

Description

This document describes the application and removal procedures for ORAFOL® films for aircraft applications, in particular ORAJET® 3967AC and ORACAL 970AC

ORAFOL offers a wide range of self-adhesive digital printing materials for many different applications. They come with a well-matched set of laminating films. To ensure that the films perform according to the specified properties, it is important to carefully follow the instructions for proper preparation and application.

Area of Use and Limitations

ORAJET® 3967AC and ORACAL 970AC are self-adhesive films intended to be used exclusively for short-term exterior graphic applications on aircrafts. The films are suitable for flat and slightly curved surfaces, with or without rivets.

For 3967AC, overlamination of digital prints will enhance the depth of the colour and provide protection against abrasion and UV exposure. ORAGUARD® 293AC is a lamination film specifically developed for use with ORAJET® 3967AC film.

The graphic films ORAJET 3967AC and ORACAL 970AC are recommended for the application on skins of the fuselage, vertical stabilizer and rudder except for any leading edges, areas of high temperature, areas of high abrasion, areas exposed to hydraulic fluids, openings, outlets etc.

The aircraft operator is responsible for determining if the installation of these self-adhesive Aircraft Films requires a regular approval from an institution authorized by the respective aviation authorities. Furthermore, the end user is responsible for determining the suitability of the product for the application.

Storage and Processing Conditions

The self-adhesive aircraft films from ORAFOL are supplied in rolls. Always store them either suspended (with end caps) or standing on end on the roll blocks. Never store them lying down (without end caps). Store and process the materials in cool, dry environments. Specifically, a relative air humidity between 40% and 50% and a temperature between +18° to +22° C (64° to 72° F) should be ensured. Direct sunlight, storage beside radiators etc. should be avoided at all times. Please refer to the individual storage instructions listed in the technical data sheet for each type of material.

Printing

Digital printing materials, including ORAJET® 3967AC, should be handled with a high degree of care. Cotton gloves should be used to prevent damage or soiling. The surface quality should be checked prior to printing and application, and the print file should be checked with profiling for each printer.

Due to differences in characteristics among the different ORAJET® digital printing media, the printing software and parameter settings also vary depending on your specific product. Make sure you take the correct amount of ink and specific colour definitions into account. Also, check the specifications of the digital printing materials and the inks for their respective applications and durability, and match them up accordingly.

Upon request, ORAFOL can provide information on recommended printers and ICC profiles.

Freshly printed films should be spread out in order to dry and to enable residual solvent to evaporate. Printed but not sufficiently dried films may shrink after application during the drying process and could lift at the material's edges and/or at corrugations and rivets. Laminating too early may (depending on the ink used) affect the functionality of the film (adhesive power, service life).

ORAFOL recommends that the printed panels be spread out (lying down or hanging) and dried for at least 72 hours.

Lamination

ORAGUARD® 293AC over-laminating film is specifically formulated for use with ORAJET® 3967AC Aircraft Film. Over-lamination has to be done stress-free to prevent a deformation of the film compound. Therefore it is recommended to ensure the temperature of the compactor is not higher than +30° C (86° F).

Required Tools and Materials

- Squeegee with felt edge (it is recommended to use a soft natural fibre-based felt type)
- Measuring tape
- Solvent cleaner: Isopropanol
- Clean cloths
- Knifeless Tape¹
- Snitty / snappy cutter¹
- Masking tape
- Rivet brush
- Edge sealer and paint brush

Application Temperatures

For specific application temperatures for the materials, please refer to the data sheet for your specific product. The optimum surface temperature ranges between +15° to 25° C (59° to 77° F). Avoid significant drops in temperature during the first 24 hours after adhesion.

Surface Preparation

Prior to applying the ORAFOL® self-adhesive film, clean the aircraft surface thoroughly with isopropanol and wipe it dry with a clean cloth. Improper cleaning, residual solvent or application to newly painted surfaces can result in air bubbles. Allow at least three weeks to elapse before applying the film to paint which has been air-dried or baked. Isopropanol is recommended as the cleaning agent as other agents may, under certain circumstances, damage the paint or reduce the adhesive strength of the film. Be sure to allow sufficient time for the solvent to evaporate after cleaning.

