers in protected storage. Not affected by freezing.

PACKAGING: One-quart and one-gallon containers.



U-865 URETHANE CATALYST



An aliphatic polyisocyanate in a solvent blend for use in Aero-Thane and UV-550 Urethane Varnish. Refer to directions on the base component listing.

Urethane Catalyst is furnished with **Aero-Thane** components as a kit. **Urethane Catalyst** is hydroscopic (sensitive to moisture) and will immediately start to polymerize in the presence of moisture. Therefore, it is very important the catalyst container cap be tight in storage. Containers are packaged with a nitrogen purge to eliminate moisture, and should be used as soon as possible after the cap is first removed and the nitrogen purge released. A milky appearance, gel in the bottom of the container, or swelling of the seals are indications of moisture reaction with the catalyst, and it should not be used because there will be no polymerization with the polyol (base component).

After each opening, the aluminum foil seal in the cap should be checked for damage and a new aluminum foil seal cut if necessary to prevent reaction with impurities in the paper gasket. The suitability of urethane catalyst can be checked by mixing 1 spoon to 3 spoons of the base component and brush a small test patch. After aging 7 days, rub 50 strokes with an MEK soaked rag. Any good quality, properly polymerized urethane coating will not be softened and the pigment transferred to the rag.

SHELF LIFE: Guaranteed two years from date of manufacture, unopened in protected storage. Avoid extended storage above 100°F. Not affected by freezing.

PACKAGING: Half-pints and quarts.

RANTHANE POLYURETHANE

Ranthane is a high-solids, flexible two-part polyurethane that is FAA approved for use on Poly-Fiber fabric. Except for **Aero-Thane,** no other polyurethane is approved on the Poly-Fiber STC. Although extremely flexible, **Ranthane** is also optimized for use on primed aluminum, steel, or composite surfaces. **Ranthane** is offered in 50 colors as presented on Randolph Color Card 2004 and Poly-Fiber Color Card No. 50. **Ranthane** has three separately packaged components that are mixed before application. All three components are required and cannot be substituted: **Ranthane** Polyurethane Paint, **AU-CAT-2X1** Catalyst, and **G-4200** Urethane Reducer.

COVERAGE: One gallon of mixed components (two gal. sprayable) will yield 300 square feet with one coat. See specific aircraft amounts in the rear of this manual.

MIXING: Mix two parts **Ranthane** with one part **AU-CAT-2X1** and stir. Allow to sit for 20 minutes induction time before use.

POT LIFE: Six hours, depending upon temperature, humidity, and color.

THINNING: Thin 33% with **G-4200** Urethane Reducer. As a rule of thumb, this is about 3 parts catalyzed **Ranthane** to one part **G-4200** Urethane Reducer. For best results, thin 33%, then spray a vertical surface test area with a moderate coat to insure that the film has no orange peel and is not too runny.

APPLICATION:

WARNING: AS WITH ALL CATALYZED POLYURETHANES, A FRESH-AIR SUPPLIED SPRAY MASK IS MANDATORY. CHARCOAL MASKS WILL NOT PROTECT FROM POLYISOCYNATES IN THE SPRAY MIST!

Ranthane may be applied directly over fabric surfaces when the **Poly-Spray** has dried at least 36 hours. More drying time is better. Epoxy primer should dry for one week over metal or composite surfaces before applying Ranthane. Applying **Ranthane** directly over fresh sub-coats may result in bubbles in the **Ranthane** from trapped sub-coat solvents.

Before committing to spraying a whole component, spray a vertical test area. If orange peel results, add more **G-4200 Urethane Reducer;** if the test area results in runs, spray less. Spray a light coat; allow this coat to dry for 10 minutes or until tacky. Follow with a full coat, wet enough for coverage and color, but not heavy enough to run. Wait 45 minutes between coats. Two coats should be sufficient for color and hide. If you wait more than seven days between coats, lightly scuff the surface with an ultra-fine Scotch-Brite pad.

DRY TIME: 30 to 45 minutes, depending upon temperature and humidity. Wait at least 24 hours before turning components on sawhorses to avoid damaging the fresh paint. To speed up drying, use 1 ounce of **D-7201** Accelerator per quart of catalyzed **Ranthane.**

SHELF LIFE: Four years unopened. Insure contents are fully mixed before use.

PACKAGING: Gallons and quarts.

Required components are as follows:

Gallon Components:
- One gallon **Ranthane** polyurethane paint
- Two quarts **AU-CAT-2X1** Catalyst
- One gallon **G-4200** Urethane Reducer. These components will yield over two gallons of sprayable **Ranthane.**

Quart Components:
- One quart **Ranthane** polyurethane paint
- One pint **AU-CAT-2X1** Catalyst
- One quart **G-4200** Urethane Reducer. These components will yield over two quarts of sprayable **Ranthane.**

AU-CAT-2X1 RANTHANE CATALYST

AU-CAT-2X1 is the only catalyst approved for **Ranthane.** Other products cannot be substituted. See mixing instructions in the **Ranthane** section above.

PACKAGING: Pints and quarts only.

SHELF LIFE: Two years unopened. Do not use if the catalyst becomes milky or stringy. Catalyst reacts with humidity, once opened, it may react in contact with any moisture.

D-7201 RANTHANE ACCELERATOR

This product accelerates the drying time of **Ranthane.** Used to speed drying in cooler spraying temperatures (60s), or to accelerate drying time when airborne dirt contamination is a problem.

PACKAGING: Quarts.

SHELF LIFE: Four years unopened.

MIXING: Add **AU-CAT-2X1** Catalyst to **Ranthane** before adding **D-7201** accelerator. Use up to 4 fl oz per catalyzed gallon (one fl oz per catalyzed quart). Finally, add **G-4200** Reducer as instructed above.

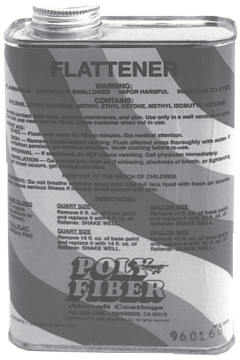
G-4200 REDUCER FOR RANTHANE

G-4200 Reducer is a special blend of solvents specifically formulated for use with **Ranthane** polyurethane paint. Other products cannot be substituted. See mixing instructions in the **Ranthane** section above.

PACKAGING: Quarts and gallons.

SHELF LIFE: Unlimited in closed containers.

FLATTENER



Flattener is a liquid product with silica flattener added. It is used to reduce the gloss of **Poly-Tone, Enamel, Ranthane** and **Aero-Thane.** Adding **Flattener** in increasing amounts can result in semi-gloss or full military flat, depending upon the percentage added. Flattening is an inexact science; it is always best to spray a sample then let it dry to insure you are achieving the desired flatness.

PACKAGING: Quarts and pints.

SHELF LIFE: Four years unopened.

MIXING: Flattener must be stirred and shaken regularly to insure that all the silica is in suspension.

APPLICATION:
FIRST – get bigger containers for mixing. Since **Flattener** always increases the volume of the paint, if you plan on flattening a whole quart or gallon at one time, you will need empty cans or containers big enough to hold the flattened product. For example, if you are going to flatten a quart of **Aero-Thane,** you will need an empty gallon can with a lid if you plan to store it after flattening.

SECOND: Always do a test spray to insure you are getting the level of flatness you desire. Flatten a small amount, spray, and let it dry. Do this before you commit to painting your airplane. Adjust the amount of **Flattener** if necessary. Again, flattening is not an exact science. TEST FIRST!

TO FLATTEN POLY-TONE OR ENAMEL TO SEMI GLOSS: Mix four parts paint with one part **Flattener** (eight fluid ounces of **Flattener** per quart of paint.) Thin normally.

TO FLATTEN POLY-TONE OR ENAMEL TO FULL FLAT: Mix two parts paint with one part **Flattener.** (sixteen fluid ounces of **Flattener** per quart of paint.) Thin normally.

TO FLATTEN AERO-THANE OR RANTHANE TO SEMI-GLOSS: Mix four parts paint with one part **Flattener.** (eight fluid ounces per quart of paint.)

Then catalyze this flattened mixture normally. (see the instructions for **Aero-Thane** or **Ranthane**)

Then thin this flattened mixture normally (see the instructions for **Aero-Thane** or **Ranthane.**)

NOTE: YOU WILL NEED EXTRA CATALYST. Since the flattened paint yields more sprayable product, you will need some extra catalyst. For each can of **Aero-Thane** or **Ranthane,** get an extra companion unit of catalyst. For example, for **Ranthane,** each flattened gallon to be catalyzed will require an extra quart.

UV-550 URETHANE VARNISH

Clear, high-gloss, exterior and interior. The most durable varnish available.

A tough, light-fast, non-chalking, weather-, chemical-, and solvent-resistant two-part urethane varnish formulated especially for aircraft and marine wood surfaces which will be exposed to severe environmental conditions.

INSTRUCTIONS:

SURFACE PREPARATION: The surface must be clean, dry, free of wax, dirt, oil and grease. Old surfaces should be dry sanded to remove any loose varnish and paint scale. Use **C-2210** Paint Surface Cleaner to remove grease and oil from new wood surfaces and old paint and varnish surfaces.

MIXING PROCEDURE: Mix exactly 1 part **U-865** catalyst with 2 parts **UV-550** base component. Ratio must be accurate for best characteristics. Stir thoroughly and allow 20 minutes induction time before application. Avoid shaking which causes bubbles in thick solution. Thinning eliminates bubbles. Filter thru a 60x48 mesh or finer paint strainer cone.

THINNING FOR BRUSH APPLICATION – NEW WOOD: After the two components are mixed, reduce the first brush coat 25% with toluol for good surface penetration. Second and optional third coats may be brushed unthinned at 2 to 3 hour intervals, or applied with a spray gun at 15 to 20 minute intervals.

THINNING FOR SPRAY GUN APPLICATION: Reduce the two mixed components to spray gun viscosity by adding 25% toluol

(toluene) (19 to 21 seconds with a #2 Zahn viscosity cup). Three spray coats are recommended at 15 to 20 minute intervals.

RETARDER: UR-826 retarder may be added at 1 oz to 1 gal varnish for each 2° of temperature above 77°F. to delay surface drying and provide smooth flow-out in hot weather or eliminate blushing in very humid hot weather.

APPLICATION PROCEDURE: Urethane varnish may be applied with any spray equipment rated for lacquer or enamel. Flooding spray or brush coats will cause crawling and cratering over old finishes or dry first coats on new wood. Recommended dry coat thickness 1 to 1.5 mils. Contamination from oil base coatings leaching from old pressure pot hoses or contamination from unclean or soluble plastic or plastic lined containers used for mixing or measuring will cause crawling. Spray gun head should be dismantled to remove residue from previous coatings before applying urethane varnish. Application in less than 55° or over 90°F. or relative humidity over 80% not recommended.

COVERAGE: One gallon urethane varnish base component catalyzed and reduced 25% will cover approximately 600 sq ft with one coat.

POT LIFE: The sooner urethane varnish is applied after the induction period the better the durability. Maximum pot life is five hours at 77°F. Discard materials when viscosity increases or becomes stringy when tested between the fingers. Do not add reducer to extend pot life after thickening occurs.

CLEAN UP: Use toluol or MEK for final flush cleaning before the varnish starts to polymerize in the equipment.

DRYING AND FULL CURE TIME: Dry to handle 30 to 90 minutes, depending on coating thickness. Full cure to develop solvent and chemical resistance is 7 days at 77°F. Lower ambient temperatures require a proportionally longer period. Fully cured varnish will not be lifted by adhesives, fabric coatings, enamel, or lacquer top coats.

RECOATING: Varnish coats aged more than 2 days should be dry scuff-sanded with fine sandpaper or Scotch-Brite pads to break the gloss surface and provide tooth adhesion. Wipe the scuffed surface with **C-2210** Paint Surface Cleaner using new, clean rags or paper towels to thoroughly remove the sanding residue.

SHELF LIFE: Guaranteed shelf life, unopened, in protected storage at room temperature is four years from date of manufacture. Avoid long-range storage above 100°F. Not affected by freezing.

PACKAGING: Each component is sold separately, or packaged in a kit. Recommended unit ratios: 1 qt **UV-550** base component, 1 pt **U-865** catalyst and 1 qt toluol.

COMPANION PRODUCTS:
Toluol
U-865 Urethane Catalyst
UR-826 Urethane Retarder

EP-420 EPOXY PRIMER

EP-420 GREEN OR WHITE

A superior quality, amine-cured, corrosion-inhibiting, fast-drying primer providing excellent chemical and solvent resistance. Bonds to all metal surfaces better than any other type field-applied coating. Application and curing in temperatures down to 35°F.

INSTRUCTIONS:

SURFACE PREPARATION: Surface must be clean, dry and free of rust, loose paint scale, dirt, wax, oil, silicone, and grease. Contamination may cause crawling and craters. Immediately before primer application clean metal surface with **C-2200** Metl-Sol Cleaner, then wipe lightly with a clean tack rag.

PAINT PREPARATION: Pigments may hard settle after three months' storage. We recommend inverting the can every 30 days to avoid pigment compaction. Pigments hard settled in extended storage should be dislodged from the bottom with a tool, then dispersed thoroughly by agitating with a double-action paint shaker for 5 minutes minimum.

MIXING PROCEDURE: Mix exactly 1 part **EP 430** catalyst with 2 parts **EP-420** base component. Ratio must be accurate for best characteristics. Stir thoroughly and allow 30 minutes induction time before thinning. In high-humidity allow 1 hour induction time to avoid curing agent "bloom."

THINNING: As a starting point, for spray gun application, reduce 50% with **E-500** Epoxy Reducer (2 parts catalyzed primer to 1 part reducer) (19 to 21 seconds with a #2 Zahn viscosity cup). Additional thinning may be required in warm weather to provide a wet, smooth flow-out.

CURE ACCELERATION: To shorten the cure time in cold weather, add **EX-501** Epoxy Accelerator at a ratio of 1 to a maximum 2 liquid oz to 1 qt of primer reduced to spray viscosity. Stir thoroughly. One oz of **EX-501** accelerator will reduce the pot life 50% at 70°F. Don't exceed 2 oz per qt.

APPLICATION PROCEDURE: Epoxy Primer may be applied with any spray equipment rated for lacquer and enamel. Apply a light, wet tack coat and follow with 2 medium coats at 10 to 15 minute intervals to avoid runs. Flooding the first coat will cause crawling and cratering on any semi-clean surfaces. Recommended dry coat thickness is .06 to 1.0 mils. Contamination from oil base coatings leaching from old pressure pot hoses or contamination from unclean or soluble plastic or plastic lined containers used for mixing or measuring will cause crawling. The spray gun head should be dismantled to remove residue from previous coatings before applying epoxy primer.

COVERAGE: One gallon of primer base component catalyzed and reduced to spray viscosity will cover approximately 1000 sq ft., one coat.

POT LIFE: The sooner epoxy primer is applied after the induction period, the better the durability. Maximum pot life is seven hours at 70°F. Discard materials when viscosity increases or becomes stringy between

the fingers. Do not add reducer to extend pot life after thickening occurs.

CLEAN UP: Use **E-500** Epoxy Reducer for final flush cleaning before the primer starts to polymerize in the equipment. MEK does not dissolve and flush all the epoxy resin from the equipment.

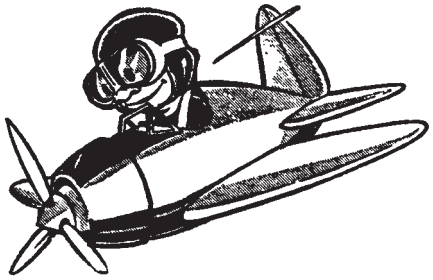
DRYING AND FULL CURE TIME: Dries to handle in 30 to 60 minutes. Full cure to develop solvent and chemical resistance is 7 days at 70°F. Lower ambient temperatures require a proportionally longer period. Full cured primer will not be lifted by adhesives, fabric coatings, enamel, or lacquer top coats.

RECOATING: To avoid possible damage and release from incompatible solvents, primer should dry 6 to 8 hours. When finishing with **Poly-Tone,** spray **Poly-Tone** into tacky primer. See page 85. Scuff-sand after 48 hours cure time when the finish is enamel. Wipe the scuffed surface with **C-2210** Cleaner using new, clean rags or paper towels to thoroughly remove the sanding residue.

SHELF LIFE: Guaranteed shelf life, unopened, in protected storage at room temperature is four years from date of manufacture. Avoid long-range storage above 100°F. Not affected by freezing.

PACKAGING: Each component is sold separately, or packaged in a kit. Recommended unit ratios: 1 qt **EP-420** base component, 1 pt **EP-430** catalyst and 1 qt **E-500** reducer.

