

Exterior Aircraft Graphic Film A7322

For Screen Printing and UV Inkjet Printing

Product Bulletin

1. Product Description

A. Product Features

- 0.05 mm (2 mil), white vinyl film, available in perforated or non-perforated film
- Short-term, exterior durability
- Slideable, repositionable adhesive allows for easier installation
- Grey adhesive color provides good hiding power
- Designed for application on flat surfaces with and without flush rivets, and simple curved surfaces
- Adheres to properly cleaned aluminum that is bare, primed or painted
- Removable with heat, steam and/or chemicals
- Covered by the Specific Warranty for 3M™ Exterior Aircraft Graphic Films

2. Intended End Use

- Sold exclusively to qualified graphics manufacturers for the aircraft industry for exterior aircraft graphics
- Film A7322 is intended only for use with the Compatible Products listed on page 2.

A. Limitations of End Uses



WARNING

Serious product failure, such as the graphics lifting off the surface, can result if the product is used on surfaces for which it is not intended, or if it is improperly applied or maintained.

3M has identified certain limitations for graphic film A7322, which does not imply that all other applications are safe or will provide acceptable performance.

- This film is only for exterior aircraft graphics. However, the aircraft operator is responsible for determining if installing this product requires regulatory approval from the operator's authorizing agent or appropriate aviation authorities.
- This film is restricted for sale to properly trained users. The end user is responsible for determining the product's suitability for the end user's application.
- Do not use for any regulatory-required graphics.
- Do not use in applications that require conformance to Mil-P-38477A.
- Do not apply to aircraft windows.
- Do not use this film on these surfaces:
 - Areas exposed to severe abrasion
 - Within 16 inches (406 mm) of leading edges
 - Areas exposed to high operating temperatures
 - Interior surfaces
 - Surfaces exposed to leaking fluids, such as aviation hydraulic fluid
 - Covering seams, unless film is completely cut along seam
 - Hinges, locking mechanisms or other similar uneven surfaces
 - Extreme, sharply rounded or complex curves
- Do not apply film at less than 50°F (10°C). Film may not have sufficient adhesion at lower application temperatures. See **Application Characteristics**, page 3, and **Application**, page 6, for additional details.

3. Compatible Products

A. Screen Printing

Additional specific information about compatible products can be found in the Product and Instruction Bulletins listed in **3M Related Literature**, page 8.

- 3M™ Screen Printing Ink Series 1900 (Solvent based)
- 3M™ Screen Printing UV Ink Series 9800
- 3M™ Screen Print UV Gloss Clear 9740i
- 3M™ Screen Print Dirt Resistant Gloss Clear 1920DR
- 3M™ Screen Print Matte Clear 1930

B. UV Inkjet Printing

- 3M™ Piezo Inkjet Ink Series 2200UV for the EFI™ VUTEK® PV200 Printer
- 3M™ Piezo Inkjet Ink Series 2700UV for the Durst Rho 160R and 351R Printers
- 3M™ Piezo Inkjet Ink Series 2800UV for the EFI™ VUTEK® QS2000 QS3200, QS3220 and QS220 Printers
- EFI™ VUTEK® GS 3M™ Premium UV Inks for the EFI™ VUTEK® GS2000, GS3200 and GS3250 Printers
- EFI™ VUTEK® GSr 3M™ Premium UV Inks for the EFI™ VUTEK® GS3250r and GS5000r Printers

C. Other Products

- 3M™ Screen Print UV Gloss Clear 9740i
- 3M™ Edge Sealer 3950
- 3M™ Prespace Tape SCPS-2, SCPS-100, SCPS-53X
- 3M™ Premask Tape SCPM-3, SCPM-19, SCPM-44X

4. Characteristics

These are typical values for unprocessed product; processing may change the values.

A. Physical Characteristics

Characteristic	Value		
Film material	2 mil (0.05 mm) vinyl, white		
Film thickness	Gray, repositionable, pressure activated		
Adhesive	3 to 4 mil (0.08 to 0.10 mm)		
Liner	Polyethylene-coated paper with a clear film backing		
Tensile strength of non-perforated film	5 inch/pound at 73°F (22 N/25 mm at 23°C) <i>Perforations in the film may reduce this property</i>		
Chemical resistance <i>Unprinted film was applied to an aluminum substrate at 73°F (23°C) and conditioned at 73°F (23°C) for 24 hours.</i>	Chemical	Exposure Time	Results
	Water	8 hours at 73°F (23°C)	No effect
	Mil-L-7808 oil with Edge Sealer 3950	24 hours at 73°F (23°C)	Slight gloss loss; less than 1/8 inch (3 mm) edge attack; Edge sealer dissolves
	Jet A fuel	1 hour	Slight edge attack
	Aviation hydraulic fluid	1 hour	Film delaminates from panel; edge sealer dissolves

