

MADE IN GERMANY

ORATEX®

MODEL AIRCRAFT FABRIC MADE OF GENUINE POLYESTER FIBRES THAT CAN BE IRONED ON

The ORATEX® aircraft fabric is a high-tech product for covering larger model aircraft. Compared to ORACOVER® covering film, the ORATEX® aircraft fabric has a positive aerodynamical effect to the flight quality of your model airplane. Thanks to the special structure of the fabric, a micro vortex effect is generated, which turns the boundary layer of the fabric into a turbulent layer. The above located steady flow is being accelerated through this turbulent flow and aspirated. The acceleration and the aspiration guide the airflow towards the trailing edge. In other words: The ORATEX® fabric reduces the induced drag. Your advantages: In landing approach the aircraft will have a stabile flight even at low speed, and in high speed flight it flies more energy efficient, that means you are able to fly faster with the installed engine power, owing to the reduction of the induced drag. ORATEX® is available in an extended range of attractive colours. The specially for ORATEX® developed hotmelt adhesive has an extremely strong adherence, so that it anchors supremely well on the surface to which the covering is ironed-on.



ORATEX® gave wings to Solar Impulse SI I & SI 2 to fly around the world. This fantastic product covered the wing, the fuselage and the empennage of both airplanes. The cockpit and the cowlings were covered in ORALIGHT® silver.



Fig. 1 Recommended tools

1. TOOLS YOU'LL NEED (Fig. 1)

- ORATEX® T14 sealing iron (ref. no. 08420), heat gun (ref. no. 08465 / 08470)
- ORACOVER® iron-on cloths (ref. no. 08460) OR ORATEX® self-adhesive sliding coating (ref. no. 08461)
- ORATEX® felt blade (ref. no. 0915 / 0948)
- working gloves (ref. no. 08428 / 08429 / 08430) when working with the heat gun or the T14 sealing iron
- chemical gloves (ref. no. 08431 / 08432), respirator mask (ref. no. 08249) when working with solvent products
- ORACOLOR® filler (ref. no. 100-999)
- ORATEX® hotmelt adhesive (ref. no. 0965 / 0968 / 0966) – for outside EU: Granulate to be dissolved in acetone (ref. no. 0465 for 100ml / 0468 for 250ml / 0466 for 1L: ORATEX® self mixed hotmelt adhesive)
- press roll (ref. no. 08150), special brush (ref. no. 08152 / 08153 / 08154)
- ORATEX® degreaser (ref. no. 08245)
- scissors / cutting bar / ruler / sanding block + fine-grained sandpaper
- scalpel (ref. no. 0914) OR cutting knife (ref. no. 0916)
- fixing-tape for ORATEX® (ref. no. 08258), kitchen roll, self-adhesive tape
- ORACOLOR® 2K-PU-mastic (ref. no. 08445) elastic, non shrinking and high heat resistant
- ORATEX® special thinner (ref. no. 0969)
- ORATEX® cleaner (ref. no. 08200), ORATEX® wax (ref. no. 08240)

2. SURFACE PREPARATION (Fig. 2)

Take time to sand your model completely. Fill all cracks and dents of the surface with ORACOLOR® 2K-PU-mastic/putty (ref. no. 08445) and ORACOLOR® filler (ref. no. 100-999). Finally sand the surface with a 320-grade sandpaper or higher, always using a sanding block. Completely vacuum and then wipe the structure free of any dust left. If the surface is suitable to take a finish, treatment of the surface is not necessary. If the surface is NOT suitable to take a finish, we recommend you apply ORATEX® - iron-on adhesive (ref. no. 0965 / 0968 / 0966) first. You can test the suitability by sticking some self-adhesive tape on the surface. If you can pull the tape off easily and the adhesive tape is covered with fine wood particles and fibres, prepare the surface as recommended above, to guarantee a permanent anchoring of the aircraft fabric on the surface (see last passage of these instructions: "self-adhesive tape test").



