

Additional helpful supplementary information to the Oratex instructions.

Applying Oratex is simply a matter of bonding it to the surface to be covered and then shrinking it tight. This is a summary of the procedures and processes involved the more detailed manual can be downloaded from the website .

Surface preparation

- All contact surfaces **must** be completely free of any grease, oil, silicones, dirt, or other contaminants. When working with gloss surfaces such as powder coating or gloss paint, the surface must be scuffed to provide a key for the adhesive to adhere. 3M Scotchbrite Maroon surfacing pads works well for scuffing most surfaces. Aluminium surfaces can be alodined, etch primed or painted with a good quality two part primer, or simply scuffed with Scotchbrite. But be sure to do one or the other. With modern aluminum alloys the surface coating can be so smooth that the adhesive will not adhere properly. Scuffing with Scotchbrite will give the surface a good key for the adhesive to grab.
- Provided the surface is properly prepared and the adhesive properly applied, the adhesive will hold in excess of 100 pounds per square inch, (7kgs per square centimetre). Never use any Zinc-Phosphate primers with Oratex because they do not adhere to aluminum sufficiently to create the design strength bond. As a result, the primer will fail and pull off the metal surface. You must use quality, 2 component wash primer or self-etching primer Zinc Chromate primers work well (do not confuse with Zinc Phosphate)
- Whichever primer you choose, be sure to test it before applying to your airframe by testing a small piece to destruction. The desired result is for the adhesive or fabric to fail, rather than the primer peeling from the metal.
- When working with a wooden airframe, all surfaces should be painted or varnished (per aircraft designer's recommendation) and then scuffed or lightly sanded, TLAC Eco Prime offers users fast drying water based technology system that provides the ideal base for the use of Oratex adhesive. Failure to properly prepare wooden surfaces will cause problems. Because Oratex is so durable, an unprotected airframe could easily begin to deteriorate long before the fabric even begins to show wear. Un-primed wood will soak up the adhesive, making multiple applications necessary. Failure to properly scuff the painted surface could result in inadequate adhesion. So, always prepare wood surfaces correctly, and always scuff the surface.
- Always make several test pieces to exactly replicate the surface preparation and test these to ensure good bond strength.

Applying the Adhesive

- Adhesive is applied to **both** the underside of the fabric and the contact area of the airframe. In other words, ***both surfaces are coated with adhesive.***
- Be certain to use adhesive that has not reached its expiration date, be sure to use enough adhesive but do not apply so much that it puddles or forms milky pools!
- After the adhesive has been applied, it must be allowed to dry completely. If the fabric is applied to the airframe before the adhesive has been allowed to dry completely, proper adhesion will not occur. When the adhesive is properly dried, it will take on a translucent appearance and be completely dry to the touch. Again, the adhesive will not adhere if you don't let it dry completely!
- The adhesive must be visibly present on the fabric and on the airframe, if you can't see or feel it, you haven't applied enough adhesive, and you must apply a second coat. When applying the adhesive, only synthetic fibre or sponge brushes are acceptable.
- Do not use a real hair or bristle brush, as real hair or bristle will cause an adverse chemical reaction. The results will be completely unsatisfactory as the adhesive will clump up on the brush and you will end up holding something that resembles a cauliflower. On the other hand, an artificial brush will not have this problem, and it can be washed clean with cold soapy water, provided the adhesive has not dried. Dried adhesive cannot be easily removed, it is easier to replace the brush.
- Keep in mind that the uncured adhesive must not be allowed to freeze. If the uncured adhesive is allowed to freeze, it will be ruined. Once cured, the adhesive is good to at least 40 degrees below zero, but until it has cured it is vulnerable.
- The shelf life of adhesive is rated at 6 months, although adhesive that was a year old has been used successfully. Once the adhesive has been applied, and allowed to cure, it will be tolerant of temperatures exceeding forty degrees below zero.