COMPANION PRODUCTS:
Epoxy Primer Catalyst EP-430
Epoxy Reducer E-500
Epoxy Accelerator E-501



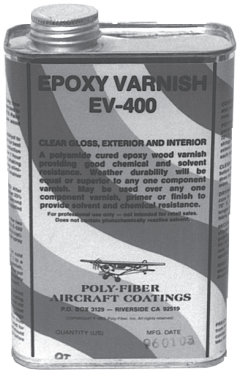
EP-430 EPOXY PRIMER CATALYST

An amine resin in a solvent blend for use in EP 420 Epoxy Primer according to directions on the base component listing.

SHELF LIFE: Guaranteed two years unopened in protected storage. Avoid long-range storage above 100°F. Not affected by freezing.

PACKAGING: One-pint and one-quart cans.

EV-400 EPOXY VARNISH



CLEAR GLOSS, EXTERIOR AND INTERIOR

A polyamide-cured epoxy wood varnish providing good chemical and solvent resistance. Weather durability will be equal or superior to any one component varnish. May be used over any one-component varnish to provide chemical resistance.

INSTRUCTIONS:

SURFACE PREPARATION: The surface must be clean, dry, free of wax, dirt, oil and grease. Old surfaces should be dry-sanded to remove any loose varnish and paint scale. Use **C-2210** Paint Surface Cleaner to remove grease and oil from new wood surfaces, old paint and varnish surfaces.

MIXING PROCEDURE: Add exactly one part **EV-410** catalyst to 2 parts **EV-400** base component. Ratio must be accurate for best characteristics. Stir thoroughly and allow 30 minutes induction time before thinning. In high humidity weather allow 1 hour induction time to avoid curing agent "bloom." Avoid shaking which causes small bubbles in thick solution. Thinning eliminates bubbles. Filter thru a 60x48 mesh or finer paint strainer cone.

THINNING – New Wood: After the **EV-400** and **EV-410** components are mixed, reduce 50% with **E-500** Epoxy Reducer (2 parts catalyzed varnish to 1 part reducer) and brush on for good surface penetration. Second and optional third coats may be brushed or sprayed on using following spray gun directions.

Spray Gun Directions: After the **EV-400** and **EV-410** components are mixed, reduce 25% with **E-500** Epoxy Reducer (4 parts catalyzed varnish to 1 part reducer) (19 to 21 seconds with a #2 Zahn viscosity cup). Additional thinning may be required in hot climates. Three spray coats are recommended at 3 to 4 hour intervals.

Floorboard Application: After two to three sprayed-on coats at 25% reduction, immediately spray on a fourth coat reduced 50% with **E-500** Epoxy Reducer which will bite into initial coats and flow out to provide a smoother, higher gloss.

CURE ACCELERATION: To shorten the cure time in cold weather, add **EX-501 Epoxy Accelerator** at a ratio of 1 to a maximum 3 liquid oz to 1 qt of catalyzed varnish, unthinned. Stir thoroughly. One oz of **EX-501** will reduce the pot life from 5 hours to 3 hours and the curing time from approximately 7 days to 4 days at 70°F. Do not exceed 3 oz per qt.

APPLICATION PROCEDURE: Epoxy varnish may be applied with any spray equipment rated for lacquer or enamel. Flooding spray or brush coats will cause crawling and cratering over old finishes or dry first coats on new wood. Recommended dry coat thickness 1 to 1.5 mils.

Contamination from oil base coatings leaching from old pressure pot hoses or contamination from unclean or soluble plastic or plastic lined containers used for mixing or measuring will cause crawling. Spray gun head should be dismantled to remove residue from previous coatings before applying epoxy varnish.

COVERAGE: One gallon **Epoxy Varnish** base component catalyzed and reduced 25% will cover approximately 600 sq ft with one coat.

POT LIFE: The sooner epoxy varnish is applied after the induction period the better the durability. Maximum pot life is five hours at 70°F. Discard materials when viscosity increases or becomes stringy when tested between the fingers. Do not add reducer to extend pot life after thickening occurs. Mix material fresh for each coat.

CLEAN UP: Use **E-500** Epoxy Reducer for final flush cleaning before the varnish starts to polymerize in the equipment. MEK does not dissolve and flush all the epoxy resin from the equipment.

DRYING AND FULL CURE TIME: Dry to handle 3 to 5 hours. Full cure to develop solvent and chemical resistance is 7 days at 70°F. Lower ambient temperatures require a proportionally longer period. Full cured varnish will not be lifted by adhesives, fabric coatings, enamel or lacquer top coats.

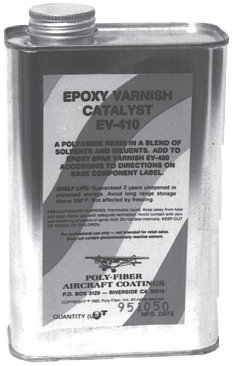
RECOATING: Varnish coats which have aged more than 4 days should be dry scuff sanded with fine sandpaper or Scotch-Brite pads to break the gloss surface and provide tooth adhesion. Wipe the scuffed surface with **C-2210** Paint Surface Cleaner using new, clean rags or paper towels to thoroughly remove the sanding residue.

SHELF LIFE: Guaranteed shelf life, unopened, in protected storage at room temperature is four years from date of manufacture. Avoid long-range storage above 100°F. Not affected by freezing.

PACKAGING: Each component is sold separately, or packaged in a kit. Recommended unit ratios: 1 qt **EV-400** base component, 1 pt **EV-410** catalyst, and 1 qt **E-500** reducer.

COMPANION PRODUCTS:
Epoxy Varnish Catalyst EP-410
Epoxy Reducer E-500
Epoxy Accelerator EX-501

EV-410 EPOXY VARNISH CATALYST

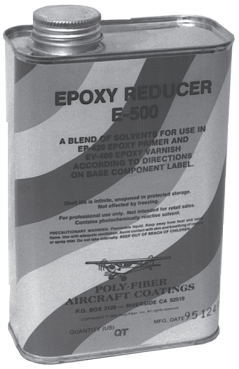


A polyamide resin in a blend of solvents and diluents. Add to EV-400 Epoxy Varnish according to directions on base component listing.

SHELF LIFE: Guaranteed two years unopened in protected storage. Avoid long-range storage above 100°F. Not affected by freezing.

PACKAGING: One-pint and one-quart cans.

E-500 EPOXY REDUCER

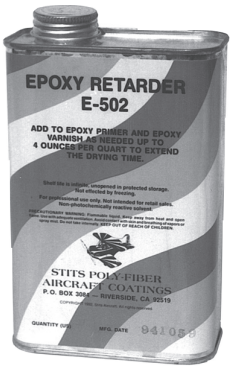


A blend of solvents for use in EP-420 Epoxy Primer and EV-400 Epoxy Varnish according to the directions in the base component listing.

SHELF LIFE: Infinite in sealed container in protected storage. Not affected by freezing.

PACKAGING: One-quart and one-gallon cans.

E-502 EPOXY RETARDER

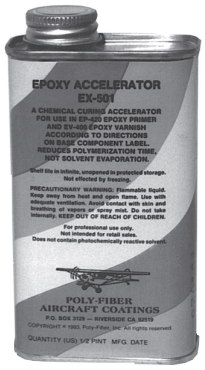


Add to Epoxy Primer and Epoxy Varnish as needed, up to four oz per qt, to extend the drying time.

SHELF LIFE: Infinite, in sealed container in protected storage. Not affected by freezing.

PACKAGING: One quart.

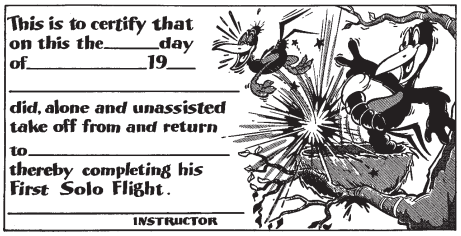
EX-501 EPOXY ACCELERATOR



A chemical curing accelerator for use in EP-420 Epoxy Primer and EV-400 Epoxy Varnish according to the directions on the base component listing.

SHELF LIFE: Infinite, in sealed container in protected storage. Not affected by freezing.

PACKAGING: One-pint container.



FLOAT LACQUER

Float Lacquer is a time-honored silver coating for aircraft floats. Although it can be applied by brush, it is more suitable for spraying. **Float Lacquer** is a classic, low-tech way of coating floats. Although its service life is far less than today's polyurethanes, its ease of application and repair make it a useful product. Apply over epoxy-primed metal or over old float lacquer.

PACKAGING: Quarts, gallons, 5-gallon pails, 55-gallon drums.

SHELF LIFE: One year in unopened containers.

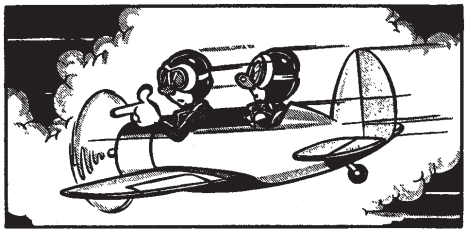
COVERAGE: 225 square feet per gallon.

MIXING: Stir thoroughly before use. Insure all the silver is in suspension.

THINNING: Thin one to one with **286** Nitrate Thinner.

APPLICATION – Stripped or Bare Aluminum: Use phosphoric acid etch and conversion coating. (See acids section) Prime with epoxy primer. When dry, scuff with an ultra-fine Scotch-Brite pad clean well, then spray three coats of 1:1 thinned float lacquer.

APPLICATION – Old Float Lacquer: Clean well, scuff with an ultra-fine Scotch-Brite pad, and spray float lacquer as required for cosmetics. Can be brushed, although spraying results in a better coating



SUPERFIL

An ultra lightweight corrosion-inhibiting filler for aircraft, marine, and automotive use. Adheres to composites, bare aluminum, steel, and bare or varnished wood.

Epoxy resin with non-MDA hardener. Ships non-hazardous. Apply **EP-420** Epoxy Primer directly over **SuperFil.**

COMPOSITE FILLING: Use as you would an epoxy micro slurry. Mix by weight for best results. Scuff-sand smooth surfaces before application. Trowel or squeegee to desired thickness. After drying, sand to shape, and finish. Works as an excellent fillet material.

BARE ALUMINUM: Scuff surface with a Scotch-Brite pad. Treat bare aluminum with **E-2300** Conversion Coating prior to application. Apply **EP-420** Primer directly over dried **SuperFil.**

BARE STEEL: Clean off all rust and oil, and wipe with **C-2200** Metl-Sol.

VARNISHED OR BARE WOOD: Scuff-sand and clean as necessary. **EV-400** Epoxy Varnish may be applied directly over **SuperFil.**

MIXING:
By Weight (preferred)
2 parts A to 1 part B
By Volume:
2 parts A to 1 part B

Thoroughly stir each individual container of part A and part B before combining. Resin or hardener can separate from fillers during storage. After combining parts A and B, scrape the sides of the mixing container to insure a thorough blend. Mix to a consistent light blue color.

CURE: Allow to cure at 70° or above for best results. Lower temperatures will lengthen the cure time.
Dry film cure: 8 hours at 77°
Cure to sand: 12 hours at 77°

POT LIFE: One hour at 77°

CLEAN UP: MEK before curing occurs

SHELF LIFE: Two years unopened. Avoid storage above 100°. Resin will separate from filler during storage. Remix thoroughly.

PACKAGING: Quart kit (yields 1 quart). Industrial kit (yields 3 gallons).

E-2310 ALUMA-DYNE PHOSPHORIC ACID ETCH AND BRIGHTENER

An effective all-purpose brush-on, wash-off cleaner, brightener, and paint preparation for all aluminum surfaces. Will clean and remove light oil, natural oxides, weathering stains, and light corrosion while etching to provide a firm primer bond. Restores new aluminum appearance. Concentrated solution – dilute before using.

INSTRUCTIONS:

ALUMINUM SURFACES: Surfaces heavily coated with oil, dirt, or mud should be cleaned with 1 part **310** Alkaline Cleaner in 20 parts water. After alkaline cleaning, mask any adjacent areas which may be damaged by acid contact, using cloth masking tape and polyethylene plastic sheet.
Dilute 1 part Aluma-Dyne **E-2310**

with 2 parts clean water using a plastic, porcelain, or stainless steel container.

Using rubber gloves and eye shield, apply the diluted solution with a nylon or polyester brush or synthetic sponge, working a limited area to provide adequate attention. Continue wiping the surface, especially vertical and bottom areas, to replenish drained off or spent solution. Horizontal surfaces which allow solution to "pool" will require less reapplication. Keep the surface wet for 1 to 5 minutes, depending on the surface position and the degree of cleaning, etching, or brightening action required. Excessively oxidized, stained, corroded, or pitted surfaces should be scrubbed with Scotch-Brite ultrafine cleaning pads while etching.

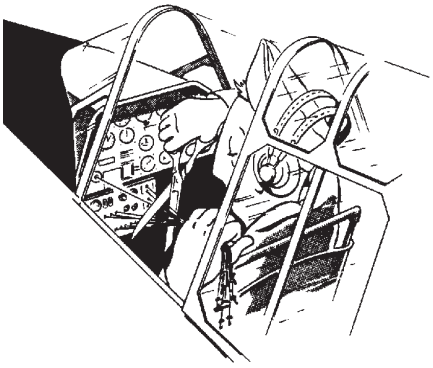
While the surface is wet with **E-2310** solution, rinse with clean running water while wiping with clean rags or sponge. Do not rinse with hot water. Any acid remaining around rivet heads or seams can cause primer failure. Air blow hinges, seams, or joints which may trap acid.

Allow surface to dry, or wipe dry with clean rags and proceed with next operation within 8 hours. We recommend Aluma-Dyne **E-2300** chromic acid treatment for corrosion resistance whether the surface will remain bare, be waxed, or painted with a clear or opaque finish.

One quart Aluma-Dyne **E-2310** will treat approximately 250 sq ft of surface area.

SHELF LIFE: Guaranteed four years in sealed container in protected storage. Avoid long-range storage above 100°F. Protect from freezing.

PACKAGING: One-quart and one-gallon plastic bottles.



E-2311 ALUMA-DYNE ETCHING AND BRIGHTENING CREAM

Phosphoric acid etch and brightener. Will not drain from vertical or inverted surfaces. Alternate to E-2310.

An exclusive formula, all-purpose brush-on, wash-off cream cleaner, brightener, and paint preparation for all aluminum surfaces. Will clean and remove light oil, natural oxides, weathering stains, and light corrosion while etching to provide a firm primer bond. Restores new aluminum appearance. Non-flammable.

INSTRUCTIONS:

Surfaces heavily coated with oil, dirt, or mud should be cleaned with 1 part **310** Alkaline Cleaner in 20 parts water. After alkaline cleaning, mask any adjacent areas which may be damaged by acid contact, using cloth masking tape and polyethylene plastic sheet. Working a limited area to provide adequate attention, apply the cream to a thickness of approximately 1⁄16″ with a nylon or polyester brush or synthetic sponge. Use a plastic, porcelain or stainless steel container. Continue working the surface to replenish spent cream and obtain uniform brightening. Chemical action will be noted by slight foaming which will stop when cream is spent. Keep the surface coated for 1 to 5 minutes depending on the degree of cleaning, etching, or brightening action required. Excessively oxidized, stained, corroded or pitted surfaces should be scrubbed with Scotch-Brite ultra-fine cleaning pads while etching.

Rinse with clean running water while wiping with clean rags or a sponge. Do not rinse with hot water. Any acid remaining around rivet heads or seams can cause primer failure. Air blow hinges, seams, or points which may trap acid.

Allow surface to dry, or wipe dry with clean rags and proceed with next operation within eight hours. We recommend Aluma-Dyne **E-2300** chromic acid treatment for corrosion resistance whether the surface will remain bare, be waxed, or painted with a clear or opaque finish.

One quart Aluma-Dyne **E-2311** will treat approximately 150 sq ft of surface area.

SHELF LIFE: Guaranteed four years in sealed container in protected storage. Avoid long-range storage above 100°F. Protect from freezing.

PACKAGING: One-quart and one-gallon plastic bottles.

E-2300 ALUMA-DYNE CONVERSION COATING REF: Mil C-81706

A brush-on chromic acid treatment to improve corrosion protection on all aluminum surfaces and to improve primer adhesion.

E-2300 Aluma-Dyne chemically accelerates the formation of the natural passive oxide film (technically a ceramic) on aluminum surfaces to resist galvanic corrosion by blocking any electrochem-ical cell. Does not discolor or change the surface appearance. Not harmful if trapped in faying surfaces, and is non-flammable. A concentrated solution. Dilute before using.

INSTRUCTIONS:

New aluminum should be cleaned with 1 part **310** Alkaline Cleaner in 20 parts water, using a sponge to remove any light contamination.