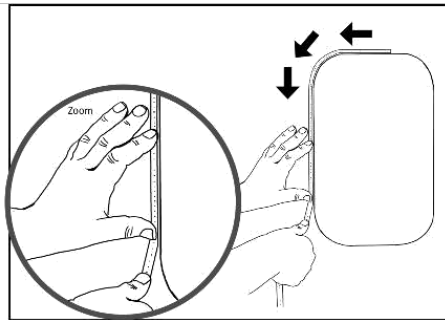
Application – General Information

Aircraft films are suitable for flat surfaces, or surfaces that are slightly curved in many places. This type of material should not be heated nor deep drawn into corrugations and joint laps. This may cause tension / stretching that result in material lift / delamination due to rapid temperature fluctuations during aircraft operation. **Do not cut or scratch the aircraft skin with any sharp tools!** To cut around windows, doors, access panels, lamps, substrate seams etc. apply Knifeless Tape before applying the graphic to define your cuts. Instead of a knife, the use of a snitty / snappy vinyl cutter is recommended.

¹ While there are many different names for these tools, we have used the most common brand names for ease of reference.

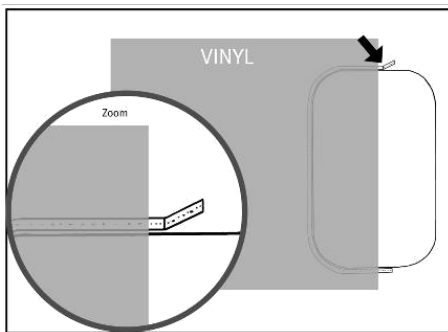
Film Cutting on Aircraft Bodies

Below is a brief overview of how to use Knifeless Tape for film cutting on aircraft bodies. For more specific application recommendations, please refer to the Knifeless Tape manufacturer or your supplier.



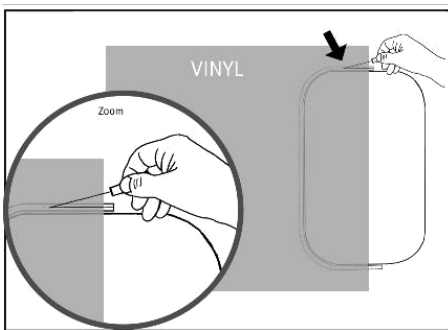
Cutting - Step 1

Adhere Knifeless Tape around the area you intend to cut out. Ensure that the Knifeless Tape overlaps the graphic by a few cm (about an inch or so).



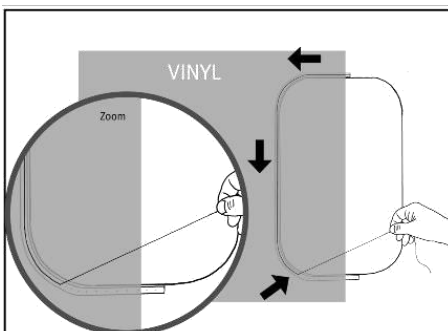
Cutting - Step 2

Apply the graphic onto the surface (over the Knifeless Tape). Use either Application Method 1 or 2 found in this document. Fold the tape over onto itself up to the end of the vinyl.



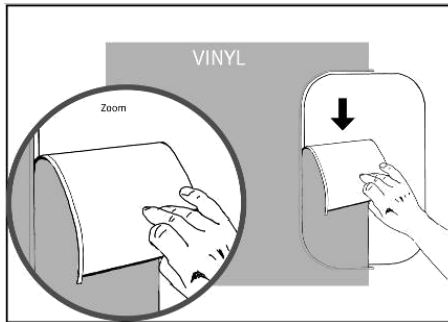
Cutting - Step 3

Carefully pull out the synthetic fibre filament from the Knifeless Tape.



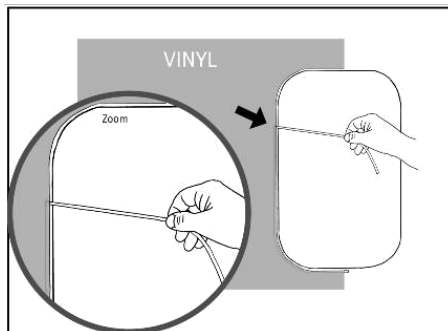
Cutting - Step 4

Cut the vinyl graphic by pulling the filament out along the length of the Knifeless Tape.



Cutting - Step 5

Remove the offcut.



Cutting - Step 6

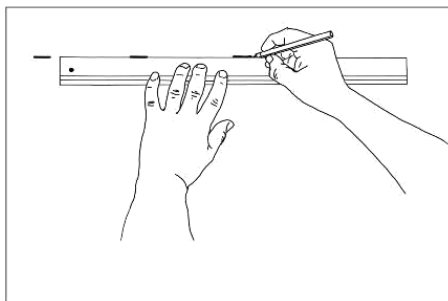
Carefully remove the remainder of the Knifeless Tape from beneath the graphic, and squeegee all edges.