Cutting, Fitting and Securing the Fabric

- Once the adhesive has dried completely, the fabric is secured to the airframe with nonabrasive clamps, such as spring clamps with rubber coated tips.
- When you cut the fabric, keep in mind that you want to have a minimum four inch overlap on leading edges, and a minimum two inch overlap on trailing edges. This may seem excessive but it is very helpful for getting a good grip and being able to pull to tighten during covering.
- Special tools are not required to cut the fabric. Good scissors or pinking shears and a craft knife all work well.
- Because both heat and pressure are required to achieve a satisfactory bond, all fabric joints must occur over airframe members. Attempting to make a joint in open space will not allow sufficient pressure to be applied. Therefore all joints must be positioned over airframe members where sufficient pressure can be applied.
- When covering a wing structure, the top piece of fabric must be long enough that it will reach to the underside of both the leading and trailing edges, far enough to allow for at least a four inch overlap on the leading edge and at least a two inch overlap on the trailing edge. Under no circumstances should the top fabric terminate on the top side of the wing. It must always extend over the leading and trailing edges and terminate on the bottom side.
- It is important to get the fabric taught and as wrinkle free as possible when you adhesive it down. To be sure, it will be loose and there will be wrinkles, but it is important that you do your best to remove those wrinkles as far as possible when you bond the fabric down. This is particularly important information for those of you who are experienced with other fabric systems, because Oratex does not shrink quite as much as some other fabrics. Specifically, Oratex fabric can be shrunk up to 18%, which is considerable. Nevertheless, if you take the time to make the fabric as tight as possible on the adhesive down, it will make the shrinking job easier, and the end product will look great.

Activating the Adhesive

- The adhesive is activated by heat, and pressure is required to ensure that the adhesive fully penetrates the weave of the fabric surface. The surface of the fabric is rubbed with a hot iron set at about 100° Celsius (212° Fahrenheit). This will melt and trigger the adhesive. As the adhesive reaches 70° Celsius (158° Fahrenheit) the melting will trigger the adhesive activation. As the adhesive melts, good pressure is applied with the iron to force the adhesive into good contact with the fabric.
- As the iron is moved forward to a new area, the melted adhesive behind will set in about 10 seconds.
- It is imperative that the fabric does not move while the adhesive is setting up.
- Once the adhesive has fully cured (24 hours at 18-20°C) it will have a much higher melting point. It will still melt before the fabric melts 250°C (482°F) thus allowing for removal if necessary. The melting point will be high enough to withstand any environmental exposures—for example, on an airplane that is painted black and placed in the hottest desert on the hottest day.
- The actual iron temperature needed will vary depending upon the underlying structure, and how much heat it is absorbing.
- While applying heat with the iron, silicon release paper is placed between the iron and the fabric. The purpose of the silicon release paper is to allow the iron to be moved smoothly without marking the fabric. Without silicon release paper, the iron will tend to move in a jerky fashion, making control difficult.
- The adhesive will reach its full design strength in 24 hours at 24° C (75° F). If your hangar is cold, it could take up to seven days to reach full strength.
- Because pressure is an important part of the process, an iron with a top handle (such as the TLAC T14) is the preferred tool. Sometimes you will need to use a standard narrow fabric iron, and in such circumstances special effort must be made to apply good pressure. Occasionally, you may find yourself in a position where the heat gun may be best.
- When using the heat gun for bonding adhesive down, it is essential that you also use the felt pad to apply pressure. Heat alone will not result in a good bond. You must use both heat and pressure. Because of the heat necessary to activate the adhesive, fabric cannot be bonded to some foams., because the foam will melt. Aluminum with foam backing will work because the aluminum will dissipate the heat, but extra caution will be required to keep from melting the foam.

Shrinking the Fabric

- Once the adhesive has had sufficient time to set (usually 24 hours, longer in a cold environment) it is time to shrink the fabric. Apply heat with your hot air gun (never more than 250°C / 482°F) and shrink the fabric until taut and wrinkle free.
- Be careful about getting the nozzle too close to the fabric. If you get the nozzle too close, you can permanently discolour the fabric. Before you begin shrinking, test your heat gun on a scrap piece of fabric, so that you can learn how close you can get before you damage the fabric. Better to learn this on a scrap rather than on a wing! If (when you bonded the fabric down) you stretched and clamped the fabric to be as wrinkle free as possible, a minimal amount of shrinking will be required. In difficult areas where fabric has wrinkled, creased, or is slack, you will have to draw the irregularities out by shrinking the fabric in a wrinkle free zone don't try to shrink the wrinkle shrink the area around it. You might try shrinking the fabric from the opposite end of where your irregularities are located. This method of shrinking the fabric with your hot air gun will pull out those irregularities (and in most instances provide superior results to the use of a flat iron).
- Do not attack the wrinkled areas initially, instead try to draw them out by shrinking fabric away from them. Hot Air gun motions and techniques will vary from job to job and with the fabric irregularities, so a well illuminated working area is essential to give you a clear view of your results. With a well lit work area, you will be able to visually interpret your success as you work with your heat gun.
- Be aware that surface temperatures will vary according to the distance of the heat gun from the fabric. Monitor and control this temperature variation with your infrared thermometer.
- Fabric surface temperatures should not exceed 200°C / 392°F.
- Avoid burning your hands and fingers wear protective gloves.
- Keep in mind that it takes some time for the heat from the heat gun to saturate the heat sink of the fabric itself. This is especially evident with the 6000 as it is thicker than the 600. So when you start heating it with the heat gun, give it some time to react before going closer with the nozzle. It might take 5 seconds or more for the 6000 fabric to become heat saturated enough that it will shrink. So, do not go closer and closer with the nozzle; rather, give the heat a chance to sink in.
- It makes sense to start off using leftover scraps to get a feel for the technique. Do not simply start in on the wings and fuselage first.
- Unlike conventional covering systems, Oratex has a design limitation built into it, where you are unable to over tighten the fabric to the point of structural damage to the airframe. Oratex fabrics do not continue to shrink following the application of artificial heat. Aging records indicate negligible (to virtually immeasurable) shrinkage over time. Natural ambient temperatures (even the hottest Sahara Desert sun) will not cause further shrinkage, even when painted black.
- The finishing touch is the final application of heat, using your flat iron. It is not necessary to use the silicone release paper this time. For this final shrinking, do not press down on the iron. Hold the iron "weightless" over the unsupported surfaces and move the iron back and forth. Light contact is all that is needed. Once the shrinking is complete, your fabric will have a taut and smooth finished surface.