Old corroded or stained aluminum surfaces should be treated with **E-2310** Aluma-Dyne Phosphoric Acid Etch and Brightener, followed with **E-2300** within 8 hours or before weather exposure.

Dilute **E-2300** Aluma-Dyne 1 part to 2 parts clean water in a clean plastic, porcelain, or stainless steel container.

Using rubber gloves and eye shield, apply diluted **E-2300** Aluma-Dyne with a nylon or polyester brush or swab with a sponge, working a limited area to provide adequate attention. Continue wiping the surface, especially vertical and bottom areas, to replenish drained-off or spent solution. Horizontal surfaces which allow the solution to pool will require less reapplication.

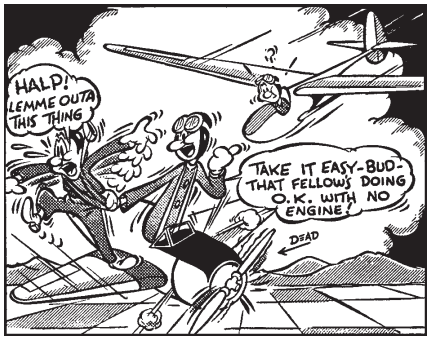
Conversion coating action of **E-2300** Aluma-Dyne is invisible and no color change will be noticed. Keep the surface wet for 5 to 7 minutes, and rinse off with clean water or wipe off with clean wet rags rung out in clean water. If the chromic acid is allowed to dry on the surface, the penetrating stain will require phosphoric acid etch to remove.

For mirror finish on unpainted aluminum, surface should be buffed before, not after, **E-2300** Aluma Dyne treatment to avoid removing the conversion coating. Remove any buffing compound residue with **310** Alkaline Cleaner before the **E-2300** Aluma-Dyne treatment.

One quart Aluma-Dyne **E-2300** will treat approximately 250 sq ft of surface area.

SHELF LIFE: Guaranteed four years in sealed container in protected storage. Avoid long-range storage above 100°F. Protect from freezing.

PACKAGING: One-quart plastic bottles.



E-2390 MAGNA-DYNE MAGNESIUM CONVERSION COATING REF: Mil M-3171 Class V1

A brush-on, wash-off, chromic acid treatment for magnesium alloy surfaces. Magna-Dyne develops a passive oxide film on magnesium surfaces to prevent galvanic corrosion by blocking any electrochemical cell. Recommended as a touch-up over all other conversion coating treatments after a paint stripping operation. Not harmful if trapped in faying surfaces. Non flammable. Concentrated solution. Dilute before using.

INSTRUCTIONS:

Thoroughly clean the surface with 1 part **310** Alkaline Cleaner in 20 parts water. Rinse with clean water, and wipe dry with clean rags. Never use Methanol (methyl alcohol) or wood alcohol to clean magnesium.

Dilute **E-2390** Magna-Dyne with equal parts clean water. Using rubber gloves and eye shield, apply the diluted solution with a nylon or polyester brush or synthetic sponge, working a limited area to provide adequate attention. Continue wiping the surfaces, especially vertical and bottom areas to replenish drained off or spent solution. Horizontal surfaces which allow the solution to "pool" will require less reapplication. Chemical action on bare untreated magnesium will be noted by foaming which will stop when solution is spent. Keep surface wet 1 to 3 minutes. One minute treatment time produces a brassy iridescence. Three minutes produces a dark brown color, the best for paint adhesion. Do not exceed 3 minutes or a powdery coating may result.

If the surface is corroded or pitted, scrub with Scotch-Brite abrasive pads to show new metal before conversion coating treatment.

While the surface is still wet with **E-2390** Magna-Dyne**,** rinse off with clean water or wipe with clean wet rags or sponge. Do not use hot water rinse.

Wipe dry and apply primer within 8 hours or before exposure to outside atmospheric conditions.

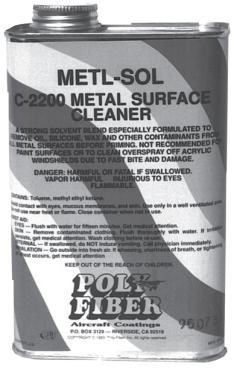
Magnesium is a very chemically sensitive metal and must be protected from rapid oxidation during the cleaning and conversion coating treatment process through priming to assure a good primer bond.

One quart diluted **E-2390** Magna-Dyne will treat approximately 200 sq ft of surface area.

SHELF LIFE: Guaranteed four years in sealed container in protected storage. Avoid long-range storage above 100°F. Protect from freezing.

PACKAGING: One-quart plastic bottles.

C-2200 METL-SOL METAL SURFACE CLEANER



A strong solvent blend especially formulated to remove oil, silicone, wax, and other contaminants from all metal surfaces before priming. Not recommended for paint surfaces or to clean overspray off acrylic windshields due to fast bite and damage.

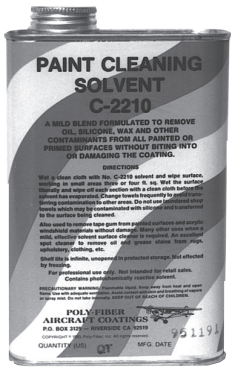
DIRECTIONS: Immediately before priming, wet a clean cloth or paper towel with **Metl-Sol** Cleaner and wet the surface liberally working a small 3 or 5 foot square area. Wipe off each section with a clean dry

cloth or paper towel before the Metl-Sol has evaporated to remove dissolved or loosened contaminants. Change towels frequently to avoid transferring contamination to other areas. Do not use laundered shop towels that may be contaminated with silicone which would be transferred to the surface being cleaned.

SHELF LIFE: Infinite, in sealed containers in protected storage. Not affected by freezing.

PACKAGING: One-quart and one-gallon cans.

C-2210 PAINT CLEANING SOLVENT

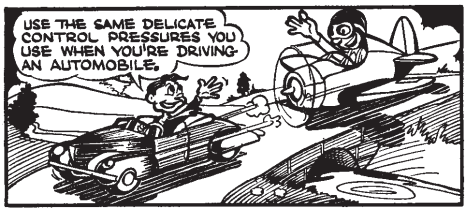


A mild blend formulated to remove oil, silicone, wax, and other contaminants from all painted or primed surfaces without biting into or damaging the coating.

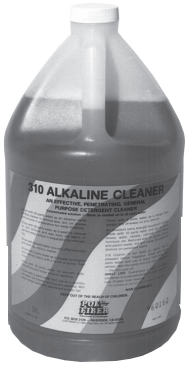
Also used to remove tape gum from painted surfaces and acrylic windshield materials without damage. Many other uses when a mild, effective solvent surface cleaner is required. An excellent spot cleaner to remove oil and grease stains from rugs, upholstery, clothing, etc. Allow **C-2210** to dry at least 30 minutes before using a tack rag.

SHELF LIFE: Infinite, in sealed containers in protected storage. Not affected by freezing.

PACKAGING: Quarts and gallons.



310 ALKALINE CLEANER



AN EFFECTIVE, PENETRATING, GENERAL PURPOSE DETERGENT CLEANER

Concentrated solution – dilute as needed with up to 32 parts water.

Dilute with 20 parts water as an alkaline metal surface cleaner to remove wax, dirt, oil, grease, and silicone in preparation for metal finishing.

Dilute with 20 parts water as a wash to remove oil, dirt, silicone, and wax from old fabric or painted metal surface in preparation for refinishing.

Dilute with 20 parts water as a very effective vinyl and cloth upholstery cleaner.

Dilute with 5 parts water as a cleaner for engine and cowling. Apply with a brush or spray, then rinse.

Dilute with 32 parts water for aircraft, auto, motor home, and trailer exterior washing.

Dilute with 5 parts water and use as a laundry pre-wash soil breaker and laundry additive. Will clean where nationally advertised brands fail.

Dilute with 5 parts water as a hangar floor, garage, and driveway oil drip remover.

An excellent extra-strength household cleaner. Dilute with 10 parts water and use on sinks, stoves, walls, carpets, cabinets, vinyl floors, furniture, etc. Removes wax, oil, grease, crayon, and pencil marks, dirt and stains. Decrease the dilution on persistent stains.

310 Cleaner is not harsh on hands, and it has a pleasant lemon fragrance. Dilute with equal parts water and use in liquid hand soap dispenser. Wet the hands first and use a few drops – the dirt runs off.

Space limits the listing of the hundreds of uses for **310** Cleaner.

SHELF LIFE: Guaranteed four years in sealed container in protected storage at room temperature. Protect from freezing.

PACKAGING: One-quart and one-gallon plastic containers.

TUBESEAL INTERNAL TUBING CORROSION INHIBITOR

Tubeseal is a blend containing a very fine preservative oil (REF: MIL. SPEC. L-21260), which has a characteristic of climbing the tube wall and spreading over the entire surface to provide lasting protection. Prevents rust and corrosion inside aircraft tubing structures.

Tubeseal will penetrate and reveal very small pin holes in a weld and, in time, due to exposure, congeal and seal the hole.

One quart is sufficient to treat a 1- to 4-place aircraft fuselage and miscellaneous tubular components.

INSTRUCTIONS:

1. Drill a No. 30 (.128) hole on top side of tube approximately 1½″ from an end. Holes are usually drilled before welding is completed for venting purposes.

2. Insert into each tube section the following quantity of inhibitor:

   • ⅝″ dia. or less -1 cc per ft

- 1″ dia. or less -1.5 cc per ft
- 1½″ dia. or less - 2 cc per ft
- 2″ dia. or less - 3 cc per ft

3. Close all holes with pop rivets No. AD-41H (closed end type).

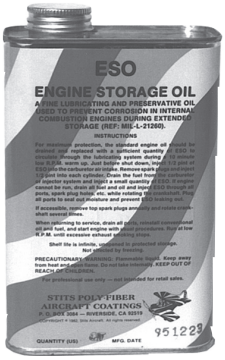
4. In order to insure complete internal wall coverage, rotate fuselage or other welded tube assembly to assure all tubes are cycled from upright thru 90° to side, then 90° to inverted, then 90° to opposite side and finally 90° back to upright. A minimum of 5 minutes waiting period should punctuate each 90° arc. Room temperature during application should not be lower than 60°F.

Process approved by FAA during certification of Stits Skycoupe Model 9A. TC No. 4A-31.

SHELF LIFE: Infinite, in sealed containers in protected storage Not affected by freezing.

PACKAGING: One-pint and one-quart cans.

ESO
ENGINE STORAGE OIL



A fine lubricating and preservative oil used to prevent corrosion in internal combustion engines during extended storage (REF: MIL-L 21 260).

INSTRUCTIONS:

For maximum protection, the standard engine oil should be drained and replaced with a sufficient quantity of **ESO** to circulate through the lubricating system during a 10-minute low R.P.M. warm up. Just before shut down, inject ½ pt of **ESO** into the carburetor air intake. Remove spark plugs and inject ½ pt into each cylinder. Drain the fuel from the carburetor or injector system and inject a small quantity of **ESO.** If engine cannot be run, drain all fuel and oil and inject **ESO** through all ports, spark plug holes, etc. while rotating the crankshaft. Plug all ports to seal out moisture and prevent **ESO** leaking out.

If accessible, remove top spark plugs annually and rotate crankshaft several times.

When returning to service, drain all ports, reinstall conventional oil and fuel, and start engine with the usual procedures. Run at low R.P.M. until excessive exhaust smoking stops.

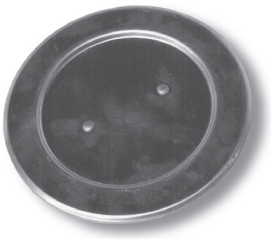
SHELF LIFE: Infinite, in sealed container in protected storage. Not affected by freezing.

PACKAGING: One-quart and one-gallon cans.

MEK
Methyl Ethyl Ketone

Packaged in 1-quart and 1-gallon cans.

INSPECTION HOLE COVERS

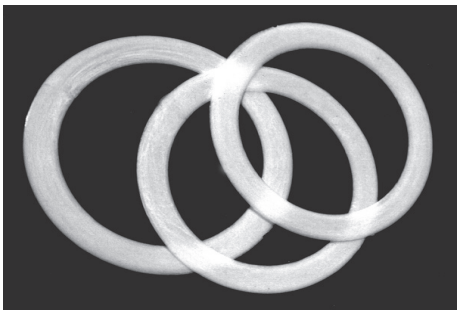


Recessed-center and flanged-edge design will not creep off center due to vibration in prop wash areas 4 13/16″dia., .020 aluminum. Strong 11/16″ steel spring strap mounted with two ⅛″ solid aluminum rivets.

PRACTICE KIT

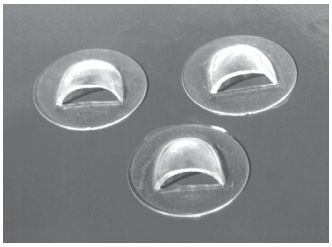
A practice frame plus coatings to cover it at least twice through the **Poly-Spray** stage. Includes a simplified manual. thermometer, rib lacing needle, and materials to learn and practice rib lacing.

INSPECTION ACCESS REINFORCING RINGS

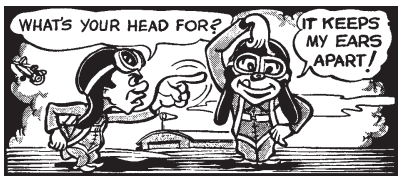


Injection molded from CAB plastic. Beveled edges, 4⅝″ outside diameter x 3 7/16″ inside diameter x 035 thick. Attach with **Poly-Tak.**

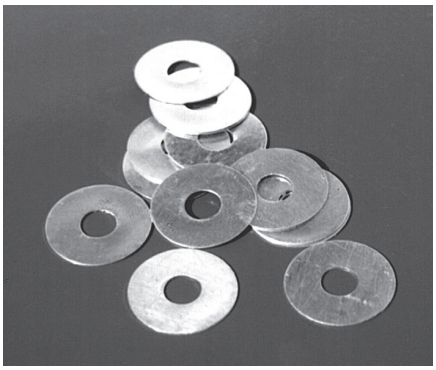
SEAPLANE GROMMETS



Molded CAB plastic, 1⅛″ outside diameter x .032 skirt with 9/16″ x 3/16″ lip opening. Attach with **Poly-Tak.**

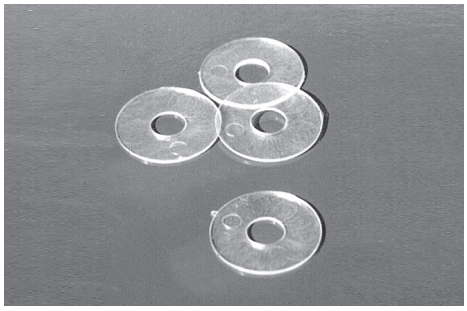


ALUMINUM DRAIN GROMMETS



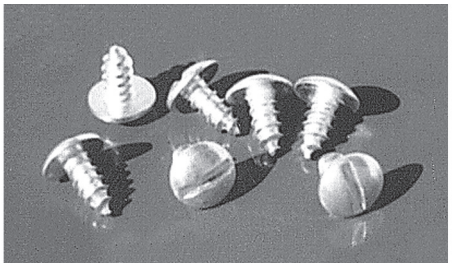
Inside ¼″ hole; outside ¾″ diameter; .010 thick. The best choice when melting the drain hole thru polyester with a hot probe. Will not melt or curl and warp with age and are reusable. Attach with **Poly-Tak.**

PLASTIC DRAIN GROMMETS



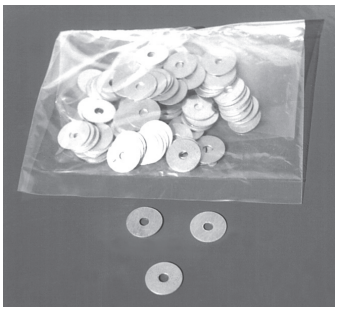
Injection molded from CAB plastic. Inside 7⁄32″ hole; outside ¾″ diameter; .030 thick. Attach with **Poly-Tak.**

SELF-TAPPING METAL SCREWS



Low profile, slot or phillips head, type A, pointed end. Used on some aircraft models to attach fabric to metal wing ribs and empennage ribs in lieu of rib lacing.

ALUMINUM REINFORCING WASHERS

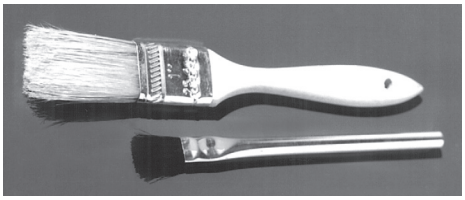


Recommended as a substitute for original plastic washers under screws and pop rivets where fabric is anchored to metal wing rib empennage ribs. 2024-T3 aluminum, .128 hole ½″ outside diameter x .016 thick.