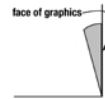
B. Application Characteristics

Characteristic	Value
Application surfaces	Can be applied to a raised bead riveted surface (maximum dimensions of rivets: 3/8 inch (9.5 mm) wide by 1/8 inch (3 mm) high) Some film tenting and erosion of clear coat may appear on raised, beaded rivets
Application substrates	Aluminum: bare, primed, or painted
Application temperature range	50° to 100°F (10° to 38°C) (air and substrate)
Applied shrinkage	0.015 inch (0.4 mm)
Adhesion, Typical <i>After 24 hours</i>	Aluminum: 4.6 pound/inch (20 N/25 mm)
	Primer: 5.3 pound/inch (23 N/25 mm)
	Paint: 4.3 pound/inch (19 N/25 mm)
Removal	Permanent film; see the techniques listed in Removal, page6

5. Definitions

A. Exposure Types

Vertical:



The face of the graphic is +/- 10° from vertical.

B. Finished Graphic

A graphic that has been applied to the intended substrate and is considered fully finished.

C. Graphic Construction

The products used to make a graphic, which may include film, graphic protection, ink, printer and application tape.

6. Warranty Information

A. Warranty Coverage Overview

Both the warranty coverage and durability for each graphic are based on the user(s) reading and following all applicable and current 3M Product and Instruction Bulletins. 3M will honor the **Warranty Period** stated in the Warranty Period Table in the version of this Product Bulletin that is current when the film was purchased.

B. Warranty Period

Subject to Stipulations set forth in Section C., below

Finished graphics constructed with the materials specified and used as recommended are eligible for the **Specific Warranty for 3M™ Exterior Aircraft Graphic Films**. See the terms of this warranty on page 6.

(1) Warranty Period Table for Finished Graphics in a Standard Vertical Exposure

Printing Method	Ink/Toner	Clear Coat	Warranty Period
Screen	Screen Printing Ink Series 1900	1920DR 1930	1.5 years
Screen	Screen Printing Ink Series 9800	9740i	1.5 years
UV Inkjet	Piezo Inkjet Ink Series 2200UV, 2700UV and 2800UV; and GS, GSr UV Inks	9740i	1.5 years

C. General Warranty Stipulations

(1) Hairline Cracks

These stipulations apply to graphics covered by the **Specific Warranty for 3M™ Exterior Aircraft Graphic Films**.

Hairline cracks may develop in the graphic within the Warranty Period. This does not affect the Warranty Period but may significantly increase the removal time. You may prefer to use 3M™ Aircraft Exterior Graphic Film VS7704 if the removal time is an issue.

(2) Abrasion and Loss of Gloss

Abrasion damage and loss of gloss are not covered by any 3M Warranty. This is considered normal wear and tear.

(3) Application to Aircraft Windows

3M does not support applications of this film to aircraft windows. 3M accepts no liability for damage if this film is used on window graphics.

(4) Graphics Made with Components Not Sold or Recommended by 3M

The 3M Warranty does not, under any circumstances, cover graphics made with inks, film, graphic protection, edge sealers and/or application tapes that are not sold or recommended by 3M.

The user is solely responsible for the graphic appearance, performance and durability of graphic constructions that include any non recommended or qualified products.

(5) Graphic Protection

Clear 1930 may haze, which is not warranted.

7. Factors that Affect Graphic Performance Life

The actual performance life of a graphic is affected by all of the following.

- Correct combination of 3M-recommended graphics products
- Proper UV curing (for UV inks and clears)
- Selection and preparation of the substrate
- Surface texture
- Application methods
- Angle and direction of sun exposure
- Environmental conditions
- Cleaning or maintenance method.

8. Graphics Manufacturing



To get the durability given in the Warranty Period, use the recommended combination of ink, clear coat and edge sealer. Carefully follow the processing directions.

Before using any equipment, always follow the manufacturers' instructions for safe operation.

A. Screen Printing

Film A7322 may be screen printed with the inks listed in Compatible Products on page 2. A clear coat is required. Check the appropriate Product and Instruction Bulletins referenced in the Related 3M Literature section on page 8 for the recommended processing and limitations of each ink.

