



Gillpatch™ Cargo Liner Repair Systems

January 2006

The M. C. Gill Corp. offers a family of cargo liner repair systems designed for the permanent repair of damaged liners in commercial transport aircraft. Each patch system is designed to repair liners of specific types and in specific locations, and within defined extents of damage.

Gillpatch repair systems, and their applications, are described in the following data sheets.

Gillpatch III

Description

Gillpatch III meets the most demanding requirements for the repair of cargo liner laminates in compartment classes B, C, and E, as described in FAR 25.857, since it provides burn-through protection required for Class C compartments.

Gillpatch III is a peel-and-stick patch which provides rapid repairs to damaged liners. It offers improved flexibility over Gillpatch II, superior impact strength, and can be used on flat and curved surfaces as a permanent repair. It meets all of the requirements of FAR 25.855, and is approved by the FAA for repairs to the common types of cargo liner laminates found in all transport aircraft.

Gillpatch III restores the impact resistance of liners up to .070" thickness, in addition to restoring flammability properties, making it a truly permanent repair system, unlike other repair patches which restore only flammability properties.

Applications

Designed as a repair patch for holes and tears in all cargo compartment liner laminates and damage to cargo containers. It is, also, used in cargo areas where added reinforcement is desired (e.g., lower sidewall attachment points, ceilings, floors).

Gillpatch III is approved by the FAA for use as a permanent repair patch for cargo liner laminates with facings of Tedlar®, phenolic, polyester, and epoxy resin systems when applied according to the instructions, shown below.

It is approved for repair of damage of Airbus cargo liner sandwich panel sidewalls according to Airbus Service Information Letter (SIL) 25-097 and Airbus AMM 25-00-00. (These repair instructions must be carefully followed to provide the necessary protection to sandwich panel liners.) In Airbus aircraft, Gillpatch III may be used to repair ceiling panel liners with damage only on the visible face, that is, damage must not penetrate both liner faces. For ceiling panel damage in which both faces have been penetrated, Gillpatch III With Rivets must be used.

Features

- Self-sticking adhesive with easy peel backing paper, making damage repair possible in seconds.
- Not affected by normal temperature variations.

Specifications

- Meets requirements of FAR 25.855
- FAR Part 25, Appendix F, Parts I (flammability) and III (flame penetration requirement).
- Airbus Individual Product Specification IPS 08-07-001-01; Qualified on the Basis of AIMS 08-07-000, AIMS 08-07-001, and ABS 5665A.
- M. C. Gill Corp. Airline Instruction Manual MCG-AIM-2001 for Airbus Aircraft.



Construction

Facings: Fiberglass reinforced phenolic laminate with a protective intumescent fire barrier on the front side.
Top surface: 1 mil Tedlar® overlay.
Adhesive: .010" pressure sensitive (back side).

Shelf Life

3 years from date of manufacture

Availability

Patch sizes of 5" X 5", 8" X 8", and 12" X 12" are available in kits of 10 each.

A kit assortment containing 4 each of 5" X 5", 8" X 8", and two each of 12" X 12" patches is available, also.

Sheet stock: up to 4' X 12'.

Standard Tolerances

Length & Width: ± .125"

Thickness: 0.058" – 0.082", including pressure sensitive adhesive and release paper.

Alternative Gill Products

Product Number	Difference
Gillpatch III With Rivets	Approved by Airbus to repair ceiling liner panels in which both faces have been penetrated ("through damage").
Gillpatch 1367P System	Gillpatch™ 1367P System is a low smoke and toxicity, fiberglass reinforced phenolic laminate patch for repair of limited damage to cargo liner sandwich panels in Airbus aircraft – refer to specific Airbus AMM for application and limitations. In other aircraft, Gillpatch 1367P may, also, be used to repair damaged laminate liner sidewalls in cargo compartment classes A, B, and E as defined by FAR 25.857.
Gillpatch 6006	Fiberglass reinforced polyester laminate with a pressure sensitive adhesive on the back side. Thinner, lighter and lower cost. Approved for use only in Classes B and E cargo compartments as defined in FAR 25.857.
Gillpatch 6160	Gillpatch II Made obsolete by Gillpatch III. Original peel and stick patch meeting FAR Part 25, Appendix F, Part I and Part III (burn-through). Thicker, heavier and less flexible than Gillpatch III. No longer available.
Gillpatch 6167	Made obsolete by Gillpatch II. Fiberglass reinforced phenolic patch installed using monel rivets. Expensive, labor intensive to install.