BRUSHES

Best quality, well-anchored natural bristles. Tested as best for **Poly-Brush** application. Beaver tail handle. 2-, 3-, & 4-inch widths.

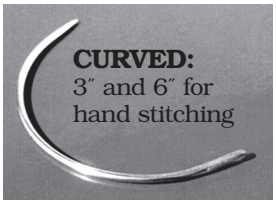
GLUE BRUSHES

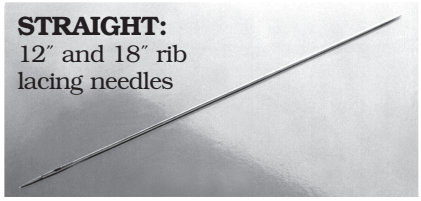


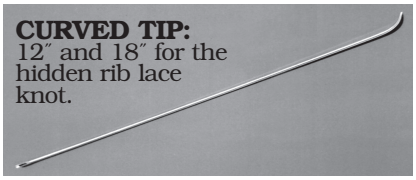
1″ wide natural bristles.

½″ wide, tin-plated tubular handle. Double crimped to hold the natural bristles.

SEWING NEEDLES



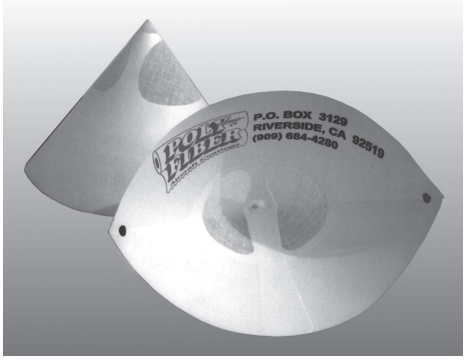




PAINT STIRRING PADDLES

Polished wood, 12″ length, 1″ width. Imprinted with the Poly-Fiber logo.

PAINT STRAINER CONES

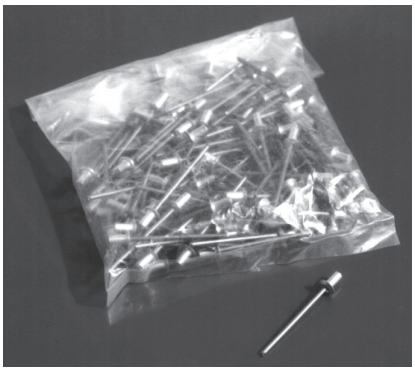


Fine mesh, 60x48, for filtering all pigmented finishes, **Poly-Brush**, **Poly-Spray**, varnish, and other liquids. Imprinted with Poly-Fiber logo.

BLIND RIB RIVETS

All-aluminum ⅛″ dia. body—⅜″ dia head – .031 to .125 grip range 156 lb shear – 235 lb tensile. Used to attach fabric to ribs on 1967 and later Champion/Bellanca aircraft with .032 x ½″ wide rib caps.

CLOSED END BLIND RIVETS



Used to seal tubing vent holes after welding and installation of Tubeseal Corrosion Inhibitor.

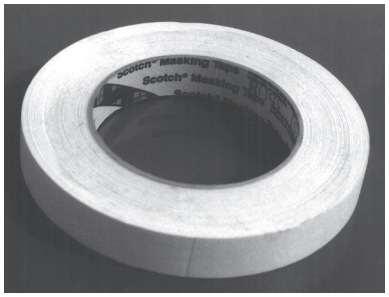
SANDPAPER

Silicon carbon on waterproof paper. 3M Wet-or-Dry Tri-M-ite brand 280-, 320- and 400-grit.

INTER-RIB BRACING TAPE

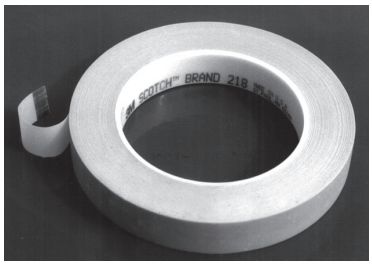
Used to brace ribs before covering. See instruction manual for use. Comes 36 yards long by ⅜″ wide.

CREPE PAPER MASKING TAPE



3M #Y231.The most solvent resistant crepe paper type available. Recommended for the majority of the non-critical masking on a paint job.

PROPYLENE MASKING TAPE

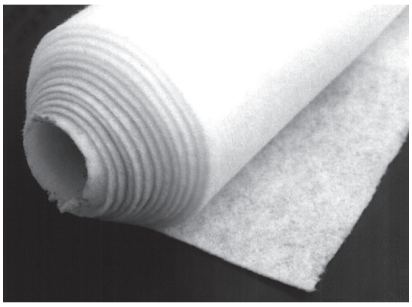


3M #218 Fine Line, 4.5 mils thick. The best choice by test for paint stripper masking and paint trim line masking. Most solvent resistant masking tape available for clean trim lines with no edge bleed. No crepe paper imprint on fresh finishes.

ANTI-CHAFE TAPE

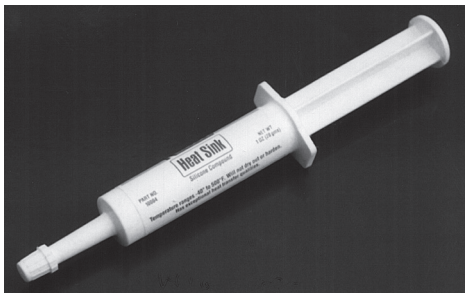
A white rubber-based adhesive on cotton cloth. 1″ wide, 60 yard rolls. Recommended as the best choice for smoothing sharp metal edges, rough joints, and all sharp corners under fabric covering.

POLYESTER PADDING



NON-WOVEN, 48″ wide, 3 oz per yard. Used under fabric on wing leading edge and turtle deck to smooth rough surfaces. .125 thick, compresses to .020 under load.

SILICONE HEAT SINK COMPOUND



For more accurate thermal transfer during iron calibration.

POLY-FIBER CALIBRATION THERMOMETER

Made specifically for calibrating irons. Scale is printed with 225°, 250°, and 350° settings. ±10° accuracy. Superior to open coil thermometers which may vary 30°.

POLY-FIBER COVERING VIDEO VHS or DVD

EAA SportAir two-hour video, demonstrating the entire process, from surface preparation through color coat application. VHS or DVD.

MANUFACTURING DATE CODES

The manufacturing dates of all liquid products are indicated on the labels. The first two digits are the year, the third and fourth digits the month, and the last three digits the production batch number for that month.

PRODUCT WARRANTY & LIABILITY

Warranty limited to the replacement of materials only. Since we have no control over the application of our products, we disclaim any guarantee of performance.

United States Of America

Department of Transportation - Federal Aviation Administration

Supplemental Type Certificate

Number SA1008WE

This Certificate issued to Poly-Fiber, Inc.
4343 Fort Drive
Riverside, California 92509-3129

or

(mailing address)
P.O. Box 3129
Riverside, California 92519

*certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part * of the * Regulations.*

Original Product Type Certificate Number : *

Make : *

Model : *

* See attached FAA Approved Model List (AML) No. SA1008WE for list of approved aircraft models and applicable airworthiness regulations

Description of Type Design Change: Remove original cloth covering and install Poly-Fiber covering material in accordance with Procedure Manual No. 1, How to Cover An Aircraft Using the Poly-Fiber System, dated July 2001, or later FAA approved revision.

Limitations and Conditions: The approval for this modification applies to the aircraft models on the attached FAA Approved Model List No. SA1008WE only. This installation should not be incorporated in any aircraft unless it is determined that the interrelationship between this installation and any previously approved configuration will not introduce any adverse effect upon the airworthiness of the aircraft. This modification was determined not to increase the noise level and was not considered an "acoustic change" as defined in section 21.93(b), Amendment 21-71 of the Federal Aviation Regulations.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked or a termination date is otherwise established by the Administrator

Date of application : May 20, 1965

Date reissued : October 6, 1992, May 27, 2003

Date of issuance : July 26, 1965

Date amended : March 18, 1966, March 22, 1976

of the Federal Aviation Administration.

By direction of the Administrator

(Signature)

Manager, Airframe Branch
Los Angeles Aircraft Certification Office

(Title)

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

FAA Form 8110-2(10-68) Page 1 of 2 *This certificate may be transferred in accordance with FAR 21.47.*

FEDERAL AVIATION ADMINISTRATION - PARTS MANUFACTURER APPROVAL

Poly-Fiber, Inc.
4343 Fort Drive
P.O Box 3129
Riverside, CA 92519-3129

PMA NO. PQ0075NM
SUPPLEMENT NO. 1
DATE: October 6, 1992
AMENDED: April 28, 2003

PART NAME	PART NUMBER	APPROVED REPLACEMENT FOR PART NUMBER	APPROVAL BASIS AND APPROVED DESIGN DATA	MAKE ELEGIBILITY	MODEL ELEGIBILITY
Poly-Fiber Covering Material	As listed in Poly-Fiber Procedure Manual No. 1 dtd: 7/01	Modification Part	STC SA1008WE Dwg: Poly-Fiber Procedure Manual No. 1 Rev: None Dtd: July 2001 or later FAA approved revision(s)	Per Approved Model List (AML): SA1008WE	Per Approved Model List (AML): SA1008WE

----------End of Listing----------

Note: Minor design changes (reference 14 CFR part 21 §§ 21.93 and 21.95) must be submitted in a manner as determined by the ACO. Major design changes (reference 14 CFR part 21 §§ 21.93 and 21.97) to drawings and specifications are to be handled in the same manner as that for an original FAA-PMA.

Christopher B. Bergen
Manager, Los Angeles Manufacturing
Inspection District Office

If an aircraft is not listed on the Poly-Fiber Approved Model List (AML), it may be added as follows:

1. The mechanic who did the work should complete this form and sign it.
2. Send the form to Poly-Fiber, P. O. Box 3129, Riverside, CA 92519.
3. Poly-Fiber will acknowledge receipt back to you and submit the Installation Report for your aircraft to the FAA Los Angeles Aircraft Certification Office/ANM-120L, 3960 Paramount Blvd., Lakewood, CA 90712-4137 (phone 562-627-5232). Your aircraft will be added to the published Approved Model List when the Poly-Fiber Procedure Manual is revised and reprinted.

POLY-FIBER INSTALLATION REPORT

I certify that fabric-covered surfaces of the following aircraft have been recovered in accordance with STC SA1008WE Procedure Manual No. 1, How to Cover An Aircraft Using the Poly-Fiber System.

Aircraft Make: _____

Aircraft Model: _____

Aircraft Type Certificate Number: _____

Date of Installation Completion: _____

Components Recovered: _____

_____

Date of Poly-Fiber Procedure Manual No. 1: _____

Signed: _____
(Signature & Date)

_____
(Printed Name)

_____
(Address)

_____
(Phone)

_____
(Email Address)

FAA Approved Model List (AML) No. SA1008WE

The Poly-Fiber STC
For
Installing Fabric Covering

Issue Date: July 26, 1965

Note: Entries shown in bold are either new or were revised since the previous Master Eligibility List, dated July 2001.

Item No.	Aircraft Make	Model	Original Type Certificate	Components	AML Amend.
1	Aeronca	C-2 Standard, C-2 Scout, PC-2	ATC 351	All fabric covered components	7/1/2001
2	Aeronca (American Champion / Bellanca / Trytek)	C-3, PC-3	A-396	All fabric covered components	
3	Aeronca (American Champion / Bellanca / Trytek / Gores)	K, KS	A-634	All fabric covered components	
4	Aeronca	LC, LCS	ATC 614	All fabric covered components	
5	Aeronca (American Champion / Bellanca / Trytek)	O-58A (Army L-3A), O-58B (Army L-3B, L-3C), SO-58B	A-751	All fabric covered components	
6	Aeronca (Gores)	50-C, 65-C, 65-CA (Army L-3F), S-50-C, S-65-C, S-65-CA, KCA	A-675	All fabric covered components	
7	Aeronca (Trytek/Gores)	50-L, 50-LA, 65-LA, 65-LB (Army L-3G)	A-702	All fabric covered components	7/1/2001
8	Aeronca (American Champion / Bellanca / Trytek)	50-TC, 60-TF, 65-TC (Army L-3J), 65-TF, 50-TL, 65-TL, 65-TAC (Army L-3E), 65-TAF (Army L-3D), 65-TAL, YO-58 (Army L-3)	A-728	All fabric covered components	
9	Aeronca (Bellanca / American Champion)	Champion 7AC, 7ACA, S7AC, 7BCM (Army L-16A), 7CCM (Army L-16B), S7CCM, 7DC, S7DC, 7EC, S7EC, 7ECA, 7FC, 7GC, 7GCA, 7GCAA, 7GCB, 7GCBA, 7GCBC, 7HC, 7JC, 7KC, 7KCAB	A-759	All fabric covered components	
10	American Champion (Bellanca)	8KCAB, 8GCBC	A21CE	All fabric covered components	
11	Aeronca (American Champion / Bellanca / Trytek)	Chief 11AC, S11AC, 11BC, S11BC	A-761	All fabric covered components	
12	American Champion (Aeronca / Bellanca / Trytek)	Super Chief 11CC, S11CC	A-796	All fabric covered components	7/1/2001

FAA Approved Model List (AML) No. SA1008WE

Item No.	Aircraft Make	Model	Original Type Certificate	Components	AML Amend.
13	Aeronca (Rogers / Mitchell)	Sedan 15AC, S15AC	A-802	All fabric covered components	
14	Aetna Aerocraft	2SA	TC 733	All fabric covered components	
15	Air Tractor, Inc.	AT300, AT301, AT302, AT400, AT400A	A9SW	All fabric covered components	
16	American (Roos)	American Eagle A-1 or 101	ATC 17	All fabric covered components	7/1/2001
17	American (Roos)	Eaglet B-31	ATC-450	All fabric covered components	
18	Arrow Aircraft & Motors Corp.	Arrow Sport	ATC 115 / TC 2-110	All fabric covered components	7/1/2001
19	Aviat (Sky / Christen / White)	A-1	A22NM	All fabric covered components	7/1/2001
20	Ayres (Rockwell Commander)	Snow S-2B, S-2C, 600-S-2C	2A7	All fabric covered components	7/1/2001
21	Ayres (Rockwell)	Thrush 600 S-2D, S-2R	A3SW	All fabric covered components	7/1/2001
22	Ayres (Rockwell)	Commander 600 S2D, 600 S2R	A4SW	All fabric covered components	
23	Beech	C18S (Army C-45, -45A, UC-45B, -45F, AT-7, -7A, -7B, -7C; Navy JRB-1, -2, -3, -4, SNB-2, -2C, -3)	A-757	All fabric covered components	7/1/2001
24	Beech	D17S (Army UC-43, -43B; Navy GB-1, -2), SD17S	A-649	All fabric covered components	
25	Beech	D17A (Army UC-43F)	TC 713	All fabric covered components	7/1/2001
26	Beech	D17R (Army UC-43A)	TC 638	All fabric covered components	7/1/2001
27	Beech	D18C, D18S, E18S, E18S-9700, G18S, H18, C-45G, TC-45G, C-45H, TC-45H, TC-45J (SNB-5), JRB-6	A-765	All fabric covered components	7/1/2001
28	Beech	E17B (Army UC-43D)	TC 641	All fabric covered components	7/1/2001
29	Beech	F17D (Army UC-43C)	TC 689	All fabric covered components	7/1/2001
30	Beech	Army AT-11, Navy SNB-1	A-2-582	All fabric covered components	7/1/2001
31	Bell Helicopter	47D1	H-1	All fabric covered components	7/1/2001
32	Bellanca (Aeronca / American Champion)	14-12F-3	TC 745	All fabric covered components	7/1/2001