Two Application Methods for Large Graphics

Although there are several methods for applying large graphics to aircraft, the two most commonly used methods are presented here. Which method to choose depends on the dimensions of the graphic as well as on personal preference.

When applying the film to curved surfaces, **always follow the profile**. In recesses, the material has to be worked in, cut and applied with an overlap at the edges. Over rivets, the film has to be worked down with a rivet brush.

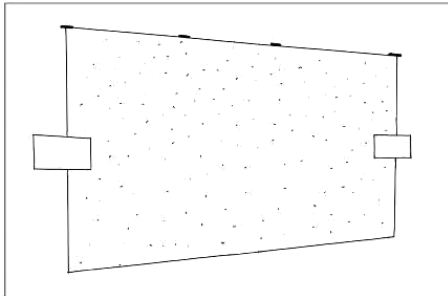
Never use a wet application method. Apply graphics only with dry application methods!



Regardless which application method is chosen, start by making registration marks on the surface to position the top or side edge of the graphic.

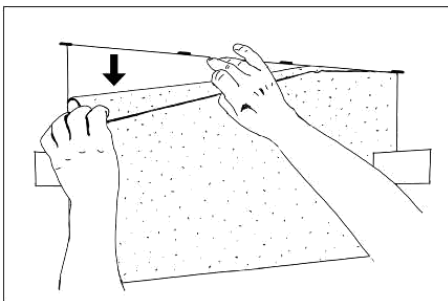
In order to avoid surface damage to the aircraft, be sure to use only markers that are specifically approved by the aircraft manufacturer for safe use on the skin of the aircraft.

Application: Method 1



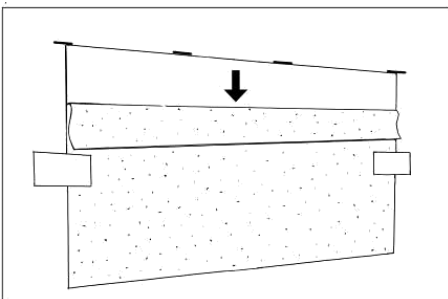
Application Method 1 – Step 1:

Position the graphic and affix the edges using strips of masking tape.



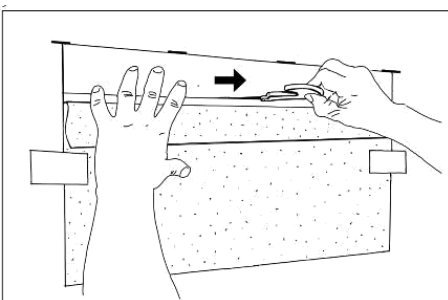
Application Method 1 – Step 2:

Peel the film away from the liner about 5 - 10 cm (2 - 4") from the top edge of the graphic.



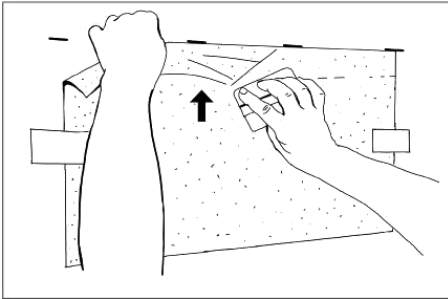
Application Method 1 – Step 3:

Fold over the film in the upper part of the graphic from the top and downwards.



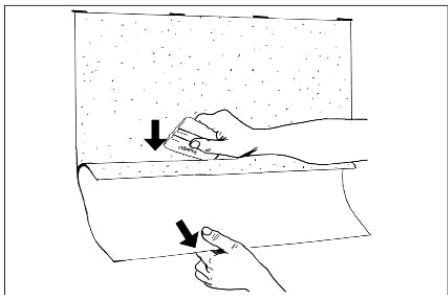
Application Method 1 – Step 4:

Cut off a strip of the exposed liner using a snitty / snappy vinyl cutter.



Application Method 1 – Step 5:

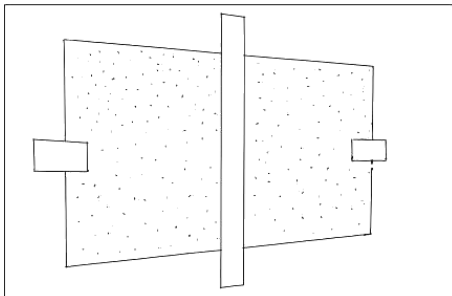
Fold back the graphic onto the aircraft surface, and tack it into place starting in one corner of the film. Adhere the full area of exposed adhesive by gently swiping the felt squeegee across the film.