Typical of Properties of Gillpatch III

Property	Test Method	Typical Measurement
Weight, psf (kg/m ²)	GTP 085	0.72 (3.52)
Flammability	12 sec. Vertical Extinguishing Time, secs. Burn Length, in (mm.) Drip Time, Secs.	0 0.12 (3) (0)
	60 sec. Vertical Extinguishing Time, secs. Burn Length, in (mm.) Drip Time, Secs	0 0.19 (4.8) 0
	45 Degree Test Extinguishing Time, secs. Flame Penetration After Glow Time, secs.	0 None 0
	Oil Burner Burn-Through Flame Penetration Temperature Rise, max., °F (°C)	FAR Part, 25 Appendix F, Part III None 226 (108)
	Impact resistance, ft.-lbs. (N-m)	Boeing, BSS 7326, minimum, ft.-lbs

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How to Install GILLPATCH® III (Product Specification, M.C. Gill Corporation GPS 6306)

1. IMPORTANT -- READ THIS INSTRUCTION SHEET BEFORE PROCEEDING

First, decide if the damage can be patched. If not, the cargo liner must be replaced. The patch ***must*** extend at least 2 inches ***beyond all*** sides of a puncture. Straight tears of any length can be repaired, but the damage must not be closer than 3 inches from any seam, screws, or trim strips; and the patch must extend at least 3 inches from all edges of the damage. The margin for L-shaped tears can be 2 inches, and a single square or rectangular patch must be used to cover this type of damage.

Pay careful attention to the following description of allowed, repairable damages:

1. Holes

Impact damage in cargo liner up to 0.070 inches thick, (approximately 1/16 inch). The damage is a punctured opening in which there is no supporting cargo liner surrounding the damage. The minimum size patch for this type of repair is 5 inches x 5 inches (or 5 inches diameter) to keep a 2 inch margin of patch from the edge of the damage.

2. Straight Tears

Straight tears which are no closer than 3 inches to a seam, trim strip, or mounting screw can be covered with a single length of Gillpatch III at least 6 inches wide. Make sure that the patch adheres to the liner on both sides of the tear.

3. L-Shaped Tears

L-shaped tears of up to 12 inches long by 8 inches wide must be covered by a single patch 16 inches long by 12 inches wide, to maintain a minimum 2 inch margin from the edge of the damage. Make sure that the patch repair for any type of damage does not cover a seam, mounting screw, or trim strip -- it must be flat and follow the contours of the liner.

Cutting the Patch:

Gillpatch III sheet material can be cut by hand with suitable heavy shears, or a shearing machine such as used for cutting metal sheets. A ***sharp*** knife or razor cutter can be used, also, as long as the edges of the patch are not delaminated or torn, or surface material is lost. Do ***not*** use a saw or abrasive wheel for trimming because these will damage the patch material and pressure sensitive adhesive along the edges.