B. Inkjet Printing

Film A7322 may be inkjet printed with the inks listed in the **Compatible Products** on page 2. A clear coat is required. Check the appropriate Product and Instruction Bulletins referenced in the **Related 3M Literature** section on page 8 for the recommended processing and limitations of each ink.

(1) Total Ink Coverage

280%: Maximum recommended total ink coverage when printed with 3M UV inkjet inks.

Do not exceed the recommended total ink coverage for the ink series used on this film.

Too high of a total physical ink amount on the film results in media characteristic changes, incomplete curing, and/or poor graphic performance. Refer to the Product & Instruction Bulletin for the ink system being used for additional details about total ink coverage.

(2) Cure graphics

Use the cure settings recommended by the printer manufacturer. Also review and consider the recommendations in the 3M Product-Instruction Bulletin for the ink and clear you are using, if one is published.

C. Cutting Methods

The following are common cutting methods for this film.

- Bandsawing
- Hot kiss
- Flat-bed electronic
- Guillotine
- Hand cut
- Cold and hot steel rule

D. Application Tapes

The type of 3M application tape to use depends on the type of graphic produced and which ink or clear coat was applied last.

- Use a prespace tape if the graphic has large amounts of the liner exposed.
- Use a premask tape if very little of the liner is exposed

Clear Coat	Prespacing Tape	Premasking Tape
None (unprinted film)	SCPS-2 SCPS-100*	SCPM-3 SCPM-19*
1920DR 1930	SCPS-2 SCPS-100*	SCPM-3 SCPM-19*
9740i	SCPS-53X	SCPM-44X

*Where available.

9. Application



WARNING

Film A7322 must be applied according to Instruction Bulletin 5.27. Improper application or maintenance may result in a serious product failure, including the graphics lifting off the surface.

- The film must be edge sealed to protect it from serious in-flight abrasion. Edge sealing also helps to reduce the attack of fluids on the film. Use edge sealer 3950.
- Do not apply the film if the air or surface temperature is higher than 100°F (38°C) or lower than 50°F (10°C).
- Because of its construction, this film will bridge when applied over seams. To prevent film failure, which may include cracking, erosion and/or lifting, use these techniques when you are bridging seams:
 - Cut completely along film that bridges seams.
 - Always re-squeegee the film around the cut edge.

In addition to other Bulletins specified in this document, the following Bulletins provide details that you may need to successfully apply a graphic.

10. Maintenance

Use a cleaner designed for high-quality painted surfaces. The cleaner must be wet, non-abrasive, without strong solvents, and have a pH value between 3 and 11 (neither strongly acidic nor strongly alkaline.)

11. Removal

This is a permanent film, but it may be possible to remove it using steam, heat and/or chemicals. 3M offers these products to assist in removal: 3M™ Graphic Remover System (where available), film remover 3M™ Controltac™ Film Remover R221 and 3M™ Controltac™ Adhesive Remover R231. Follow the procedures in Instruction Bulletin 5.27.

12. Shelf Life, Storage and Shipping

A. Shelf Life

Total shelf life: 3 years from the date of manufacture on the original box. If you do process the film, do so within 2 years and apply within 1 year. If you do not process the film, apply it within 3 years.

B. Storage Conditions

- 40° to 100°F (4° to 38°C)
- Out of sunlight
- Clean dry area
- Original container
- Bring the film to print room temperature before using

C. Shipping Finished Graphics

Flat, or rolled printed side out on 6 inch (15 cm) or larger core. This helps prevent the application tape, if used, from popping off.

13. Health and Safety



When handling any chemical products, read the manufacturers' container labels and the Material Safety Data Sheets (MSDS) for important health, safety and environmental information. To obtain MSDS sheets for 3M products go to 3M.com/MSDS, or by mail or in case of an emergency with any equipment, call your local Technical Service and always follow the manufacturers' instructions for safe operation.

14. Specific Warranty for 3M™ Exterior Aircraft Graphic Films

A. Warranty Coverage

(1) To Whom the Warranty Is Made

3M exterior aircraft graphic films are covered only by this warranty in this Product Bulletin. Do not refer to 3M Commercial Graphics Warranty brochure.

Individual Product Limited Warranty

3M warrants to the Purchaser and End User the compatibility and performance of the 3M graphic products recommended in this Bulletin and used in the manufacture of the finished graphics when they are processed and applied according to applicable 3M Instruction Bulletins.

Finished Graphic Limited Warranty

3M further warrants to the End User that when graphics are made using exclusively 3M graphics products recommended in the Bulletin, 3M will honor all warranties extended to the Distributor or Graphics Manufacturer who sold or produced the graphics as described in the applicable 3M Product and Instruction Bulletins in effect at the time of the product purchase.