Application Method 1 – Step 6:

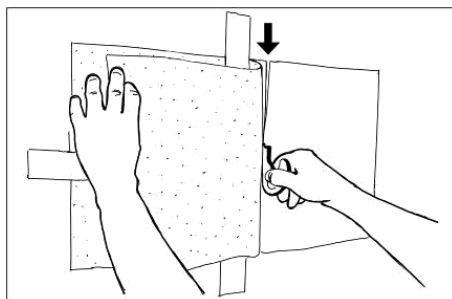
Remove the strips of masking Tape. Continue removing the liner gradually downwards and adhere the film by using the felt squeegee across the film in overlapping sweeps. Begin at the top centre and work your way down and out to each edge. Re-squeegee all edges of the graphic.

Application: Method 2



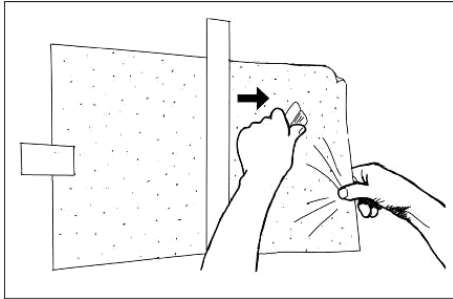
Application Method 2 – Step 1:

Position the graphic on the aircraft and affix the side edges with small strips of masking tape. Apply a vertical strip of masking tape down the centre of the graphic.



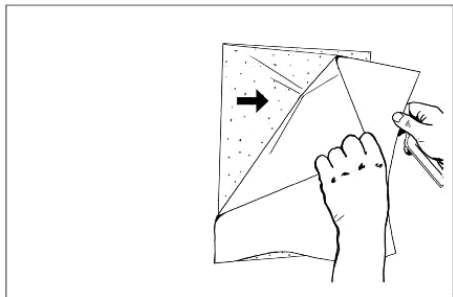
Application Method 2 – Step 2:

Peel back one half of the film from the liner and fold it back over the vertical strip of masking tape. Cut off the liner using a snitty / snappy cutter.



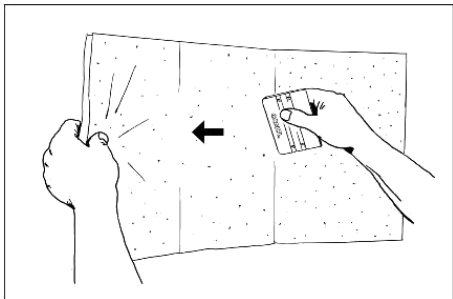
Application Method 2 – Step 3:

Fold back the graphic and adhere it by using the felt squeegee across the film in overlapping sweeps. Start from the centre and work the shortest distance to the edge.



Application Method 2 – Step 4:

Remove all the strips of masking tape, fold over the other side of the graphic and remove the rest of the liner.



Application Method 2 – Step 5:

Fold back the side with the exposed adhesive and squeegee the film down with overlapping sweeps.

Film Overlaps

To prevent any lifting of the film due to airflow and precipitation, it is important to avoid exposing leading edges. This is done by applying the graphics in the right order, and thereby creating the correct overlaps.

Install the graphics pieces starting at the upper rear of the aircraft. The following lower piece must overlap the upper one by about 5 mm (0.2"), but not more than 12 mm (0.47"). The correct order in which to apply large graphics with overlaps is illustrated in figures 1 and 2 below:

Figure 1

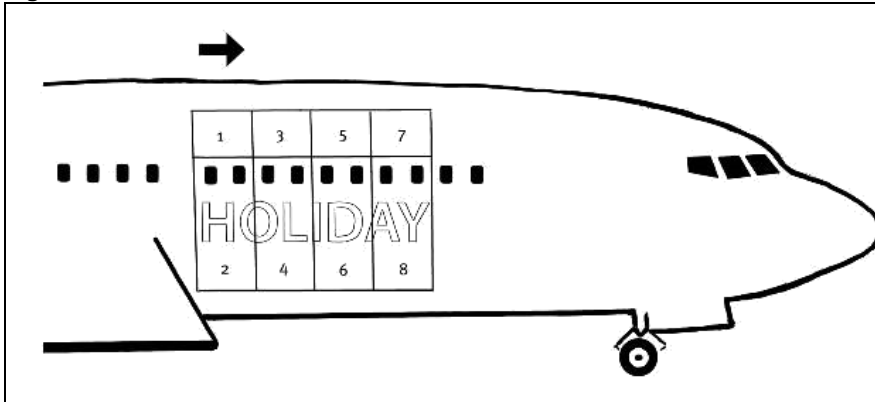
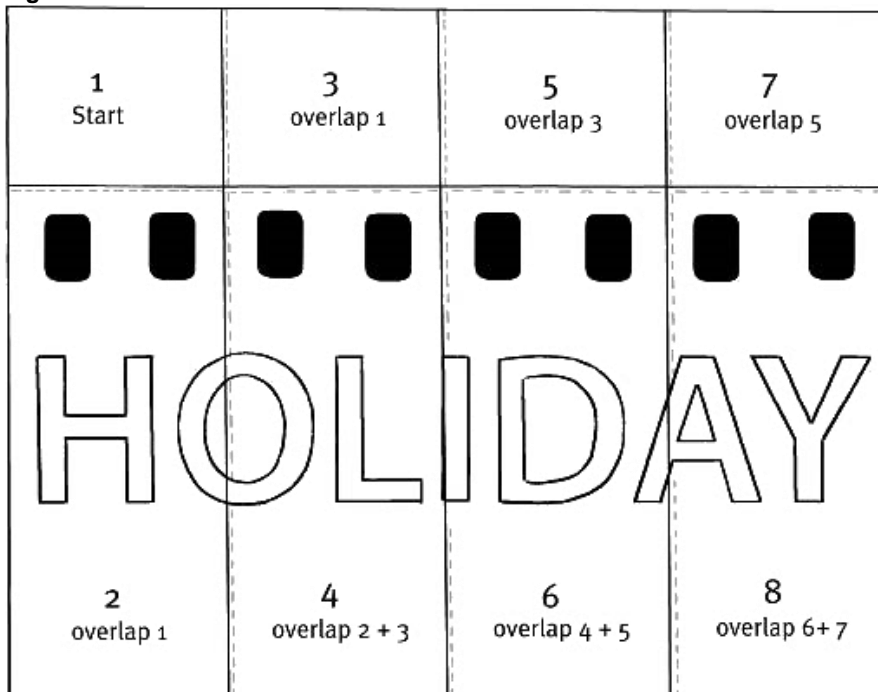
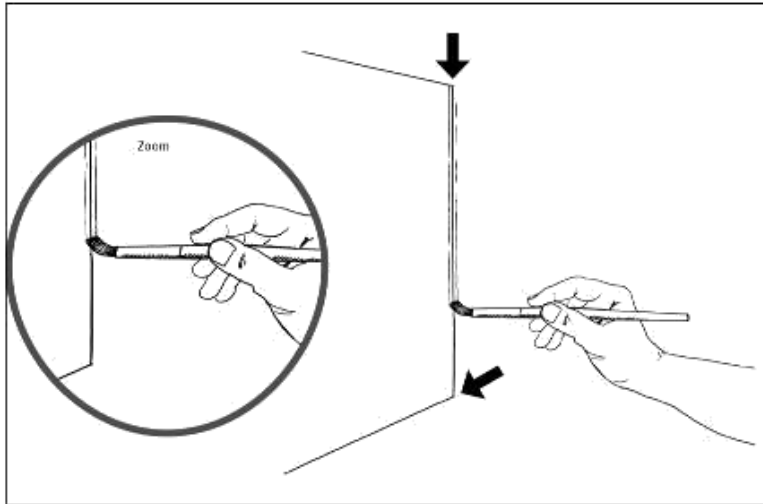


Figure 2



Edge Sealing

Edge sealing enhances the resistance against airflow and precipitation erosion and prevents lifting of the film. Therefore, all leading edges as well as any edges where graphics have been cut (doors, windows, access panels, lamps, etc.) must be sealed with an appropriate commercially available edge sealer.



Apply the edge sealer with a 1 cm (0.4") brush. Place the brush so that it covers both the aircraft surface and film equally. Move the brush along the edge in a continuous motion.

Double edge sealing improves the erosion resistance and is recommended for use over leading edges of the graphic at the conical section of the aircraft. This is where the heaviest strain and forces occur.

Curing Time

The aircraft should remain at the application temperature for at least 24 hours after application. After this time, the film has reached optimum adhesion to the substrate and the edge sealer will have fully cured.