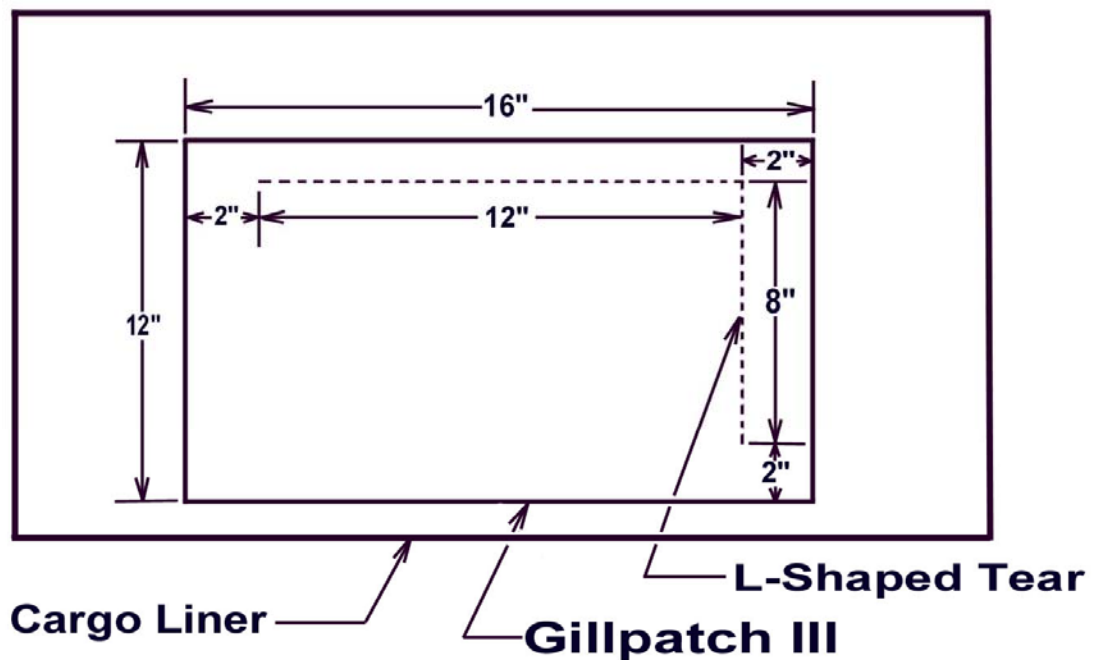
TO APPLY THE PATCH:

1. Use a lint-free, clean, dry cloth and a commercially available oil-free cleaner such as ethanol, methyl ethyl ketone, isopropanol, acetone, or Windex® to remove any oil, grease, dirt, or moisture from the damaged area to be patched. Make sure the area is clean and dry before applying the patch. Also, be sure to completely wipe off any cleaner remaining on the surface. **It is not necessary to remove any Tedlar® surface. The patch can be applied directly to Tedlar.**
2. After the damaged area is clean and dry, and any film residue has been wiped off, peel the tan backing off the patch. Handle the patch very carefully at this point because the adhesive is very tacky and will adhere very aggressively to any surface it contacts. ***Do not remove the protective backing from the pressure sensitive adhesive on the back of the patch until you are ready to apply the patch.***



- Center the adhesive side of the patch over the damaged area. Using your hand, apply an even circular rubbing pressure over the entire surface of the patch, including the exposed edges. Make sure the patch is completely adhered to the cargo liner it covers. **The patch must be stuck firmly in place and extend 2 inches beyond all sides of the tear or puncture.** See diagram, below:

Gillpatch III Repair Patch Over Large, L-Shaped Tear





November 2005

Gillpatch™ III – With Rivets Cargo Liner Repair System
For the Repair of Overhead Cargo Compartment Liner Panels in Airbus Aircraft

Installation Instructions

1. Introduction

Gillpatch III With Rivets may be applied as a permanent repair patch on overhead liner panels in Airbus aircraft without removing or drilling through the panel, thus avoiding damage to components behind the panel. The patch can be installed rapidly using tools commonly available at aircraft repair facilities.

Gillpatch III (without rivets) is approved by the FAA for the repair of laminated cargo liners for cargo compartment classes B, C, and E (according to FAR 25.857). For Airbus aircraft, however, the patches must be attached with rivets in addition to the pressure sensitive adhesive for repairs to sandwich panel liners having through damage (both faces penetrated) in the overhead position) to ensure compliance with burn-through requirements of FAR Part 25, Appendix F, Part III. (Gillpatch III may be used to repair through damage in panel liner sidewall positions without the addition of rivets.) The rivets provide additional fastening points to hold the repair patch in position during the movement of the facings of the sandwich panel when intense flame is applied. The installation instructions must be followed carefully, and only the rivets specified below may be used for the installation; the rivets are of stainless steel construction, and the length is such that only the visible facing of the panel is penetrated by the rivet. This procedure may be used to provide a permanent repair to sandwich panels with one-side or through damage, in the ceiling as well as the sidewall positions.