Fig. 2 Sand surfaces smooth

3. SETTING THE TEMPERATURE OF YOUR SEALING IRON

If you don't own an ORATEX® T14 sealing iron which is regulated electronically and provides a digital temperature meter, you can either measure the temperature with a pocket or oven thermometer or better, an infrared thermometer, or follow these rules:

- A Low Range (90 °C / 194 °F) - Adhesive (duller) side will begin to stick to balsa (see Fig. 3a)
- B Medium Range (130 °C / 266 °F) - midway between high and low range
- C High Range (150 °C / 302 °F) - at this temperature a scrap of ORATEX® dropped on the iron (dull side up, see Fig. 3b) will wrinkle and shrink (look distorted).
- D Foam (polystyrene) test - An easy and reliable way to find the 90 °C / 194 °F setting on your iron is, to test the warm iron on a piece of polystyrene foam. If the polystyrene foam "squeaks", but does not melt yet when the iron slides over it, the iron has a temperature of 90 - 95 °C / 194 - 203 °F. Depending on the type of foam the melting point is set between 95 °C / 203 °F and 105 °C / 221 °F.

Note: For especially difficult wing tips, you can increase the iron temperature of the T14 sealing iron to 160 °C / 320 °F. Using the heat gun (ref. no. 08465/08470) you can easily stretch ORATEX® at a temperature of 180 °C / 356 °F. ORATEX® starts to melt at a product temperature exceeding 250 °C / 482 °F!

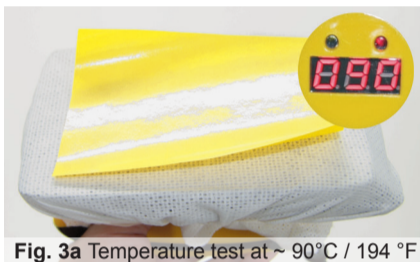


Fig. 3a Temperature test at ~ 90°C / 194 °F

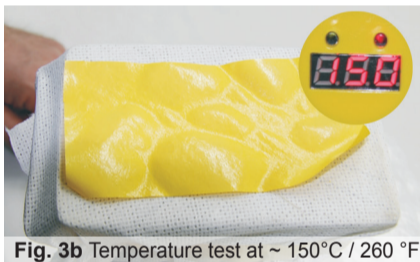


Fig. 3b Temperature test at ~ 150°C / 260 °F

4. APPLICATION OVER OPEN FRAMEWORK: WING (Fig. 4, 5, 7)

Cut a piece of ORATEX® at least 2 cm / 0.79 in oversize (Fig. 5a) all around for the bottom of the wing, and 15 cm / 5.91 in oversize around the wing tip. Remove the backing paper. For an easy removal, we recommend to stick a strip of self-adhesive tape to the top side of the fabric and to the vis-à-vis bottom side of the silicone paper – let the ends of the self-adhesive tape stick out. When you then pull the two sticking out ends of the tape in a 180 ° direction, you can easily separate the silicone paper from the fabric (Fig. 5b). To remove the silicone paper, put the fabric with its upside on a flat surface (table). Always separate the backing from the fabric and not the other way around to avoid kinks or wrinkles in the fabric (Fig. 5c). Lay ORATEX® as flat as possible into position and avoid wrinkles (Fig. 4). Note: Place its adhesive side (dull side) down onto the bottom structure and double-check positioning. Set the sealing iron to a low temperature (90 °C / 194 °F). Using the tip of the iron, seal the ORATEX® to the root-rib and then to the main spar (see Fig. 6). Doing so, slightly tighten the ORATEX® by pulling it along the wing tip to the outside and make sure it lies flat and stretched on the surface. Keep the tension while moving the sealing iron along the main spar (or wing's highest point) from the root rib to the wing tip applying light pressure. For the next step (see Fig. 7) bond ORATEX® onto bottom of the surface of the wing between the main spar and the leading edge. Hold the shoe of the iron parallel to the wing's main spar. Place the full surface of the iron with moderate pressure on the already sealed strip at the main spar and move the iron in the direction of the leading edge, starting from the wing root and moving in the direction of the wing tip. DO NOT tack the ORATEX® around the leading edge yet, nor to the trailing edge or wing tip. This sealing method is also applied to the rear two-thirds of the wing. Remember to hold your iron parallel to the main spar and move the iron in the direction of the trailing edge as you did in Fig. 7 to the leading edge. For best results always try to run your iron at least over 2 ribs at a time. This process helps to push excessive material and possible wrinkles out of the wing via the leading edge and trailing edge area. That's why you should NOT seal the ORATEX® around the leading and the trailing edge at this stage, as long as there are still wrinkles and excessive material on the wing panel. Having eliminated all of them, you seal the fabric around the leading edge, trailing edge and wing tip.