Maintenance

ORAFOL recommends inspecting the graphics periodically and repairing any damage immediately. Remove frayed or lifted pieces and clean the surface. Smaller areas may be edge sealed again around exposed edges.

For larger damages, a replacement patch is recommended. Cut the patch between 5 – 10 mm (0.2 - 0.4") larger in each dimension and apply it with overlaps. Edge sealing of all edges is essential.

Cleaning

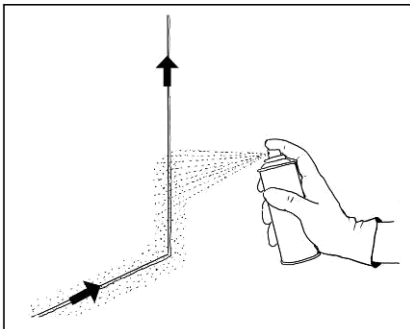
Use a mild wet cleaner that is recommended for high quality paintwork.

Do not use abrasives or cleaners containing strong acids or alkalis, aggressive solvents (such as acetone, methyl ethyl ketone, chlorinated solvents, paint stripper) to clean the graphics. Use of such agents may damage the film as well as the aircraft paintwork, and could reduce the service life of the film.

Removing ORAFOL® Aircraft Films

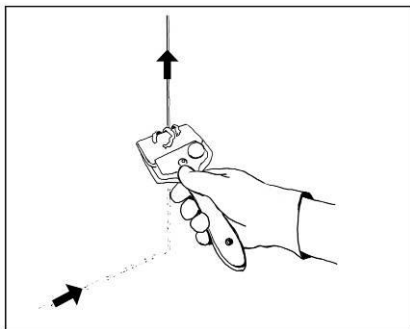
Before the films can be removed, ensure that the environment and surface temperature are least +10° C (50° F). Using a hard plastic scraper, begin by cautiously lifting one corner of the film. Proceed by slowly pulling the film from the surface at a 180° angle. Heating the film with a hot-air gun while pulling makes removal considerably easier. A small amount of residue from the adhesive may remain on the surface. This can be easily removed with isopropanol or a citrus-based industrial cleaner. After removing the graphics, residues of the edge sealer can in most cases be removed using LOCTITE® SF 7200 cleaner. **Note: It is the user's responsibility to first test any cleaners or solvents on an inconspicuous area to ensure that they do not damage paintwork!**

If the paintwork is resistant to LOCTITE® SF 7200 cleaner, the following procedure is recommended:



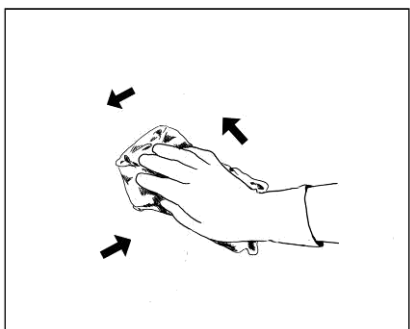
Removal – Step 1:

Spray the cleaning substrate onto the residues of the edge sealer and wait for a few seconds.



Removal – Step 2:

Use a hard plastic scraper to remove the remains of the edge sealer.



Removal – Step 3:

Wipe the surface clean using a cloth with isopropanol or household glass cleaner.

Warranty Information

In case of non-compliance with the Processing Guidelines, any warranty and liability shall be excluded. The service life of ORAFOL® Aircraft Films applied to aircraft is determined by the exact compliance with the Processing Guidelines. The processing (i.e. the application and removal) of ORAFOL® Aircraft Films shall only be done by trained specialists (i.e. by skilled and experienced advertising engineers or technicians). The trained experts are responsible for the quality of application, while the responsibility for compliance with maintenance and usage lies with the owner of the aircraft. The information provided in these Processing Guidelines is based exclusively on our current knowledge and experience. It constitutes neither a warranty of certain properties nor a quality or durability guarantee with regard to our ORAFOL® Aircraft films. ORAFOL is not responsible for costs incurred for the removal of the films.

Any warranty and liability shall be especially excluded in case of:

- paintwork that is not completely dry or completely cured at the time of application
- application of graphics on unsuitable surfaces
- surfaces that are not appropriately prepared
- use of ORAFOL® films in combination with films from other manufacturers
- use of products or product combinations that are not recommended for the intended application
- inappropriate or improper application by unskilled, improperly trained, or unprofessional staff
- film erosion at edges or lifting at edges

For further help regarding the application and removal of ORAFOL Aircraft films, please contact ORAFOL's Customer Support (contact details below).

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