2. Extent of Repairable Damage

For through damage (penetration of both panel faces), the maximum hole size is 150 mm L X 150 mm W; for damage larger than this, the liner panel must be replaced, as specified in the Airbus Aircraft Maintenance Manual, 25-00-00. Through damage of the ceiling panel requires that only riveted Gillpatch III With Rivets may be used to repair the panel.

2.1. Patch Size and Assessment of Damage:

The maximum, allowable through damage in the overhead location is 150 mm (6 ins.), and the edges of the repair patch must extend at least 38 mm (1.5 ins.) beyond the edge of the damaged area. For example, the smallest patch which may be used for a 51 mm (2 in.) hole is 127 mm (5 ins.); the patch must be carefully centered over the damaged area.

3. Gillpatch III With Rivets

Gillpatch III With Rivets has the rivet holes pre-drilled, eliminating a drilling step in repair patch preparation, reducing the time of installation. The pre-drilled patches are available in sizes of 5" X 5", 8" X 8", and 12" X 12" (other sizes may be fabricated from undrilled patch stock, but the patches must be drilled before application, increasing the repair time and complexity; instructions for fabricating these patches are shown following this section).



The riveted patches are applied to the liner without having to remove the panel from the aircraft structure; the repair is made from the visible side, and requires drilling only through the visible facing, thereby eliminating the possibility of damage to components behind the liner panel.

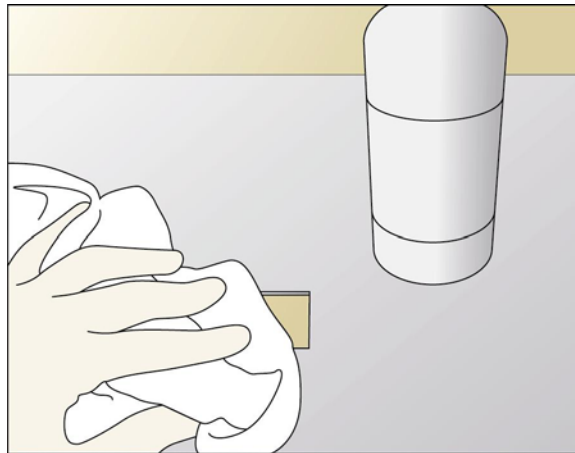
The installation procedure for Gillpatch III With Rivets is shown below.

4. Cargo Liner Repair Procedures for Gillpatch III With Rivets

Remember, use the appropriately sized patch – the edges of the patch must extend at least 38 mm (1.5 ins) beyond the edge of the damaged area.

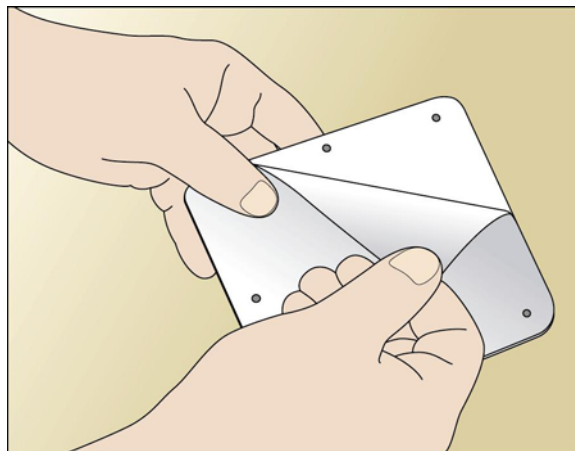
- 4.1. Clean the surface of the panel to be repaired in the area of the damage; make sure to follow the limits of damage and distance from patch edge to the damage described in the Airbus Aircraft Maintenance Manual (AMM). Use a suitable solvent to remove any grease, oil, or other contamination from the liner surface. Recommended solvents are acetone (propanone), MEK (methyl ethyl ketone), ethanol (ethyl alcohol), or isopropanol (isopropyl alcohol). See Figure 1.