- The application of heat can be repeated, again, and again, while the aircraft is in service. For example, if a stone were to dent your tail feathers, a little heat from your hot air gun will shrink the Oratex fabric back to its original finished state; restoring that smooth, consistent, finish you had with your freshly covered aircraft.
- There is a temporary colour change in the Oratex fabric that occurs when the fabric is heated, and it is desirable for shrinking to have enough heat to see that colour change. This colour change goes away after 20-30 seconds. In general, the colour gets darker. The effect is obvious when seen. Be aware that if you exceed the desired temperature ranges, permanent discoloration is possible. Never rely solely on the reading of your digital tools. Always monitor them with your digital thermometer and most importantly, be sure to test them on scrap material. By using a little care, you will never overheat the fabric. Always start by covering the smallest pieces, never begin on the wing or fuselage. It would really hurt if you ruin a piece of fabric that big. Better to begin on a door frame, aileron, flap, stabilizer or landing gear leg. Covering with Oratex is easy, but it does require somewhat different skills than Ceconite or Polyfiber, so be sure to pay attention to the techniques as noted in these instructions.

Applying Reinforcing Tape

- All seams must be covered with reinforcing tape (pinked edge or straight edge may be used).
- While other systems require their tape edges to be pinked, with Oratex the choice is yours.
- Tapes are applied after the fabric has been shrunk.
- All tapes come with adhesive already applied to one side. This adhesive side is protected by paper which must be removed prior to application. In addition to the adhesive that is already on the tape, adhesive must also be applied to the fabric seam itself. Otherwise there is the possibility of air bubbles becoming trapped at the seam joint. To avoid this potential problem is simple. Just be sure to apply a line of adhesive that is about 1/4 inch wide, and thick. Do not go overboard and apply so much adhesive that it will come out the edges. Remember, all you are doing is preventing tiny air bubbles from forming at the fabric joint.
- When applying reinforcing tapes to the wings, first apply the rib tapes. These tapes are applied over whatever primary method of attachment the original aircraft design specifies.
- If your design calls for rib stitching, the tapes will go over the stitching, but reinforcing tape must be applied prior to the rib stitching itself. If it calls for rivets, the tapes will go over the rivets. Just as you applied extra adhesive to the fabric seam, you also want to apply extra adhesive to the rivets and rib stitching.
- After the rib tapes you will apply the leading and trailing edge tapes. Leading edge tapes must be at least 4 inches wide, trailing edge tapes must be at least two inches wide. Tapes are available in 25mm (1 inch) increments.
- Note: Be sure to provide for drain/ventilation holes. Because Oratex is airtight, the air in structures can expand as the airplane gains altitude.

Mistakes You Must Not Make

- Do not bring fabric and airframe together until the adhesive has dried completely.
- Do not try to use a poor quality or non-digital heat gun or iron.
- Do not attempt to shrink the fabric until the adhesive has had at least 24 hours to set (longer in a cold environment).
- Never allow the uncured adhesive to freeze (freezing will ruin the adhesive).
- Never rely on heat alone when gluing fabric; you must use both heat and pressure.
- Do not allow the fabric to move while the adhesive is setting up.
- Do not attempt structural joints in open space. Proper pressure cannot be applied in such a situation, therefore structural joints must occur over airframe members.
- Do not forget to provide for drain/ventilation holes. Because Oratex is airtight, the air in structures can expand as the airplane gains altitude, and could conceivably explode if ventilation is not provided.
- Do not try to apply fabric without allowing for specified minimum overlap (2" trailing edge, 4" leading edge)