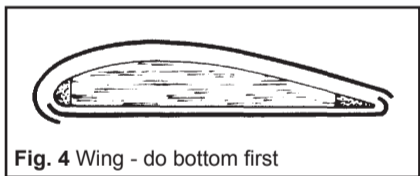


Fig. 4 Wing - do bottom first

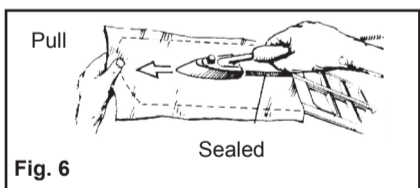


Fig. 6

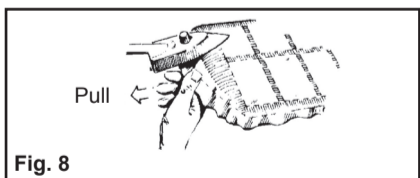


Fig. 8



Fig. 10a Final shrinking



Fig. 10b Complete bonding



Fig. 5 a

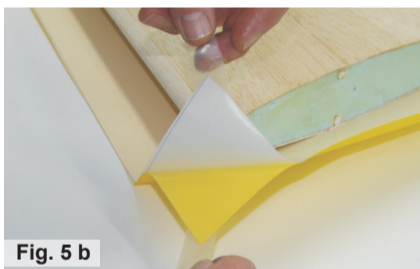


Fig. 5 b

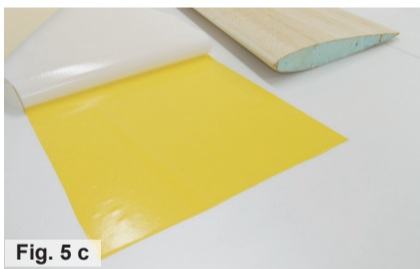


Fig. 5 c

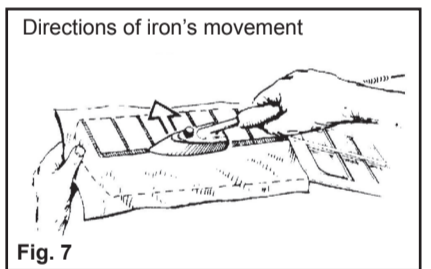


Fig. 7

5. COVERING SHEETED SURFACES - OPEN FRAMEWORK STRUCTURES (Fig. 9, 9a, 9b)

Repeat the procedure described for open framework wings above but with one exception: Set your covering iron to low (90 °C / 194 °F) sealing the ORATEX® from the centre, as we did in Fig. 6 and 13. Seal the entire surface with low heat, then again repeat the same procedure with middle range (130 °C / 266 °F) as in Fig. 9 and 9a. Keep your iron flat to the surface, so all of the ORATEX® is tightly bonded to the surface. For the second and final shrinkage you can also use the heat gun (ref. no. 08465 / 08470), see step 9b. In doing so, the fabric must be firmly pressed onto the surface with the ORATEX® felt blade (ref. no. 0915, 0948), see Fig. 9b.



Fig. 9 / 9a Gradually work around curves



Fig. 9a



Fig. 9b Final shrinking

5a. COVERING SHEETED SURFACES WITH STYRENE FOAM CORES (Fig. 9a, 9b)