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Item No.	Aircraft Make	Model	Original Type Certificate	Components	AML Amend.
33	**Bellanca (Aeronca / American Champion)**	**14-9**	**TC 716**	**All fabric covered components**	**9/1/2006**
34	Bellanca (Aeronca / American Champion)	14-13, 14-13-2, -3, -3W	A-773	All fabric covered components	
35	Bellanca	Cruisemaster 14-19, -19-2, -3, -3A, 17-30, 17-31, 17-31TC	1A3	All fabric covered components	
36	Bellanca	17-30A, 17-31A, 17-31ATC	A18CE	All fabric covered components	
37	Bellanca	Eagle DW-1	A4NW	All fabric covered components	
38	Bellanca (Aeronca / American Champion)	CH-300 Pacemaker	ATC 129	All fabric covered components	7/1/2001
39	Blanik (LET Aeronautical Works)	L-13 Glider	G24EU	All fabric covered components	
40	**Blanik (LET Aeronautical Works)**	**L 23 Super - Blanik Glider**	**G60EU**	**All fabric covered components**	**9/1/2006**
41	Boeing	Army B-17F, B-17G	LTC-1	All fabric covered components	7/1/2001
42	Boeing	377	A-812	All fabric covered components	7/1/2001
43	Brunner-Winkle (Perth-Amboy)	Bird BK	ATC 239	All fabric covered components	7/1/2001
44	Brunner-Winkle (Bird / Perth-Amboy)	Bird BW	ATC 382	All fabric covered components	
45	Brunner-Winkle (Bird / Perth-Amboy)	Bird CK	ATC 388	All fabric covered components	
46	Buhl	Flying Bull Pup LA-1	ATC 405	All fabric covered components	7/1/2001
47	Callair (Intermountain / Aero Commander)	A, A-2, A-3, A-4, A-5, A-5T, A-6, A-7, A-7T, A-9, A-9B	A-758	All fabric covered components	
48	Callair (Intermountain / Aero Commander)	B-1A	A8WE	All fabric covered components	
49	Cessna	120, 140	A-768	All fabric covered components	
50	Cessna	C-145, C-165 (Army UC-94)	A-701	All fabric covered components	7/1/2001
51	Cessna	170	A-799	All fabric covered components	
52	Cessna	T-50 (Army AT-17 & UC-78 Series, Navy JRC-1)	A-722	All fabric covered components	7/1/2001

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Item No.	Aircraft Make	Model	Original Type Certificate	Components	AML Amend.
53	Chase (Roberts)	YC-122C	AR-25	All fabric covered components	7/1/2001
54	Command-Aire	3-C-3 Trainer	ATC 150	All fabric covered components	7/1/2001
55	Commonwealth (see Rearwin)				
56	Consolidated-Vultee (General Dynamics)	PBY-5 (Army OA-10), PBY-5A (Army OA-10A)	TC 2-548	All fabric covered components	
57	Consolidated-Vultee (General Dynamics)	PBY-6A (Convair)	TC AR-22	All fabric covered components	7/1/2001
58	Convair (Consolidated-Vultee / General Dynamics)	Army L-13A	TC AR-10	All fabric covered components	7/1/2001
59	Consolidated-Vultee (General Dynamics)	BT-13, -13A (Navy SNV-1), -13B (Navy SNV-2), -15	A-2-571	All fabric covered components	
60	Consolidated-Vultee (General Dynamics)	P4Y-2 (Convair Privateer)	TC AR-29	All fabric covered components	7/1/2001
61	Consolidated-Vultee (General Dynamics)	28-5ACF Catalina	TC 785	All fabric covered components	7/1/2001
62	Culver (Superior)	V, V2	A-778	All fabric covered components	
63	Culver (Superior)	Army PQ-14A, -14B, YPC-14A, -14B; Navy TD2C-1	LTC-28	All fabric covered components	
64	Curtiss-Wright (Reed)	P-40L, P-40N	TCS LTC-18	All fabric covered components	
65	Curtiss-Wright	C-46A, C-46D	A-772, A-789, 3A2	All fabric covered components	7/1/2001
66	Curtiss-Wright	C-46E	A-772, A-786	All fabric covered components	7/1/2001
67	Curtiss-Wright	C-46R	3A2	All fabric covered components	7/1/2001
68	**Curtiss-Wright**	**Robin C-2**	**ATC 144**	**All fabric covered components**	**9/1/2006**
69	Curtiss-Wright	Robin J-1, J-1 Deluxe	ATC 220	All fabric covered components	7/1/2001
70	Curtiss-Wright	CW-1	ATC-397	All fabric covered components	
71	Dart	G	TC 674	All fabric covered components	7/1/2001
72	Davis	D-1-K	ATC 272	All fabric covered components	7/1/2001
73	Davis	D-1-W	TC 2-394	All fabric covered components	7/1/2001

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Item No.	Aircraft Make	Model	Original Type Certificate	Components	AML Amend.
74	de Havilland (Cliff Robertson)	DH 82A Tiger Moth	A8EU	All fabric covered components	
75	de Havilland	104 Dove Series 1A, 2A, 5A, 5BA, 6A, 6BA, 7A, 7AXC, 8A, 8AXC	A-807	All fabric covered components	
76	de Havilland	DHC-1B-2 Chipmunk	A26NM	All fabric covered components	
77	de Havilland (Rust)	DHC1 Chipmunk 22A	A44EU	All fabric covered components	7/1/2001
78	Dornier-Werke	Do 28 A-1	7A13	All fabric covered components	
79	McDonnell Douglas	DC-3-G102, DC3-G102A (Army C-49E, -50, -50A, -50B, -50C, -50D, -51), DC3-G103A, DC3-G202A (Army C-49, -49A, -49B, -49C, -49D, -49J, -49K, Navy R4D-2)	A-618	All fabric covered components	
80	McDonnell Douglas	DC3A-SCG,-SC3G,-S1CG,-S1C3G (Army C-41, C-41A, C-48,-48A,-52,-52A,-52B,-52C,-53, -53B,-53C,-53D,-68; Navy R4D-3,-4); DC3A-S4C4G; DC3C-SC3G,-S1C3G,-S4C4G (Army C-47,-47A; Navy R4D-1,-5); DC3C-R-1830-90C (Army C-47B; Navy R4D-6); DC3D-R-1830-90C (Army C-117A)	A-669	All fabric covered components	
81	Douglas	R4D-8	6A2	All fabric covered components	7/1/2001
82	Douglas (Seaboard)	Army A-24B, Navy SBD-5	L-4	All fabric covered components	7/1/2001
83	Douglas	A-26B (Army), A-26C (Army)	TCS L-3	All fabric covered components	
84	McDonnell Douglas	C-54-DC (Army C-54, Navy R5D); C54A-DC (Army C-54A, Navy R5D-1); C54B-DC (Army C-54B, Navy R5D-2); C54D-DC (Army C-54-D, Navy R5D-3); C54E-DC (Army C-54E, Navy R5D-4); C54G-DC (Army C-54G, Navy R5D-5), DC-4	A-762	All fabric covered components	
85	McDonnell Douglas	DC-6 (YC-112A)	A-781	All fabric covered components	7/1/2001
86	McDonnell Douglas	DC-6A (Navy R6D-1, USAF C-118A)	6A3	All fabric covered components	
87	McDonnell Douglas	DC-6B (Navy R6D-1Z)	6A4	All fabric covered components	
88	McDonnell Douglas	DC7B	4A10	All fabric covered components	
89	**Duramold Aircraft Corp.**	**F-46A**	**TC 2-545**	**All fabric covered components**	**9/1/2006**
90	Emair (Murryair)	MA-1, MA-1B	A6PC	All fabric covered components	
91	Ercoupe	415-C, -CD	A-718	All fabric covered components	

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Item No.	Aircraft Make	Model	Original Type Certificate	Components	AML Amend.
92	Ercoupe	415-D, -E, -G	A-787	All fabric covered components	
93	**Extra Flugzeugbau**	**EA-300/200**	**A67EU**	**All fabric covered components**	**9/1/2006**
94	Fairchild	KR-21	ATC 215	All fabric covered components	
95	Fairchild	KR-31	ATC 19	All fabric covered components	7/1/2001
96	Fairchild Hiller	M-62A (Army PT-19, -19A, -19A-AE, -19A-SL, -19B, -19B-AE); M-62A-3 or -4 (Army PT-26, -26A, -26B); M-62B, -62C (Army PT-23, -23-AE, -23-HO, -23-SL, -23A, -23A-SL)	A-724	All fabric covered components	
97	Fairchild	22 C7G	ATC 564	All fabric covered components	7/1/2001
98	Fairchild	24 C8	ATC 475	All fabric covered components	
99	Fairchild	24 C8C, C8CS	A-535	All fabric covered components	
100	Fairchild	24 C8E and 24 C8ES	ATC 600	All fabric covered components	
101	Fairchild	24G (Army UC-61H)	ATC 633	All fabric covered components	7/1/2001
102	Fairchild	24H	ATC 632	All fabric covered components	
103	Fairchild	24J (Army UC-61B), 24JS	TC 663	All fabric covered components	7/1/2001
104	Fairchild	24R9 (Army UC-61C), 24R9S, 24R40 (Army UC-86), 24R40S, 24R46, 24R46A (Army UC-61K), 24R46S	A-706	All fabric covered components	
105	Fairchild (Steward)	C-82A Jet Packet	AR-15	All fabric covered components	7/1/2001
106	Fairchild	F-45 (Army UC-80)	TC 603	All fabric covered components	7/1/2001
107	Fleet (Brewster)	Fleet 1	ATC 122	All fabric covered components	7/1/2001
108	Fleet (Brewster)	Fleet 2	ATC 131	All fabric covered components	7/1/2001
109	Fleet (Brewster)	Fleet 7, 7-C, 7 Deluxe, 10	ATC 374	All fabric covered components	
110	Fleet (Brewster)	Fleet (Phillips) 7	TC 2-562	All fabric covered components	7/1/2001
111	Fleet (Brewster)	Fleet 8, 9	ATC 428	All fabric covered components	7/1/2001
112	Fleet (Brewster)	16B (RCAF Finch II)	TC 2-566	All fabric covered components	
113	Fleet (Brewster)	Fleet 80	TC 788	All fabric covered components	7/1/2001
114	Fleetwings (Kaiser)	F-401	TC 2-540	All fabric covered components	

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Item No.	Aircraft Make	Model	Original Type Certificate	Components	AML Amend.
115	Frankfort (Corcoran)	B Glider (Army XTG-1, -TG-1A, -1C)	GTC 7	All fabric covered components	
116	Franklin	Model A (S/N #8)	ATC 2-246	All fabric covered components	
117	Funk (McClish)	B, B75L (Army UC-92), B85C	A-715	All fabric covered components	
118	Great Lakes Aircraft	2T-1	ATC 167	All fabric covered components	7/1/2001
119	Great Lakes Aircraft (Chapparal)	2T-1A, 2T-1A-1, 2T-1A-2	ATC 228 / A18EA	All fabric covered components	
120	Great Lakes Aircraft	2T-1E	ATC 354	All fabric covered components	7/1/2001
121	Grumman	F7F-3 (Navy Tigercat)	AR-28	All fabric covered components	7/1/2001
122	Grumman	F8F-1 (Navy Bearcat)	LTC-23	All fabric covered components	
123	Grumman	F8F-2 (Navy Bearcat)	AR-32	All fabric covered components	7/1/2001
124	Grumman	FM-2 (Navy Wildcat)	LTC-25	All fabric covered components	
125	Grumman	G21, -21A (Army OA-9, Navy JRF-1, -2, -3, -4, -5, -6B) (Goose)	TC 654	All fabric covered components	
126	Grumman (Gulfstream)	G-44 (Army OA-14, Navy J4F-2), -44A, SCAN Type 30 (Widgeon)	A-734	All fabric covered components	
127	Grumman (Gulfstream)	G-73 (Mallard)	A-783	All fabric covered components	
128	Grumman (Allied Ag Cat)	G-164, G-164A, G-164B	1A16	All fabric covered components	
129	Grumman	Navy TBF & TBM Series (Avenger)	LTC-8	All fabric covered components	
130	Grumman	Navy J2F-3, J2F-4, J2F-5, J2F-6 (Duck)	LTC-17	All fabric covered components	7/1/2001
131	Grumman	HU-16A, HU-16B (Albatross)	A33SO	All fabric covered components	
132	Harlow (Peacock)	PJC-1, -2 (Army UC-80)	TC 659	All fabric covered components	
133	Helio	H-250, H-295 (USAF U-10D), H-391 (USAF YL-24), H-391B, H-395 (USAF L-28A), H-395A	1A8	All fabric covered components	
134	Helton (Spinks)	Lark 95	A-748	All fabric covered components	
135	Hiller Aviation	UH-12B, UH-12C	6H2	All fabric covered components	7/1/2001
136	Howard (Jobmaster)	DGA-11	TC 672	All fabric covered components	7/1/2001

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Item No.	Aircraft Make	Model	Original Type Certificate	Components	AML Amend.
137	Howard (Jobmaster)	DGA-15J (Army UC-70B), DGA-15P (Army UC-70, Navy GH-1, -2, -3, NH-1), DGA-15W	A-717	All fabric covered components	
138	Inland	W-500	ATC 315	All fabric covered components	
139	Interstate (Callair)	S-1A, S-1A-65F, -85F, -90F	A-737	All fabric covered components	
140	Interstate (Callair)	S-1B1 (Army L-6, XL-6)	A-754	All fabric covered components	
141	Intreprinderea De Constructii Aeronautice Brasov	IS-28B2 Glider	G40EU	All fabric covered components	
142	**Johnson (Pirtle)**	**Johnson Rocket 185**	**TC 776**	**All fabric covered components**	**9/1/2006**
143	Kinner Motors, Inc.	Sportster K	ATC 490	All fabric covered components	7/1/2001
144	Laister-Kauffmann	LK-10A (Army TG-4A), LK-10B	G-15	All fabric covered components	
145	**LET Aeronautical Works**	**L33 SOLO Glider**	**G71EU**	**All fabric covered components**	**9/1/2006**
146	Lockheed	1649A-98	4A17	All fabric covered components	7/1/2001
147	Luscombe	8, 8A, 8B, 8C, 8D, 8E, 8F, T-8F	A-694	All fabric covered components	
148	Luscombe	Phantom 1	TC 552	All fabric covered components	7/1/2001
149	Martin-Marietta	202, 202A	A-795	All fabric covered components	7/1/2001
150	Martin-Marietta	404	1A7	All fabric covered components	7/1/2001
151	Maule	Bee Dee M-4, M-4, -4C, -4S, -4T; M-4-180C, S, T; M-4-210, C, S, T; M-4-220, C, S, T; M-5-180C, -200, -210C, -210TC, -220C, -235C; M-6-180, -235; M-7-235; MX-7-235, -180	3A23	All fabric covered components	
152	McKinnon	G-21G	4A24	All fabric covered components	
153	Meyers	OTW, -KR, -145, -160	A-736	All fabric covered components	
154	Monocoupe	90, 90A, 90AF, 90AF-100, 90AL-115	A-306	All fabric covered components	
155	Monocoupe	110	TC-327		
156	Mooney	M20, M20A, M20B, M20C, M20D, M20E, M20F, M20G	2A3	All fabric covered components	
157	Mooney Mite	M-18C, -18C55, -18L, -18LA	A-803	All fabric covered components	
158	Moth/Hawker	60GM, 60GMW	ATC 197	All fabric covered components	

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Item No.	Aircraft Make	Model	Original Type Certificate	Components	AML Amend.
159	Naval Aircraft Factory	Navy N3N-3	A-2-569	All fabric covered components	
160	Nord-Aviation (Aerospatiale)	Nord 262 A-12	A6EU	All fabric covered components	7/1/2001
161	Noorduyn	Army UC-64, Norseman Mark VI, UC-64A, UC-64B, UC-64AS	A-2-578	All fabric covered components	7/1/2001
162	North American	BC-1A, AT-6 (SNJ-2), -6A (SNJ-3), -6B, -6C (SNJ-4), -6D (SNJ-5), -6F (SNJ-6, -7), T-6G	A-2-575	All fabric covered components	
163	North American (Shell)	Army RB-25; B-25C, G, H, J; B-24N; TB-25N	LTC-2	All fabric covered components	
164	North American (Cavalier)	Army P-51C, D, K	LTC-11	All fabric covered components	
165	Nelson	BB-1 Glider	GTC 19	All fabric covered components	
166	Pasped	Skylark W-1	TC 2-546	All fabric covered components	
167	**Pheasant Aircraft Company**	**H-10**	**ATC 36**	**All fabric covered components**	**9/1/2006**
168	Piaggio	P.136-L, -L1, -L2	A-813	All fabric covered components	
169	Piper	Cub E-2	ATC 455	All fabric covered components	
170	Piper	J-2	ATC 595	All fabric covered components	
171	Piper	J3C-40, -50, -50S, -65 (Army L-4, L-4A, L-4B (Navy NE-1), L-4H, L-4J (Navy NE-2)), -65S, PA-11, PA-11S	A-691	All fabric covered components	
172	Piper	J3F-50, -50S, -60, -60S, -65 (Army L-4D), -65S	A-692	All fabric covered components	
173	Piper	J3L, -S, -65 (Army L-4C), -65S	A-698	All fabric covered components	
174	Piper	J4, J4A, J4A-S	A-703	All fabric covered components	
175	Piper	J4B	TC 708	All fabric covered components	7/1/2001
176	Piper	J4E (Army L-4E)	A-740	All fabric covered components	7/1/2001
177	Piper	J4F	TC 721	All fabric covered components	7/1/2001
178	Piper	J5A (Army L-4F), J5A-80, J5B (Army L-4G), J5C, AE-1, HE-1	A-725	All fabric covered components	
179	Piper	PA-12, PA-12S	A-780	All fabric covered components	