This warranty shall be forfeited if the graphics manufacturer substitutes materials not of 3M manufacture or makes unauthorized alterations to 3M materials. Problems that may be reasonably attributed to such actions are not covered by the 3M Warranty.

(2) Defect Coverage

Product Defect Coverage

- Manufacturing Defects. Visual and adhesive defects.
- Physical Defects. Defects incurred during manufacturing, packaging or shipment.
- Graphic Production Defects. Problems in printing, such as artifacts and misprints, clear coating and drying, or premasking.
- Cutting Defects. Clean cutting and weeding characteristics when cut as recommended in the applicable Product Bulletin.
- Premature Failure. Failure due to fading, discoloration, crazing, peeling, blistering, excessive dimensional change beyond normal wear and tear.

Finished Graphic Appearance Defect Coverage

Graphics manufactured using 3M Commercial Graphics products are warranted to retain acceptable appearance for their intended use for the Warranty Period stated on page 3 when viewed from normal viewing distance. As graphics age and are subjected to natural weathering, there can be a gradual reduction in gloss, slight color changes, a slight amount of lifting at edges or around rivets, a slight amount of leading edge erosion and, ultimately, development of a minor amount of cracking which will not materially detract from appearance. These changes are not evidence of a failure, but are normal consequences of weathering and are not covered by warranty.

(3) Use of Defect Product

It shall be the graphic manufacturer's responsibility to immediately cease using what is perceived to be defective product.

B. Limited Remedy

UPON TIMELY NOTIFICATION AND 3M'S CONFIRMATION OF A VALID WARRANTY, 3M'S SOLE RESPONSIBILITY, AND PURCHASER AND USER'S EXCLUSIVE REMEDY, SHALL BE AT 3M'S OPTION EITHER (1) FULL REFUND OF THE PURCHASE PRICE, OR (2) FULL REPLACEMENT OF ALL 3M PRODUCTS CONSUMED IN THE MANUFACTURE OF THE GRAPHICS.

C. Limitation on Warranty Coverage: Misuse and Force Majeure

3M has no obligations under this warranty with respect to products that have been modified or damaged through misuse, abuse, accident, neglect or mishandling by Purchaser or Purchasers' customer. For example, graphics are not warranted against ink or clear coat damage or removal, base film damage, corrosion, swelling or lifting, or staining caused by chemical or physical means such as, but not limited to, vandalism (such as slashing, deliberate peeling of graphic, penetration by sharp object, gunfire), cleaning solutions, paints, solvents, other strong chemicals, improperly used high pressure washing equipment, mechanical washing equipment which might subject the graphics to frequent, vigorous abrasive scouring action, spills of engine fuels, engine exhaust, steam, organic solvents or other spilled chemicals. Graphics applied to unsound surfaces or to surfaces which subsequently crack, peel, delaminate, outgas, or become damaged beneath the graphics are not warranted for performance. Damage from fire, structural failure, lightning, and other force majeure events are not covered.

15. Disclaimer of Warranty and Important Notice

3M MAKES NO FURTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR IMPLIED WARRANTY ARISING OUT OF A COURSE OF DEALING, CUSTOM, OR USAGE OF TRADE. User is a sophisticated purchaser and responsible for determining whether the 3M product is fit for its particular purpose and suitable for user's method of application. Many factors can affect the use and performance of this 3M product in a particular application. The materials to which the product will be adhered, the surface preparation of those materials, the product selected for use, the conditions in which the product is used, and the time and environmental conditions in which the product is expected to perform are among the many factors that can affect the use and performance of a 3M product. Given these variety of factors, many of which are uniquely within the user's knowledge and control, it is essential that the user evaluate the 3M product to determine whether it is fit for a particular purpose and suitable for the user's method of application.

16. Limitation of Liability

Except where prohibited by law, 3M SHALL NOT UNDER ANY CIRCUMSTANCES BE LIABLE TO PURCHASER OR USER FOR ANY DIRECT (EXCEPT FOR THE LIMITED REMEDY PROVIDED ABOVE), INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS, REVENUE, BUSINESS, OPPORTUNITY, OR GOODWILL) RESULTING FROM OR IN ANY WAY RELATED TO SELLER'S PRODUCTS, SERVICES OR THIS BULLETIN. This limitation of liability applies regardless of the legal or equitable theory under which such losses or damages are sought including breach of contract, breach of warranty, negligence, strict liability, or any other legal or equitable theory.



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