Superheated steam is used in the production of polystyrene foam cores; so many foam wings often contain a relatively high level of residual moisture (Unfortunately, for cost reasons hardly any cores are being tempered to remove the moisture). At ordinary room temperature, a microclimate builds up inside the core retaining the moisture. That is the reason why moisture even after a long period of storage time hardly evaporates from foam cores. The heat applied during the covering process interferes with this balance, and the moisture begins to expand from the core towards the fabric and builds up pressure, while trying to evaporate. The fabric prevents the evaporation as it is airtight and the result are bubbles in the fabric, and the fabric separates fibres and grain from the wood due to the pressure in the bubble area. This creates permanent wrinkles as the wooden particles are blocking the adhesive of the fabric and a proper re-ironing of the fabric is no longer possible. To avoid this problem, we recommend you apply a thin layer of ORATEX® hotmelt adhesive (ref. no. 0965 / 0968 / 0966) as a moisture barrier and let it dry overnight. Note: it is important to apply a thin layer so that the solvent in the adhesive does not damage the foam core. Once this barrier has cured, you can cover the model. Set your T14 sealing iron (ref. no. 08420) to low (90 °C / 194 °F) sealing the ORATEX® from the centre, as we show in Fig. 6 and 13. Seal the entire surface with low heat; then again repeat the same procedure with medium heat (120 - 130 °C / 248 - 266 °F). Keep your T14 sealing iron (ref. no. 08420) flat on the surface, so all of the ORATEX® is tightly bonded to the surface. During this process the hot fabric has to be pressed down with the ORATEX® felt blade (ref. no. 0915 or ref. no. 0948) thoroughly. For the second and final shrinkage, you can also use our heat gun (ref. no. 08465 / 08470), see Fig. 9b. Applying the heat gun technique, the hot fabric has to be pressed to the structure with the felt blade thoroughly and try to eliminate any bubble or trapped air you find. Do not use too excessive heat, as you may cause damage to the foam core (Fig. 9a, 9b).

6. COVERING THE WING TIP (Fig. 11a, b, c, d)

If you have a difficult wing tip to cover, set the heat gun to a fairly high temperature (around 300 °C / 572 °F) so that the surface temperature will reach 150 - 200 °C / 302 - 392 °F. Pull and stretch the ORATEX® around the wing tip. While heating it with the heat gun, hold the material in place and seal it by pressing it down with the ORATEX® felt blade (ref. no. 0915 / ref. no. 0948) while it is hot (see Fig. 9b). During the cooling process of the ORATEX®, maintain the tension to allow the adhesive to grip. DO NOT attempt to eliminate all wrinkles at the same time (Fig. 11a, b, c, d). If you discover some deep wrinkles in the area of the wing tip, heat the ORATEX® up with the heat gun, lift off the affected area of the ORATEX® and remove the wrinkles by applying heat and stretching / shrinking the wrinkles out. The best way to do so is by applying heat from the heat gun, because the T14 sealing iron will not provide a properly heated area, but spot heat, where it touches the spherical surface, the rest of the surface is exposed to radiated heat only, which means that you have an uneven heat distribution in the fabric. When following the shrink and stretch process, you need an EVEN heat distribution in the surface. Note that ORATEX® can be ironed onto the structure and then heated to approx. 90 °C / 194 °F and removed without damage to the material as often as needed.