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Item No.	Aircraft Make	Model	Original Type Certificate	Components	AML Amend.
180	Piper	PA-14	A-797	All fabric covered components	
181	Piper	PA-15	A-800	All fabric covered components	
182	Piper	PA-16, PA-16S	1A1	All fabric covered components	
183	Piper	PA-17	A-805	All fabric covered components	
184	Piper	PA-18, PA-18S, PA-18 "105" (Special), PA-18S "105" (Special), PA-18A, PA-18 "125" (Army L-21A), PA-18S "125", PA-18AS "125", PA-18 "135" (Army L-21B), PA-18A "135", PA-18S "135", PA-18AS "135", PA-18 "150", PA-18A "150", PA-18S "150", PA-18AS "150", PA-19 (Army L-18C), PA-19S	1A2	All fabric covered components	
185	Piper	Restricted Category PA-18A, PA-18A-135, PA-18A-150	AR-7	All fabric covered components	7/1/2001
186	Piper	PA-20, PA-20S, PA-20 "115", PA-20S "115", PA-20 "135", PA-20S "135"	1A4	All fabric covered components	
187	Piper	PA-22, -22-108, -22-135, -22S-135, -22-150, -22S-150, -22-160, -22S-160	1A6	All fabric covered components	
188	Piper	PA-25, -25-235, -25-260	2A8 / 2A10	All fabric covered components	
189	Pitcairn Autogyro	PA-5	ATC 18	All fabric covered components	
190	**Pitcairn Autogyro**	**PA-18**	**ATC 478**	**All fabric covered components**	**9/1/2006**
191	Pitts	S-1S, S-1T, S-2, S-2A, S-2S, S-2B	A8SO	All fabric covered components	
192	Porterfield	CP-50	TC 690	All fabric covered components	
193	Porterfield (Rankin)	CP-55, -65, CS-65, FP-65, LP-65	A-720	All fabric covered components	
194	Porterfield (Rankin)	35, 35-70	ATC 567	All fabric covered components	7/1/2001
195	Pratt, Reed (Gould)	PR-G1 (Army TG-32, Navy LNE-1) Glider	GTC 12	All fabric covered components	
196	PZL-Krosno	KR-03A Puchatek	G56EU	All fabric covered components	7/1/2001
197	Rearwin (Commonwealth)	175, 180, 180F, 185, 190F	A-729	All fabric covered components	
198	Commonwealth (Pigman/Reed)	**R**earwin 6000M	TC 661	All fabric covered components	7/1/2001
199	Commonwealth	**R**earwin 7000	TC 574	All fabric covered components	7/1/2001

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Item No.	Aircraft Make	Model	Original Type Certificate	Components	AML Amend.
200	Rearwin (Pigman)	Rearwin 8090, 8125, 8135 (Army UC-102A), 8135T	TC 711	All fabric covered components	
201	Commonwealth (Pigman/Reed)	Rearwin 9000, 9000 Deluxe	TC 624	All fabric covered components	7/1/2001
202	**Roos Aircraft Company**	**Roos-Lincoln PT-W**	**ATC 284**	**All fabric covered components**	**9/1/2006**
203	**Rose Aeroplane and Motor Company**	**Parakeet A-1**	**TC 2-514**	**All fabric covered components**	**9/1/2006**
204	Ryan Aeronautical	ST-3KR (Army PT-22, -22A)	A-749	All fabric covered components	
205	Ryan Aeronautical	ST-A	ATC 571	All fabric covered components	
206	Ryan Aeronautical	SCW-145	TC 658	All fabric covered components	
207	Scheibe-Flugzeugbau	Bergfalke II/55, III Gliders	7G9	All fabric covered components	
208	Scheibe-Flugzeugbau	Zugvogel IIIB Glider	G4EU	All fabric covered components	
209	Schempp-Hirth	SHK1 Glider	G9EU	All fabric covered components	
210	Schempp-Hirth	Standard Austria-S Glider	G1IN	All fabric covered components	7/1/2001
211	Schleicher	Ka 6, Ka 6B, Ka 6C, Ka 6CR, Ka 6CR-Pe, KA 6E Gliders	7G1	All fabric covered components	
212	Schleicher	K7, Ka2b Gliders	7G3	All fabric covered components	
213	Schleicher	K8, K8B Gliders	7G4	All fabric covered components	
214	Schleicher	AS-K13 Glider	G15EU	All fabric covered components	
215	Schweizer	SGU-1-19, -19A Gliders	G-17	All fabric covered components	
216	Schweizer	SGU 2-22, -22A, -22B, -22C, -22CK, -22E, -22EK Gliders	G-18	All fabric covered components	
217	Schweizer	SGS 1-26, -26A, -26B, -26C, -26D, -26E Gliders	1G10	All fabric covered components	
218	Schweizer	SGS 2-8, SGS 2-8A Gliders	GTC 5	All fabric covered components	
219	Schweizer	SGS 2-32 Glider	G1EA	All fabric covered components	
220	Schweizer	SGS 2-33, -33A, -33AK Gliders	G2EA	All fabric covered components	
221	Schweizer	SGS1-34, -34R Gliders	G3EA	All fabric covered components	

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Item No.	Aircraft Make	Model	Original Type Certificate	Components	AML Amend.
222	Schweizer	TG-3A Army Glider	TC G-2-11	All fabric covered components	7/1/2001
223	Sikorsky	VS-44-A	TC 752	All fabric covered components	7/1/2001
224	Spartan	7W (Army UC-71)	TC 628	All fabric covered components	
225	Stearman	C-3-B	ATC 55	All fabric covered components	
226	Stearman-Hammond	Y1S	TC 644	All fabric covered components	
227	Stearman-Boeing	A75L3, 75 (Army PT-13), A75 (Army PT-13A, -13B,-13C), B75 (Navy N2S-2), E75 (Army PT-13D; Navy N2S-5; PT-13D/N2S-5), A75J1 (Army PT-18), A75L300, A75N1 (Army PT-17, -17A; Navy N2S-1, -4), B75N1 (Navy N2S-3), D75N1 (Army PT-27), IB75A, E75N1	A-743	All fabric covered components	
228	Stearman-Boeing	4-C	TC 2-155	All fabric covered components	7/1/2001
229	Stearman	4E	ATC 292	All fabric covered components	
230	Stinson	SM-8A	ATC 295	All fabric covered components	
231	Stinson	SM-8B, -8BT	ATC 294	All fabric covered components	
232	Stinson	SR-5, -5A (Army L-12), -5B, -5C, -5E	ATC 530	All fabric covered components	
233	Stinson	SR-7A, -7B, -7C	ATC 594	All fabric covered components	
234	Stinson	SR-8A, SR-8B (Army UC-81), SR-8C (Army UC-81L)	ATC 608	All fabric covered components	7/1/2001
235	Stinson	SR-8D (Army UC-81B), SR-8E	ATC 609	All fabric covered components	7/1/2001
236	Stinson	SR-9A, SR-9B (Army UC-81N), SR-9C (Army UC-81C)	ATC 621	All fabric covered components	7/1/2001
237	Stinson	SR-9D (Army UC-81G), SR-9DM, SR-9E (Army UC-81J), SR-9EM (Army UC-81M)	ATC 625	All fabric covered components	7/1/2001
238	Stinson	SR-9F (Army UC-81E)	ATC 640	All fabric covered components	7/1/2001
239	Stinson	HW-75, 10	A-709	All fabric covered components	
240	Stinson	10A (Army L-9B), 10B	A-738	All fabric covered components	
241	Stinson	Army L-1	LTC-26	All fabric covered components	7/1/2001
242	Stinson	L-5, -5B, -5C, -5D, -5E, -5E-1, -5G	A-764	All fabric covered components	

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Item No.	Aircraft Make	Model	Original Type Certificate	Components	AML Amend.
243	Stinson	108, 108-1, -2, -3, -5	A-767	All fabric covered components	
244	Stinson	V-77 (Army AT-19)	A-774	All fabric covered components	
245	Taylorcraft	Model A	A-643	All fabric covered components	
246	Taylorcraft	DC-65 (Army L-2, -2C), DCO-65 (Army L-2A, -2B, -2M), DF-65 (Army L-2E), DL-65 (Army L-2D)	A-746	All fabric covered components	
247	Taylorcraft	BC, BCS, BC-65, BCS-65, BC12-65 (Army L-2H), BCS12-65, BC12-D, BCS12-D, BC12-D1, BCS12-D1, BC12D-85, BCS12D-85, BC12D-4-85, BCS12D-4-85	A-696	All fabric covered components	
248	Taylorcraft	BF (Army L-2G), BFS, BF-60, BFS-60, BF-65, BFS-65, BF12-65 (Army L-2K), BFS-65	A-699	All fabric covered components	7/1/2001
249	Taylorcraft	BL, BLS, BL-65 (Army L-2F), BLS-65, BL12-65 (Army L-2J), BLS12-65	A-700	All fabric covered components	7/1/2001
250	Taylorcraft	19, F19, F21, F21A, F21B, F22, F22A	1A9	All fabric covered components	
251	Taylorcraft (Helio)	Model 15A, 20	3A3	All fabric covered components	7/1/2001
252	Travel Air (Curtiss-Wright)	Travel Air 12-W	ATC 407	All fabric covered components	7/1/2001
253	**Travel Air (Curtiss-Wright**	**Travel Air 3000**	**ATC 31**	**All fabric covered components**	**9/1/2006**
254	Travel Air (Curtiss-Wright)	Travel Air 4000	ATC 32	All fabric covered components	
255	Travel Air (Curtiss-Wright)	Travel Air B-4000	ATC 146	All fabric covered components	7/1/2001
256	Travel Air (Curtiss-Wright)	Travel Air B9-4000	TC 2-381	All fabric covered components	7/1/2001
257	Travel Air (Curtiss-Wright)	Travel Air C-4000	ATC 149	All fabric covered components	7/1/2001
258	Travel Air (Curtiss-Wright)	Travel Air D-4D	TC 2-178	All fabric covered components	7/1/2001
259	Travel Air (Curtiss-Wright)	Travel Air D-4000	TC 2-84	All fabric covered components	7/1/2001
260	Travel Air (Curtiss-Wright)	Travel Air E-4000	ATC 188	All fabric covered components	7/1/2001

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Item No.	Aircraft Make	Model	Original Type Certificate	Components	AML Amend.
261	Travel Air (Curtiss-Wright)	Travel Air K-4000	ATC 205	All fabric covered components	7/1/2001
262	Travel Air (Curtiss-Wright/Parks)	Travel Air L-4000	TC 2-560	All fabric covered components	7/1/2001
263	Travel Air (Curtiss-Wright)	Travel Air W-4000	ATC 112	All fabric covered components	7/1/2001
264	Waco	ASO	ATC 41	All fabric covered components	
265	Waco	AVN-8	TC 677	All fabric covered components	7/1/2001
266	Waco	CSO	ATC 240	All fabric covered components	
267	Waco	CTO	ATC 257	All fabric covered components	
268	Waco	CUC-1, CUC-2	ATC 575	All fabric covered components	
269	Waco	GXE	ATC 13	All fabric covered components	
270	**Waco**	**INF**	**ATC 345**	**All fabric covered components**	**9/1/2006**
271	Waco	QCF	ATC 416	All fabric covered components	
272	Waco	RNF	ATC 311	All fabric covered components	7/1/2001
273	Waco	UBF	ATC 473	All fabric covered components	
274	Waco	UEC	ATC 467	All fabric covered components	7/1/2001
275	Waco	UIC	ATC 499	All fabric covered components	
276	**Waco**	**UKS-7**	**ATC 648**	**All fabric covered components**	**9/1/2006**
277	Waco	UPF-7, VPF-7	A-642	All fabric covered components	
278	Waco	YKS-7 (Army UC-72K), ZKS-7 (Army UC-72M)	TC 626	All fabric covered components	7/1/2001
279	**Waco**	**YMF-5**	**ATC 542**	**All fabric covered components**	**9/1/2006**
280	**Waco**	**YPF**	**ATC 586**	**All fabric covered components**	**9/1/2006**
281	White Aircraft Corp.	New Standard D25	ATC 108	All fabric covered components	7/1/2001

Note: When a design is changed to metal skin and manufactured under the same TC number (e.g., the Luscombe Model 8, all models optional fabric or metal covered wing), our STC is applicable only to those models with fabric covered components. Check the aircraft nameplate for the TC number or check with the local FSDO office.

POLY-FIBER COVERING MATERIAL ESTIMATES

These estimates are furnished as a service to assist in selecting quantities of basic materials. If your aircraft is not listed, use the numbers for the most similar aircraft and you'll get a close approximation of quantities. Final determination of quantities is the option of the customer.

Aircraft and Components	Linear yards of 70-inch wide fabric unless Light (66-inch) for plywood surfaces is listed.	POLY-TAK Fabric Cement	POLY-BRUSH Gallons (Reduce 3:1)	POLY-SPRAY Gallons (Reduce 4:1)	Poly-Fiber R 65-75 or RR 8500 Reducer Gallons	Polyester Finishing Tape Rolls ("B" = Bias)	Rib Lacing Cord (See Note 1)	Reinforcing Tape (Width same as cap strip)	POLY-TONE Pigmented Finish Gallons (See Note 2) (Reduce 4:1)	R 65-75 or RR 8500 Reducer Gallons for Poly-Tone	Optional AERO-THANE Polyurethane Finish Gal (vice POLY-TONE) (See Note 2) (Reduce 3:1 with UE-820)	Optional RANTHANE HS Polyurethane Finish Gal (vice POLY-TONE)(See Note 2) (Reduce 3:1 with G-4200)
NOTE 1: Delete rib lacing thread for those model aircraft that use wire clips or screws instead of rib lacing.												
NOTE 2: Quantity estimates of POLY-TONE, AERO-THANE, and RANTHANE finishes are based on fabric covered areas. Add appropriate additional amount for large metal portions of aircraft.												
NOTE 3: Add 1 spool polyester machine sewing thread if envelopes or a blanket are to be sewn.												
NOTE 4: "Wet goods" are sold in both gallons and quarts. A gallon equals 4 quarts. 1/4 = 1 quart, 1/2 = 2 quarts, 3/4 = 3 quarts.												
Light aircraft size & configuration of: AERONCA CHAMPION, AERONCA CHIEF, CALLAIR, CITABRIA, FUNK, INTERSTATE CADET, PIPER J-3, -4, -5, PA-11, -12, -14, -18, -25, PORTERFIELD, REARWIN, TAYLORCRAFT, etc.												
Complete Aircraft	45 yd	1 Gal	10	11	6	1(1"), 7(2"), 2(3"), 1(4"), 1(3"B), 1(4"B)	1	2(1/2")	10	2 1/2	6	4
2 Wings & Ailerons	25 yd	2 Qt	5 1/2	6	3 1/2	4(2"), 2(3"), 1(4"), 1(4"B)	1	2(1/2")	5 1/2	1 1/2	3 1/2	2 1/2
Fuselage	11 yd	1 Qt	2 1/2	2 3/4	1 1/2	1(1"), 2(2")			2 1/2	3 Qt	1 1/2	1
5 Tail Surfaces	9 yd	1 Qt	2	2 1/4	1 1/4	2(2"), 1(3"B)	50'	1(1/2")	2	2 Qt	1 1/4	1
Complete Less Fuselage	34 yd	3 Qt	7 1/2	8 1/2	5	5(2"), 2(3"), 1(4"), 1(3"B), 1(4"B)	1	2(1/2")	7 1/2	2	4 1/2	3
Complete Less 2 Wings	20 yd	2 Qt	4 1/2	5	3	1(1"), 3(2"), 1(3"B)	50'	1(1/2")	4 1/2	1 1/4	2 3/4	2
All Control Surfaces	11 yd	1 Qt	2 1/2	2 3/4	1 1/2	2(2"), 1(3"), 1(3"B)	50'	1(1/2")	2 1/2	3 Qt	1 1/2	1
Light aircraft size & configuration of: PIPER PA-15, 16, 17, 20, 22, etc.												
Complete Aircraft	40 yd	1 Gal	9	10	5 1/2	1(1"), 6(2"), 2(3"), 1(4"), 1(3"B), 1(4"B)	1	1(1/2")	9	2 1/4	5 1/2	3 3/4
Fuselage	11 yd	1 Qt	2 1/2	2 3/4	1 1/2	1(1"), 2(2")			2 1/2	3 Qt	1 1/2	1
2 Wings & Ailerons	24 yd	2 Qt	5 1/2	6	3 1/2	4(2"), 2(3"), 1(4"), 1(4"B)	1	1(1/2")	4 1/2	1 1/4	3 1/4	2 1/4
5 Tail Surfaces	9 yd	1 Qt	2	2 1/4	1 1/4	2(2"), 1(3"B)	50'	1(1/2")	2	2 Qt	1 1/4	1
Complete Less Fuselage	29 yd	3 Qt	6 1/2	7	4	5(2"), 2(3"), 1(4"), 1(3"B) 1(4"B)	1	1(1/2")	6 1/2	1 3/4	4	2 3/4
Complete Less 2 Wings	28 yd	1 Gal	6 1/4	7	4	1(1"), 3(2"), 1(3"B)	50'	1(1/2")	6 1/4	1 1/2	3 3/4	2 1/2