Fig. 11a-d Covering of the wing tip



Fig. 11b



Fig. 11c



Fig. 11d

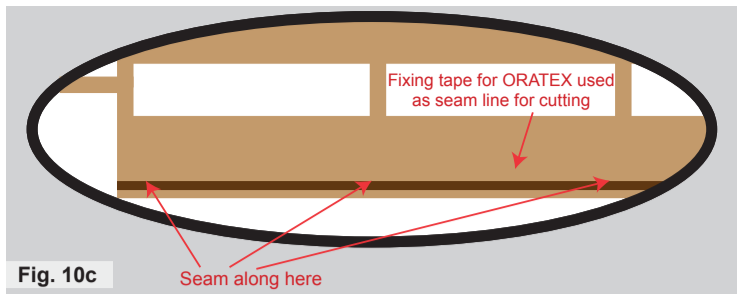


Fig. 10c

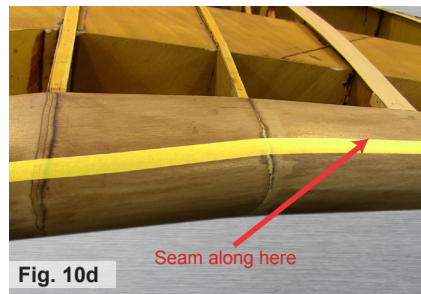


Fig. 10d

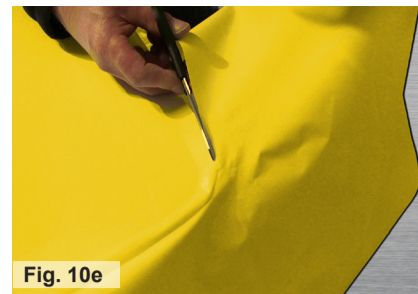


Fig. 10e



Fig. 10f



Fig. 12a For Inside corners, first slit 45°



Fig. 12b Fold and bond covering

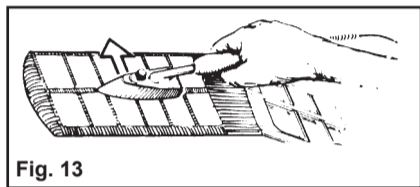


Fig. 13



Fig. 14



Fig. 15

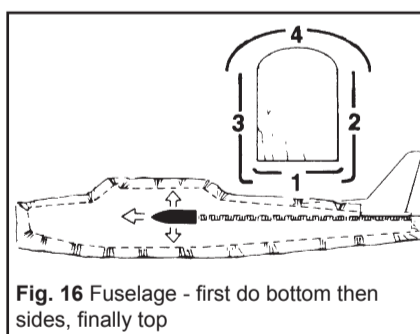


Fig. 16 Fuselage - first do bottom then sides, finally top



Fig. 19 Self-adhesive tape test

7. SEAL THE EDGES (Fig. 10a-f)

When you have completed covering the bottom of the wing and sealed the wing tip using a high temperature setting, trim the ORATEX® to about a ½ cm / 0.20 in overlap and seal the edges along the leading edge and trailing edge with the iron (Fig. 10a, 10b) - DO NOT shrink ORATEX® over the framework yet. The best way to do so is by sticking the fixing tape for ORATEX® (ref. no. 08258) along the bottom side of the wing with the according overlap implemented. Seam the fabric at the edge of the tape by 180 ° to mark a cutting line. Cut along this cutting line, remove the tape and seal the seams with the T14 sealing iron (ref. no. 08420).

8. WING UPPER SURFACE

To cover the upper surface of the wing, use the same procedure as used for the lower surface, except you must cut an overlap of approximately 25 cm / 9.84 in of the ORATEX® fabric around the wing tip area which you will need for holding and stretching around the wing tip. Note: Be sure to reduce the heat to low (90 °C / 194 °F) when you start working. For trimming the overlap, apply the fixing tape for ORATEX® (ref. no. 08258) technique again, allowing an overlap of at least 5 mm / 0.20 in as seen on the photos (see Fig 10 e, 10 f). Seam the excessive material along the tape and cut it off.

9. COMPLETING THE COVERING (Fig. 14, 15)

After the top and bottom have been sealed on the structure, it is time to uniformly shrink the material to the surface and tighten it. Set the iron to high range (150 °C / 302 °F). Use the same method you applied during sealing (Step 4). This reheats the adhesive to a higher temperature, providing a superior bond to the wood (see Fig. 14, 15). Experience shows that once you shrink the covering, some areas may not be securely attached. We therefore recommend, you repeat this procedure. If you use a heat gun or a covering iron, make sure that the fabric is pressed firmly onto the airframe surface. This allows the adhesive to formulate a permanent adhesion. Use the ORATEX® felt blade (ref. no. 0915 / 0948) to press the ORATEX® firmly onto the surface during this process (see Fig. 9a, 14, 15). If the ORATEX® is not bonded to the surface properly, wrinkles could appear, or in the worst case, the fabric could even loosen.

10. COVERING THE FUSELAGE (Fig. 16)

Cut the ORATEX® to the outline of the surface to be covered with about 1 cm / 0.39 in of overlap (see Fig. 16). Lay the ORATEX® on the surface. Using low range heat (90 °C / 194 °F), seal a centre strip down the length of the fuselage. Using the entire surface of the iron, work with gentle pressure from the centre strip outward as shown in Step 4 and 5 (see Fig. 16). Trim the excess overlap to approximately ½ cm / 0.20 in. Increase the iron heat to high (150 °C / 302 °F). Seal all edges at this time. Pass the iron over the entire fuselage as you did in Step 8 to eliminate all wrinkles. And don't forget to press the hot ORATEX® onto the structure with the ORATEX® felt blade (ref. no. 0915 / 0948).

11. HELPFUL HINTS

CAMBERED (CONCAVE) PROFILES (S-SHAPED SECTION): When covering wings with a concave lower surface, seal the ORATEX® effectively onto all wooden parts at 90 °C / 194 °F - without shrinking. Then shrink the open bay without heating the sealed parts. It may be useful to make a simple cardboard template, to protect the ribs when using a heat gun, to prevent the heat from penetrating into the sealed area of the rib and softening and activating the adhesive to a stage where it doesn't adhere but is liquid, allowing the fabric to lift off from the underlying surface (bad idea not to protect).