POLY-FIBER COVERING MATERIAL ESTIMATES

Aircraft and Components	Linear yards of 70-inch wide fabric unless Light (66-inch) for plywood surfaces is listed.	POLY-TAK Fabric Cement	POLY-BRUSH Gallons (Reduce 3:1)	POLY-SPRAY Gallons (Reduce 4:1)	Poly-Fiber R 65-75 or RR 8500 Reducer Gallons	Polyester Finishing Tape Rolls ("B" = Bias)	Rib Lacing Cord (See Note 1)	Reinforcing Tape (Width same as cap strip)	POLY-TONE Pigmented Finish Gallons (See Note 2) (Reduce 4:1)	R 65-75 or RR 8500 Reducer Gallons for Poly-Tone	Optional AERO-THANE Polyurethane Finish Gal (vice POLY-TONE) (See Note 2) (Reduce 3:1 with UE-820)	Optional RANTHANE HS Polyurethane Finish Gal (vice POLY-TONE)(See Note 2) (Reduce 3:1 with G-4200)
AERONCA 15AC Fuselage & Tail	30 yd	2 Qt	6 3/4	7 1/2	4	1(1"), 2(2"), 1(3"), 1(4"B)		1(3/8")	6 3/4	1 3/4	4	2 3/4
BEECH STAGGERWING D-17 & WACO CABIN	70 yd	1 Gal 2 Qt	15 1/2	17	9 1/2	2(1"),14(2"), 2(3"), 1(4"), 1(3"B), 1(4"B)	2	6(3/8")	15 1/2	4	9 1/2	6 1/4
BELLANCA MODEL 14												
Complete Aircraft	21 yd 33 yd Lt	3 Qt	12	13 1/4	7 1/2	5(2"), 1(3")	1	1(3/8")	12	3	7 1/4	4 3/4
Control Surfaces	7 yd	1 Qt	1 1/2	1 3/4	1	2(2"), 1(3")	50'	1(3/8")	1 1/2	2 Qt	1	3 Qt
BUCHER JUNGMIESTER	40 yd	3 Qt	9	9 3/4	5 1/2	2(1"), 7(2"), 1(3")	1	1(3/8")	9	2 1/4	5 1/2	3 3/4
CESSNA 120/140/170 Wings	25 yd	1 Qt	5 1/2	6	3 1/2	4(2"), 1(3"), 1(4"), 1(4"B)		1(1/2")	5 1/2	1 1/2	3 1/2	2 1/2
CESSNA UC-78 (T-50)	140 yd	2 Gal	31	34 1/4	19	2(1"), 30(2"), 3(3"), 1(4"), 1(3"B), 1(4"B)	3	7(3/8")	31	8	18 3/4	12 1/2
CONSOLIDATED VULTEE BT-13 Control Surfaces	12 yd	1 Qt	2 3/4	3	1 3/4	2(2"), 1(3")		1(1/2")	2 3/4	3 Qt	1 3/4	1 1/4
CULVER CADET	23 yd	2 Qt	5 1/4	5 3/4	3 1/4	4(2"), 1(3"), 1(4"), 1(4"B)	1	1(1/2")	5	1 1/4	3	2
DOUGLAS DC-3	30 yd	1 Gal	6 3/4	7 1/2	4	6(2"), 2(3"), 1(3"B)	1	1(1/2")	6 3/4	1 3/4	4	2 3/4
DeHAVILLAND CHIPMUNK DH-C1	30 yd	2 Qt	6 3/4	7 1/2	4	4(2"), 1(3"), 1(4")		1(1/2")	6 3/4	1 3/4	4	2 3/4
ERCOUPE Both Wings	17 yd	1 Qt	3 3/4	4 1/4	2 1/2	2(2"), 1(3"), 1(4"), 1(4"B)		1(1/2")	3 3/4	1	2 1/4	1 1/2
FAIRCHILD 24	47 yd 8 yd Lt	3 Qt	12 1/4	13 1/2	7 1/2	1(1"), 8(2"), 2(3"), 1(4"), 1(4"B)	1	2(3/8")	12 1/4	3	7 1/2	5
FAIRCHILD PT-19, 23, 26	32 yd 33 yd Lt	1 Gal	14 1/2	16	9	1(1"), 2(2"), 1(3")	50'	1(1/2")	14 1/2	3 3/4	8 3/4	6

POLY-FIBER COVERING MATERIAL ESTIMATES

Aircraft and Components	Linear yards of 70-inch wide fabric unless Light (66-inch) for plywood surfaces is listed.	POLY-TAK Fabric Cement	POLY-BRUSH Gallons (Reduce 3:1)	POLY-SPRAY Gallons (Reduce 4:1)	Poly-Fiber R 65-75 or RR 8500 Reducer Gallons	Polyester Finishing Tape Rolls ("B" = Bias)	Rib Lacing Cord (See Note 1)	Reinforcing Tape (Width same as cap strip)	POLY-TONE Pigmented Finish Gallons (See Note 2) (Reduce 4:1)	R 65-75 or RR 8500 Reducer Gallons for Poly-Tone	Optional AERO-THANE Polyurethane Finish Gal (vice POLY-TONE) (See Note 2) (Reduce 3:1 with UE-820)	Optional RANTHANE HS Polyurethane Finish Gal (vice POLY-TONE)(See Note 2) (Reduce 3:1 with G-4200)
FLEET, FRENCH STAMPE, GREAT LAKES, PJ-260, TRAVEL AIR 12 & 16E, etc.												
Complete Aircraft	60 yd	1 Gal	13 1/2	14 3/4	8 1/4	1(1"),10(2"), 2(3"), 1(4"), 1(4"B)	1	4(3/8")	13 1/2	3 1/2	8	5 1/4
4 Wings	36 yd	2 Qt	8	9	5	10(2"), 2(3"), 1(4"), 1(4"B)	1	4(3/8")	8	2	5	3 1/2
GRUMMAN AG-CAT	24 yd	2 Qt	5 1/2	6	3 1/4	4(2"), 1(3"), 1(4")		1(3/8")	5 1/2	1 1/2	3 1/4	2 1/4
HOWARD DGA 15	25 yd 33 yd Lt	1 Gal	13	14 1/4	8	1(1"),10(2"), 2(3"), 1(4"), 1(4"B)	1	2(1/4")	13	3 1/4	7 3/4	5 1/4
LUSCOMBE MODEL 8	22 yd	1 Qt	5	5 1/2	3	4(2"), 1(3"), 1(4")	1	1(1/2")	5	1 1/4	3	2
MAULE	28 yd	1 Gal	6 1/4	7	4	1(1"), 5(2"), 1(3"), 1(4")	1	1(1/2")	6 1/4	1 1/2	3 3/4	2 1/2
MOONEY MITE M-18	12 yd 20 yd Lt	2 Qt	7 1/4	8	4 1/2	1(1"), 2(2"), 1(3")	1	1(3/8")	7	1 3/4	4 1/4	3
NAVY N3N 4 Wing Panels	45 yd	2 Qt	10	11	6	7(2"), 2(3"), 1(4"), 1(4"B)	1	2(1/2")	10	2 1/2	6	4
NORTH AMERICAN BC-1A, AT-6, -6A, -6B, -6C, -6D, -6F, -6G, T-6G												
Rudder, 2 Elevators, Ailerons	9 yd	1 Qt	2	2 1/4	1 1/4	2(2"), 2(3"), 1(4")		1(1/2")	2	2 Qt	1 1/4	1
2 Ailerons	3 yd	1 Qt	3 Qt	3 Qt	2 Qt	1(2"), 1(3")		1(1/2")	3 Qt	1 Qt	2 Qt	2 Qt
Rudder, 2 Ailerons	6 1/2 yd	1 Qt	1 1/2	1 3/4	1	2(2"), 1(3")		1(1/2")	1 1/2	2 Qt	1	3 Qt
RYAN PT-22 & RYAN ST	29 yd	2 Qt	6 1/2	7	4	3(2"), 1(3"), 1(4"), 1(4"B)	1	1(1/2")	6 1/2	1 3/4	4	2 3/4
RYAN BROUGHAM	78 yd	1 Gal	17 1/2	19	10 1/2	1(1"),11(2"), 2(3"),1(4"), 1(4"B)	1	3(1/2")	17 1/2	4 1/2	10 1/2	7

POLY-FIBER COVERING MATERIAL ESTIMATES

Aircraft and Components	Linear yards of 70-inch wide fabric unless Light (66-inch) for plywood surfaces is listed.	POLY-TAK Fabric Cement	POLY-BRUSH Gallons (Reduce 3:1)	POLY-SPRAY Gallons (Reduce 4:1)	Poly-Fiber R 65-75 or RR 8500 Reducer Gallons	Polyester Finishing Tape Rolls ("B" = Bias)	Rib Lacing Cord (See Note 1)	Reinforcing Tape (Width same as cap strip)	POLY-TONE Pigmented Finish Gallons (See Note 2) (Reduce 4:1)	R 65-75 or RR 8500 Reducer Gallons for Poly-Tone	Optional AERO-THANE Polyurethane Finish Gal (vice POLY-TONE) (See Note 2) (Reduce 3:1 with UE-820)	Optional RANTHANE HS Polyurethane Finish Gal (vice POLY-TONE)(See Note 2) (Reduce 3:1 with G-4200)
STEARMAN-BOEING PT-13, -17, -18, -27, N2S-3, TRAVEL AIR 4000, WACO UPF-7, etc.												
Complete Aircraft	65 yd	1 Gal	14 1/2	16	9	1(1"),11(2"), 2(3"), 2(4"), 1(4"B)	1	4(3/8")	14 1/2	3 3/4	8 3/4	5 3/4
4 Wing Panels	40 yd	3 Qt	9	9 3/4	5 1/2	11(2"),2(3"), 2(4"), 1(4"B)	1	3(3/8")	9	2 1/4	5 1/2	3 3/4
Fuselage	12 yd	1 Qt	2 3/4	3	1 3/4	1(1"), 2(2")			2 3/4	3 Qt	1 3/4	1 1/4
6 Tail Surfaces	13 yd	2 Qt	3	3 1/4	1 3/4	3(2"), 1(3"), 1(4"B)	50'	1(3/8")	3	3 Qt	1 3/4	1 1/4
STINSON 10, 10A, 10B, HW-75	42 yd 5 yd Lt	2 Qt	10 1/2	11 1/2	6 1/2	1(1"), 6(2"), 1(3"), 1(4"), 1(4"B)		1(1/2")	10 1/2	2 3/4	6 1/4	4 1/4
STINSON 108												
Complete Aircraft	40 yd	2 Qt	9	9 3/4	5 1/2	1(1"), 6(2"), 1(3"), 1(4")		1(1/2")	9	2 1/4	5 1/2	3 3/4
Fuselage	14 yd	2 Qt	3	3 1/2	2	1(1"), 2(2")			3	1	2	1 1/2
2 Wings & Ailerons	25 yd	1 Qt	5 1/2	6	3 1/2	5(2"), 1(3"), 1(4")		1(1/2"), 1(3/8")	5 1/2	1 1/2	3 1/2	2 1/2
STINSON AT-19 & V-77												
Complete Aircraft	78 yd	1 Gal	17 1/2	19	10 1/2	1(1"),11(2"), 2(3"), 1(4"), 1(4"B)	2	4(3/8")	17 1/2	4 1/2	10 1/2	7
2 Wings	41 yd	1 Gal	9	10	5 1/2	6(2"), 2(3"), 1(4"), 1(4"B)	2	4(3/8")	9	2 1/4	5 1/2	3 3/4
STINSON L-5	45 yd 5 yd Lt	2 Qt	11	12 1/4	7	6(2"), 1(3"), 1(4")		1(1/2")	11	2 3/4	6 3/4	4 1/2

POLY-FIBER COVERING MATERIAL ESTIMATES

Aircraft and Components	Linear yards of 70-inch wide fabric unless Light (66-inch) for plywood surfaces is listed.	POLY-TAK Fabric Cement	POLY-BRUSH Gallons (Reduce 3:1)	POLY-SPRAY Gallons (Reduce 4:1)	Poly-Fiber R 65-75 or RR 8500 Reducer Gallons	Polyester Finishing Tape Rolls ("B" = Bias)	Rib Lacing Cord (See Note 1)	Reinforcing Tape (Width same as cap strip)	POLY-TONE Pigmented Finish Gallons (See Note 2) (Reduce 4:1)	R 65-75 or RR 8500 Reducer Gallons for Poly-Tone	Optional AERO-THANE Polyurethane Finish Gal (vice POLY-TONE) (See Note 2) (Reduce 3:1 with UE-820)	Optional RANTHANE HS Polyurethane Finish Gal (vice POLY-TONE)(See Note 2) (Reduce 3:1 with G-4200)
HOMEBUILT/SPORT AIRCRAFT												
Aircraft size & configuration of: BOWER'S FLY-BABY, BOWER'S NAMU II, CORBEN BABY ACE, PIETENPOL, STOLP STARLET												
Complete Aircraft	32 yd	2 Qt	7 1/4	8	4 1/2	1(1"), 5(2"), 1(3")	1	1(3/8")	7 1/4	1 3/4	4 1/4	3
2 Wings 26' Span x 4 1/2' Chord	22 yd	1 Qt	5	5 1/2	3	3(2"), 1(3")	1	1(3/8")	5	1 1/4	3	2
AVID FLYER, KITFOX	38 yd	2 Qt	8 1/2	9 1/4	5 1/4	5(2"), 1(3"), 1(4"), 1(4"B)	1	2(1/2")	8 1/2	2 1/4	5	3 1/2
BABY GREAT LAKES, MONG, PITTS S-1C, SMITH MINI-PLANE, SUNDAY KNIGHT TWISTER												
Complete Aircraft	25 yd	3 Qt	5 1/2	6 1/4	3 1/2	1(1"), 5(2"), 1(3"), 1(4")	1	1(3/8")	5 1/2	1 1/2	3 1/2	2 1/2
4 Wing Panels	20 yd	2 Qt	4 1/2	5	3	5(2"), 1(3"), 1(4")	1	1(3/8")	4 1/2	1 1/4	2 3/4	2
CHALLENGER	38 yd	1 Gal	8 1/2	9 1/4	5 1/4	6(2"), 2(3"), 1(4")			8 1/2	2 1/4	5	3 1/2
EAA ACRO-SPORT, EAA BI-PLANE, STOLP STARDUSTER 100, etc.												
Complete Aircraft	45 yd	3 Qt	10	11	6	1(1"), 6(2"), 1(3"), 1(4"), 1(4"B)	1	1(3/8")	10	2 1/2	6	4
HATZ, MARQUART CHARGER, STARDUSTER II, STEEN SKY BOLT, etc.												
Complete Aircraft	50 yd	3 Qt	11 1/4	12 1/4	7	2(1"), 8(2"), 1(3"), 1(4"), 1(4"B)	1	1(3/8")	11 1/4	2 3/4	6 3/4	4 1/2
PIEL EMERAUDE	33 yd	3 Qt	7 1/2	8	4 1/2	6(2"), 2(3")	1	1(3/8")	7 1/2	2	4 1/2	3
VOLKSPLANE VP-1	19 yd 8 yd Lt	2 Qt	6	6 3/4	4	3(2"), 1(3")	1	1(1/4")	6	1 1/2	3 3/4	2 1/2
VOLKSPLANE VP-2	26 yd 10 yd Lt	2 Qt	8	9	5	5(2"), 1(3")	1	2(1/4")	8	2	5	3 1/2
WITTMAN TAILWIND	24 yd 12 yd Lt	2 Qt	8	9	5	1(1"), 1(2"), 1(3")	50'	1(3/8")	8	2	5	3 1/2

POLY-FIBER COVERING MATERIAL ESTIMATES

Aircraft and Components	Linear yards of 70-inch wide fabric unless Light (66-inch) for plywood surfaces is listed.	POLY-TAK Fabric Cement	POLY-BRUSH Gallons (Reduce 3:1)	POLY-SPRAY Gallons (Reduce 4:1)	Poly-Fiber R 65-75 or RR 8500 Reducer Gallons	Polyester Finishing Tape Rolls ("B" = Bias)	Rib Lacing Cord (See Note 1)	Reinforcing Tape (Width same as cap strip)	POLY-TONE Pigmented Finish Gallons (See Note 2) (Reduce 4:1)	R 65-75 or RR 8500 Reducer Gallons for Poly-Tone	Optional AERO-THANE Polyurethane Finish Gal (vice POLY-TONE) (See Note 2) (Reduce 3:1 with UE-820)	Optional RANTHANE HS Polyurethane Finish Gal (vice POLY-TONE)(See Note 2) (Reduce 3:1 with G-4200)
GLIDERS												
ASK-13 Fuselage	8 yd	1 Qt	1 3/4	2	1 1/4	1(2")			1 3/4	1/2	1	3 Qt
BG-7 Fuselage & Tail Surfaces	14 yd	1 Qt	3 1/4	3 1/2	2	1(2")	50'	1(3/8")	3 1/4	1	2	1 1/2
BG-12	31 yd	2 Qt	7	7 1/2	4 1/4	1(2")			7	2	4 1/4	3
CHEROKEE II	50 yd	3 Qt	11 1/4	12 1/4	7	3(1")			11 1/4	2 3/4	6 3/4	4 1/2
CHEROKEE II with R-M Wing	45 yd	3 Qt	10	11	6	3(2")			10	2 1/2	6	4
SCHWEIZER 2-12 (T6-3A)	30 yd	2 Qt	6 3/4	7 1/2	4 1/4	2(2"), 1(3")			6 3/4	1 3/4	4	2 3/4
SCHWEIZER 1-26A	24 yd	2 Qt	5 1/2	6	3 1/4	2(2"), 1(3")			5 1/2	1 1/2	3 1/4	2 1/4
SCHWEIZER 2-22	50 yd	1 Gal	11 1/4	12 1/4	7	7(2"), 1(3")		1(1/2")	11 1/4	2 3/4	6 3/4	4 1/2
FRANKLIN GLIDER	45 yd	1 Gal	10	11	6	3(2")			10	2 1/2	6	4
Ka 8b SAILPLANE	41 yd	2 Qt	9 1/4	10	5 1/2	1(1"), 5(2")	1	1(1/2")	9 1/4	2 1/4	5 1/2	3 3/4
WEIHE JS SAILPLANE	41 yd	2 Qt	9 1/4	10	5 1/2	1(1"), 5(2")	1	1(1/2")	9 1/4	2 1/4	5 1/2	3 3/4
MISCELLANEOUS COVERING SUPPLIES												
Anti-Chafe Cloth Tape					Paint Strainer Cones							
Brushes					Wetordry Sandpaper							
Drain Grommets					Scotch-Brite Cleaning Pads							
Seaplane Grommets					MEK solvent for Cleaning							
Rib Screws & Alum. Washers					310 Alkaline Cleaner							
Inspection Hole Reinforcing Rings					C-2210 Paint Surface Cleaner							
Inspection Hole Covers					Epoxy Varnish for Wood Parts							
Rib Lacing Needles					Epoxy Primer for Metal Parts							
Curved Needles					High-Temp. Solvent-Resistant Masking Tape							

TEST REPORTS

Over the years, we have made many tests to determine the true quality and characteristics of many types of materials. The test results given here are a few of the most important and should dispel some myths and published misinformation.

BARE FABRIC EXPOSURE TEST

24-inch square frames with unshrunk and uncoated 2.6 oz and 3.5 oz polyester fabric and uncoated Grade A cotton fabric (TSO C-15c) were mounted on a test fence at 45º incline facing true south and exposed to the elements for 13 months at Riverside, California. ¼ of the top surface on each panel was covered with plywood to block direct sunlight. After exposure, a minimum of six 1-inch wide strips from each section were pulled on a Hefner Model 10 fabric tester and averaged. Samples from each fabric specimen had been retained on file for compaison.

Test 1:
3.5 oz wt – 250 denier filament, 53x53 thread count
(A) Unexposed – 116.66 lbs.
(B) Exposed – 17.83 lbs.
(C) Indirect Exposure (covered) – 116.66 lbs.

Exposed polyester reduced to 15.28% of the original strength.

Indirect exposed polyester did not deteriorate.

Test 2:
2.6 oz wt – 150 denier filament, 66x66 thread count
(A) Unexposed – 89.33 lbs.
(B) Exposed – 13.83 lbs.
(C) Indirect Exposure (covered) – 89.33 lbs.

Exposed polyester reduced to 15.48% of the original strength.

Indirect exposed polyester did not deteriorate.

Test 3:
Grade A cotton
(A) Unexposed – 69.25 lbs.
(B) Exposed – 6.76 lbs.
(C) Indirect Exposure (covered) – 43 lbs.

Exposed cotton reduced to 8.3% of the original strength.

Indirect exposed cotton reduced to 62% of the original strength.

CONCLUSIONS

1. Polyester will deteriorate at approximately 50% of the rate of cotton under identical exposure conditions, therefore giving twice the service life of cotton.

2. Polyester does not deteriorate by indirect exposure like cotton, providing only direct ultraviolet radiation destroys polyester used as an aircraft covering.

CELLULOSE DOPE TENSION

Dope viscosity at 43 seconds thru a Zahn G2 Cup. All coats by brush at 70º to 75ºF ambient temperature. Test made on 3" wide straight edge linen finishing tape, 66" length with load extrapolated to 1" width in ounces. Average drying time between 17 coats was 24 hours.

	Cellulose-Nitrate Dope	Cellulose-Acetate Butyrate Dope
1st coat	-0-	-0-
2nd coat	.33 oz.	.27 oz.
4th coat	8.00 oz	5.33 oz
6th coat	11.67 oz	8.00 oz
8th coat	17.33 oz	10.67 oz
10th coat	22.67 oz	18.67 oz
12th coat	27.33 oz	21.67 oz
13th coat	29.33 oz	22.00 oz
14th coat	30.67 oz	22.67 oz
16th coat	33.33 oz	26.67 oz
17th coat	34.67 oz	28.00 oz
Dry 60 days	40.00 oz	32.00 oz
Dry 120 days	41.00 oz	35.00 oz
Dry 270 days	44.00 oz	38.00 oz

CELLULOSE DOPE UNRESTRAINED RATE OF SHRINK

Dope viscosity at 43 seconds thru a Zahn G2 Cup. All coats by brush at 70º to 75ºF ambient temperature. Test made on 3" wide straight edge linen finishing tape, 50" length. Average drying time between 15 coats was 24 hours.

	Cellulose-Nitrate Dope	Cellulose-Acetate Butyrate Dope
1st coat	-0-	-0-
2nd coat	.00125%	.00125%
4th coat	.01%	.01%
6th coat	.015%	.0137%
8th coat	.028%	.025%
10th coat	.045%	.042%
12th coat	.065%	.057%
14th coat	.0725%	.071%
16th coat	.1075%	.09%
Dry 4 days	.11%	.0925%
Dry 16 days	.115%	.095%
Dry 90 days	.1175%	.0975%
Dry 270 days	.125%	.1012%

BARE GLASS FIBER CLOTH DETERIORATION TEST

Test 1:
1 year exposure on a 45-degree incline south facing weather fence at Riverside, CA. (U.S. Testing Report #LA02447-1)

(A) Strength loss, 76.9%
(B) Reduced elongation at ultimate load, 50%

Test 2:
100-hour soak test in tap water. (U.S. Testing Report #LA02994)

(A) Strength loss, 27.2%
(B) Elongation loss at ultimate load, 18.4%

Test 3:
200 hours exposure to ultraviolet radiation in a dry sunshine arc weather-ometer. (U.S. Testing Report #LA03278)

(A) Strength loss – none
(B) Elongation at ultimate load increased 2/10 of 1%

CONCLUSIONS

1. Ultraviolet radiation does not harm glass fiber.

2. Direct exposure to dew, rain, acids from atmospheric pollution, alkali, and just clean water will deteriorate glass fiber very rapidly.

POLYESTER, NYLON AND GRADE A COTTON ULTRAVIOLET EXPOSURE TEST

A sample of each fabric was exposed to ultraviolet radiation for 100 hours in an unshielded sunshine arc weather-meter (U.S. Testing Report #LA03278).

(A) Polyester, 2.6 oz., 150 denier, Breaking strength retained after exposure, 38.2%

(B) Cotton, Grade A, Breaking strength retained after exposre, 18.3%

(C) Nylon, 3 oz., Breaking strength retained after exposure, 9.7%

CONCLUSIONS

Polyester is superior to cotton and Nylon in U.V. radiation resistance.

POLYESTER FABRIC HEAT/TENSION TEST

Tape is Fabric Style D-103, Raveled Edge to 2" Wide, 50" Long, reported in ounces per 1" Width.

Test 1:
Start with no slack in tape.

Iron Temp.	**Tension**
225°F	7.5 oz.
250°F	13.0 oz.
275°F	26.0 oz.
300°F	32.0 oz.
325°F	34.5 oz.
350°F	**35.5 oz.**
375°F	35.0 oz.
400°F	32.5 oz.
425°F	Filaments weaken & separate

Test 2:
Start with 2" slack in 50" length (4%)

Iron Temp.	**Tension**
250°F	11.0 oz.
350°F	**28.0 oz.**

CONCLUSIONS

1. The maximum tension is developed at 350°F when the shrinking is started with **no slack** in the fabric panel as indicated when checking the tension in Test #1 at 350°F against the tension developed at the same temperature in Test #2.

2. Temperatures **above 350°F** tend to thermo soften polyester filaments and cause the tension to release rather than further tauting.

POLYESTER FABRIC SHRINK/ELONGATION TEST

Tape is Fabric Style D-103, Raveled Edge to 1" Wide, 50" Long.

Test 1:
Fabric restrained with no slack and heated to 350°F, then a 35 lb. load attached to the end and the clamp released.

Elongation is 1 ½" or 3% stretch with a 35 lb. load which is ½ the load required for the TSO C-15 Elongation Test.

Test 2:
Fabric restrained with 2" of slack in the 50" length (4%).

Heat to 350°F, then attach a 35 lb. load to the end and release the clamp.

Elongation is 3 ½" over twice the elongation when the fabric is installed with no slack.

CONCLUSION

Elongation of polyester fabric will be considerably more when the fabric is installed with excessive slack.

LOW TEMPERATURE FLEXIBILITY TEST

Maximum flexibility tests were made by folding and creasing the samples to zero bend radius (180 degrees) with tweezers while they were submerged in methanol which had been cooled with dry ice. All samples had aged 4 months.

Laboratory flexibility tests using a ball or other large radius object to not simulate true field conditions. Most rocks on gravel strips (especially in Alaska) have sharp corners, and fabric pressed against stringers and rib edges is bent sharply with very little radii. The zero bend test was used as a standard to test the worst conditions.

Zero Radius Bend Test
Fahrenheit

	+15°	+10°	-0°	-10°	-15°
D-101 fabric with 2 coats Poly-Brush 6 coats Poly-Spray 4 coats Poly-Tone	OK	OK	OK	OK	Film Snapped
D-101 fabric with 2 coats Poly-Brush 6 coats Poly-Spray 3 coats Aero-Thane	OK	OK	OK	OK	Film Snapped
Grade A cotton with 5 coats clear butyrate dope 4 coats Aluminum pigmented butyrate dope	OK	Film Snapped			
Glass fiber cloth with 10 coats clear butyrate dope	OK	Film Snapped			

CONCLUSIONS

Poly-Fiber coatings will flex without cracking in 20°F to 25°F colder weather than butyrate dope.

COVERING MATERIAL WEIGHT

Fabric covered area of the average 2-place aircraft such as Piper J-3, Taylorcraft, Aeronca, Porterfield, etc., is approximately 731 sq. ft. or 81.22 sq. yd. Following are the basic fabric weights.

81.22 Square Yards	**Weight per sq. yd.**	**Fabric Weight**	**Fabric Thickness**
Grade A cotton fabric	4.5 oz.	22.84 lbs.	10 mils
Heavy Duty-2 Poly-Fiber polyester	3.4 oz.	17.26 lbs.	6 mils
Medium-1 Poly-Fiber polyester	2.7 oz.	13.71 lbs	4.5 mils
Uncertified Light Poly-Fiber polyester	1.7 oz.	8.62 lbs	3.5 mils

The Poly-Fiber covering materials will weigh no more or less than any other process with equal fabric weight and film thickness. Our tests indicate that all coatings presently being used on aircraft fabric weight approximately the same when comparing equal dry film thickness. Pigmented finishes weigh 3 to 7 percent more than clear coats, depending on the pigment.

The recommended minimum 9 Poly-Fiber coatings will weigh more than 9 coats of nitrate or butyrate dope because Poly-Fiber coatings have approximately twice the solids content and the dry film will be approximately twice as thick.

The combined weight of the recommended minimum 9 coats of Poly-Fiber coatings on style **Medium 1** fabric is **1.0 oz** per sq. ft.

In a test, old cotton fabric covering with the usual 20 coats of dope removed from a PA-18 Super Cub weighed 75 lbs. or **1.64 oz** per sq. ft.

The final covering weight will depend not only on the fabric, but also on the total thickness of all the coatings, quantity of reinforcing tape, anti-chafing tape, finishing tape, screws, washers or rib lacing, reinforcing patches, drain grommets, inspection reinforcing rings, inspection hole covers and miscellaneous hardware. The use of heavy thick enamel finishes can double the weight of an otherwise good covering.

ADHESION TEST

Careful tests were made to determine the true adhesion or bond strength of the various coatings to the types of fabric currently being used. Adhesion was checked by mounting 1" wide finishing tape on the fabric test panel, dry four days at room temperature, and peel off at 90 degrees to the panel surface (perpendicular) using a calibrated recording tension scale. Five samples of each material combination were tested and reading averaged. Tape types were straight edge polyester, selvage edge glass fiber, and pinked edge cotton tape. All polyester panels were 2.6 oz weight.

		90 Degree Peel Resistance Recorded in Ounces	*Tape Flame Test
(1)	Butyrate dope with polyester tape on polyester fabric	9.25	2
(2)	Nitrate dope with polyester tape on polyester fabric	12.75	1
(3)	Dac-Proofer (Cooper) with polyester tape on polyester fabric	15.5	1
(4)	Sure-Seam cement (Certified Solvents) with polyester tape on polyester fabric	20.0	1
(5)	Super-Seam cement (Ceconite) with polyester tape on polyester fabric	24.0	1
(6)	Rand-O-Proof polyester coating (Randolph) with polyester tape on polyester fabric	32.0	1
(7)	Butyrate dope with glass fiber tape on glass fiber cloth (Razorback)	29.0	2
(8)	POLY-BRUSH with polyester tape on polyester fabric	37.0	3
(9)	POLY-TAK fabric cement with polyester tape on polyester fabric	42.0	3
(10)	Nitrate dope with cotton tape on Grade A cotton fabric	128.0	1
(11)	Butyrate dope with cotton tape on cotton fabric	85.0	2
(12)	Non-tauting butyrate dope with cotton tape on cotton fabric	80.0	2
(13)	POLY-TAK fabric cement with polyester tape on clear AERO-THANE finished panel	69.0	3
(14)	POLY-TAK fabric cement with polyester tape on pigmented AERO-THANE finished panel	80.0	3
(15)	Super-Seam cement with polyester tape on bare aluminum surface	20.5	1
(16)	Super-Seam cement with polyester tape on epoxy primed aluminum surface	18.5	1
(17)	POLY-TAK fabric cement with polyester tape on bare aluminum surface	53.5	3
(18)	POLY-TAK cement with polyester tape on epoxy primed aluminum surface	55.5	3
(19)	POLY-TAK fabric cement with cotton tape on grade A cotton	160.0	4
(20)	POLY-TAK fabric cement with glass fiber tape on glass fiber cloth	128.0	5
(21)	Flame test on uncoated polyester fabric	-	2
(22)	Flame test on uncoated Grade A cotton fabric	-	2

* 1. Ignites and burns rapidly
2. Ignites and burns slowly
3. Fabric melts—coatings do not support combustion
4. Ignites and self-extinguishes when flame source removed
5. Does not ignite

CONCLUSIONS

1. Butyrate dope on polyester provides the least bond of all coating/fabric combinations. See #1.

2. Poly-Tak and Poly-Brush provide the best adhesion of all cements and coatings on all man-made and natural fibers. See #8, 9, 17, 18, 19, 20.

3. Poly-Tak cement provides the best bond to bare aluminum surface and epoxy primer.

4. The advertised claim that 2 coats of Dac-Proofer brushed on Ceconite (polyester) provides twice the adhesion as dope to cotton is false. See #3 vs. 10.

5. The advertised claim that the use of Dac-Proofer gives the user a complete fire retardant system is false. Dac-Proofer is nitrocellulose dope and burns rapidly. See #3.

6. Non-tauting dope (excess plasticizers added) reduces the adhesive chracteristics and interferes with finish coat adhesion. See #11 vs. 12.

Notes

Notes

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