VENTILATION HOLES (PRESSURISATION): When covering open frame structured wings (sheeted or un-sheeted) as well as tailplanes and fins designed half-timbering (sheeted or un-sheeted), you must make sure to provide internal ventilation holes which allow the air exchange to the outside to compensate for pressure changes. If you haven't done it yet, drill holes of 1 - 2 mm / 0.039 - 0.078 in diameter through all ribs and webs. This allows hot air to exhaust out of the entire airframe during the covering process and allows the inside "to breathe", to compensate for temperature and pressure changes. If hot air is prevented from escaping from a wing or tailplane bay, it may expand under the covering locally while being heated up, and prevent proper shrinking causing wrinkles/slack areas after cooling.

FIRE WALL: Bond all edges around the fire wall with the T14 sealing iron (ref. no. 08420), to prevent oil seepage under the ORATEX®. Also coat the fire wall and the inside of the engine bay with the two-component paint ORACOLOR®, overlapping this proofer on to the ORATEX®, sealing all the joints in this area.

FOAM: At low range (90 °C / 194 °F) ORATEX® can be applied to polystyrene foam. Use a test piece of foam to get the right feel for the material. When reworking with the iron, is necessarily make sure the iron temperature does not exceed 95 °C / 203 °F as more heat may cause damage to the foam surface. To improve the direct adhesion of ORATEX® onto foam, we recommend to apply the ORACOVER® foam adhesive (ref. no. 0981) first. Let it dry overnight.

EPP (Expanded Polypropylene foam): To achieve a better bonding on rough and uneven surfaces, we recommend the application of a thin layer of ORACOVER® EPP Adhesive (ref. no. 0982, for outside the EU: Granulate to be dissolved in acetone ref. no. 0482 for 100ml self mixed ORACOVER® EPP adhesive). Let it dry overnight. You can apply the ORATEX® fabric the next day. When ironing and shrinking the fabric, make sure the temperature affecting the surface does not exceed 160 °C / 320 °F as more heat may damage the surface of the EPP.

PAINTING: ORATEX® can be painted easily. You will achieve best results using the ORACOLOR® paint system, which has a built-in everlasting flexibility by its formulation, without adding plasticisers. ORACOLOR® is available in the full range of ORATEX® and ORACOVER® colours. ORACOLOR® is a true two-component paint, after polymerisation it is fuel-proof and iron-proof, that means you can iron over the colour layer without damaging it. For adequate paint adhesion, clean the surface with ORATEX® degreaser (ref. no. 08245) before painting.

CLEANING: Any colour or adhesive left on your iron or smeared on your covering iron, can be removed with a clean rag while the iron is hot. Any further residue on the covering iron can be removed with ORATEX® special solvent for iron-on adhesive (ref. no. 0969 - 0972). Use this special solvent on your iron ONLY, when the iron is SWITCHED OFF, DISCONNECTED FROM SOCKET AND COLD! Do not switch the iron on with special solvent still on its surface! When working with special solvent make sure the room is aired properly, as the special solvent releases potentially explosive gases.

DECALS: Follow manufacturer's instructions on decal applications.

TRIMMING, DESIGNS, MARKINGS, ETC. (Fig. 17, 18): As ORATEX®'s special adhesive will not generate its own bubbles when applied over itself, ORATEX® can be used over ORATEX® for trimmings and markings, too. However, good workmanship is still required because if you are not careful, you can entrap air. Applied at low heat, ORATEX® will bond tightly to itself. For optimum coverage, a darker colour should go over a lighter one. Smaller designs should be positioned and tacked in place at the narrower end: Pull the design up at the opposite end and iron it down starting from the tacked end without trapping air (see Fig. 17). Larger designs (such as sunbursts) should be positioned and the narrowest end tacked in place. Then, working towards the wide end, iron the design down in an arrow shaped way (see Fig. 18). Pin striping, etc., can be made by cutting thin strips of ORATEX®. To apply multicoloured patterns onto a fuselage in open frame structure, or a wing (open framework structure), iron the single patterns on the backing paper on a flat table together. The iron should have a temperature not exceeding 90 °C / 194 °F. Allow for a 1,5 cm / 0.59 in overlap at the joints. Darker colours should always go over lighter colours, so that the edges of the dark colour do not show through the lighter one. Pay attention to an accurate position when ironing-on. When ironing the completed pattern on, do not heat the joints of the pattern too much - the heat could melt the adhesive and shrink the seams. If you use a heat gun, protect the joints from overheating using a cardboard template, if applicable.



Fig. 17

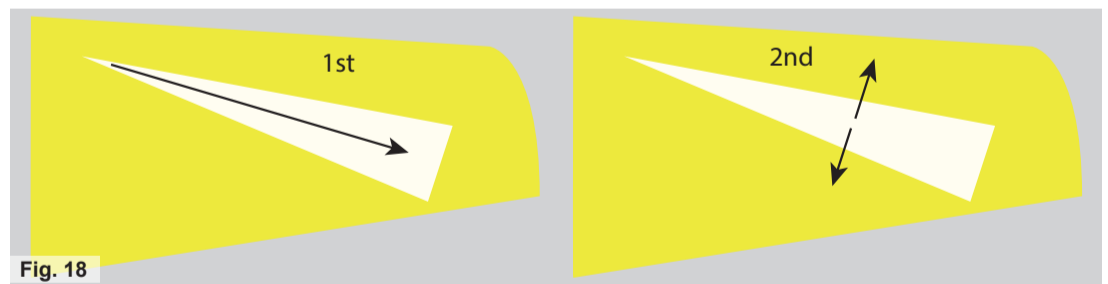


Fig. 18

PATCHING and REPAIRS: To enable the patch bonds well, be sure to remove all traces of engine oil, exhaust and grease. For a simple tear or puncture, cut a patch 2 cm / 0.79 in larger than the area to be repaired. With the iron set at low heat, apply the patch directly to the clean surface. Or for a neater repair, carefully cut out the entire bay and apply a new patch with a minimum of 1 cm / 0.39 in overlap. We recommend NOT to repair in the same colour. Cut a design from a different colour, shape it for repair and change the repair into an optical design upgrade. It surely makes you feel better about the repair.

HEAT GUN: ORATEX® will shrink to the surface using a heat gun and will appear to have covered it well, but it will not have bonded to the surface properly, if you have NOT pressed the hot fabric firmly onto the structure by means of the ORATEX® felt blade (ref. no. 0915 / 0948). If you are using a heat gun for final bonding, follow Fig. 9b and 15 for proper sealing. Use the heat gun to shrink the ORATEX® over open framework as in Fig. 9b. Over sheeted areas, heat the ORATEX® and press the hot ORATEX® fabric immediately with our ORATEX® felt blade (ref. no. 0915 / 0948) firmly onto the surface. This process presses the adhesive firmly into the wood and you achieve a firm adhearance. Pay attention to proceed only in small steps. In any case the result will justify the time you spent for this process.

WOOD and MOISTURE: Please be aware that wooden model structures absorb moisture and swell in warm, humid conditions and contract under cool and dry conditions. If you build and cover your model in humid conditions and the weather changes to cool and dry; the covering fabric tension will decrease, as the wood releases moisture and shrinks (baked apple effect). In this case you will have to re-iron the covering in order to remove sags or wrinkles.

CLEANING OF THE MODEL: For the best cleaning result of your model, we recommend the use of the ORATEX® cleaner (ref. no. 08200) for all covered and painted surfaces.

GLOSS AND PROTECTION: For the best gloss and protection of your model aircraft, we recommend to use the ORATEX® wax (ref., no. 08240) for all covered and painted surfaces. After having applied the wax you can clean your model with clear water. If you happen to have a lot of greasy exhaust fumes on your model you could use the ORATEX® Cleaner (ref. no. 08200) as well.

SELF-ADHESIVE TAPE TEST (Fig. 19): Glue a strip of self-adhesive tape onto the wood you want to cover with ORATEX®. Press the strip down thoroughly with the press roll (ref. no. 08150). Then pull the strip off. If the strip can be pulled off without a great resistance and the adhesive layer of the strip is covered with wooden particles and fibres, the wooden surface is NOT ready for covering. In this case the wooden surface has to be treated with the ORATEX® hotmelt adhesive (ref. no. 0965 / 0968 / 0966) to make it solid.

We would appreciate your comments and suggestions regarding ORATEX® and its applications.