Figure 1 – Cleaning Damaged Liner Panel



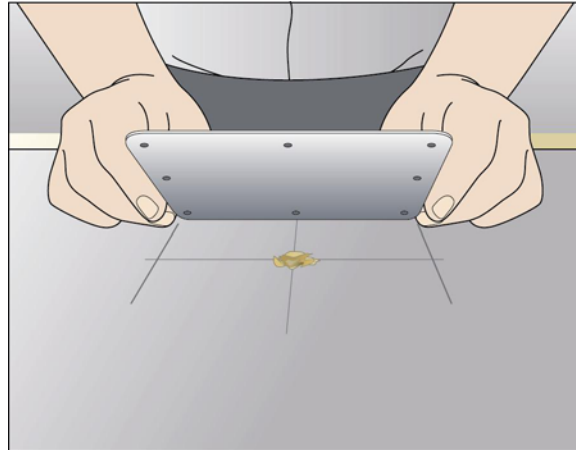
- 4.2 Carefully remove the release paper from the back of the repair patch to expose the pressure sensitive adhesive; this adhesive is very aggressive, and will hold the patch in place for use as the template for drilling holes in the liner panel. Be careful not to touch the adhesive or allow dust or dirt to settle on the adhesive once it is exposed. See Figure 2.

Figure 2 - Peeling Release Paper Backing



- 4.3 Bond the Gillpatch III in place over the damaged area such that there is a minimum of 38 mm. (1 1/2") from the edge of the damage to the edge of the patch, as required by the Airbus repair method. Press the patch firmly in place to ensure adequate adhesion. See Figure 3.

Figure 3 – Apply Patch Over Damaged Area



- 4.4 With the patch as a template, the panel is now ready to be drilled to accept the rivets. It is strongly recommended that a stop collar be used on the drill bit to prevent inadvertent drilling through the back of the panel, possibly damaging equipment or fixtures behind the panel. With a drill bit of 3 or 3.1 mm. (0.118 – 0.122 ins) diameter, place a stop collar on the bit as shown in Figure 4A, and adjust it so the maximum drilling depth is limited to 6.4 mm. (1/4 in). Check the drill bit length below the stop collar as shown in Figure 4B.

Figure 4A – Setting Drill Stop Collar

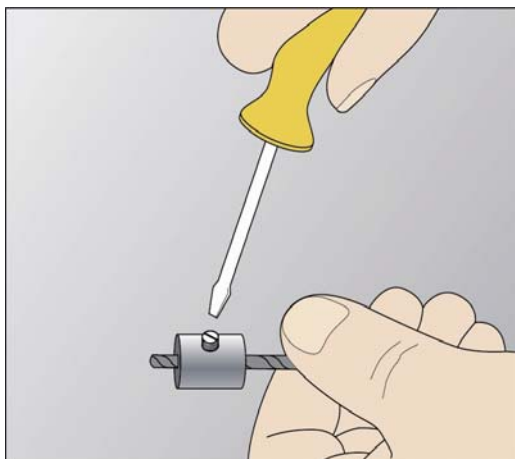
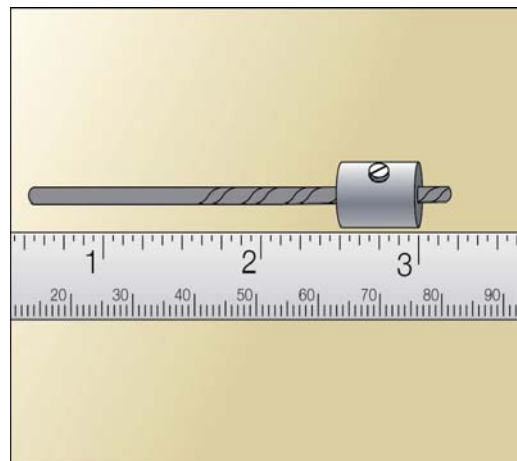


Figure 4B – Checking Drill Bit Depth



- 4.5 Carefully drill 8 holes in the damaged liner panel, using the attached patch as a template. Use a drill bit of 3 mm. (0.118”) or 3.1 mm. (0.122”) diameter, and be careful not to cause the holes to become oversized by drilling at an angle or wobbling the drill. The holes are slightly smaller than the diameter of the rivet, but this will ensure adequate pull-out resistance of the rivet after the flange is formed on the inside of the panel facing. See Figure 5.

Figure 5 – Drilling Holes in Liner Panel



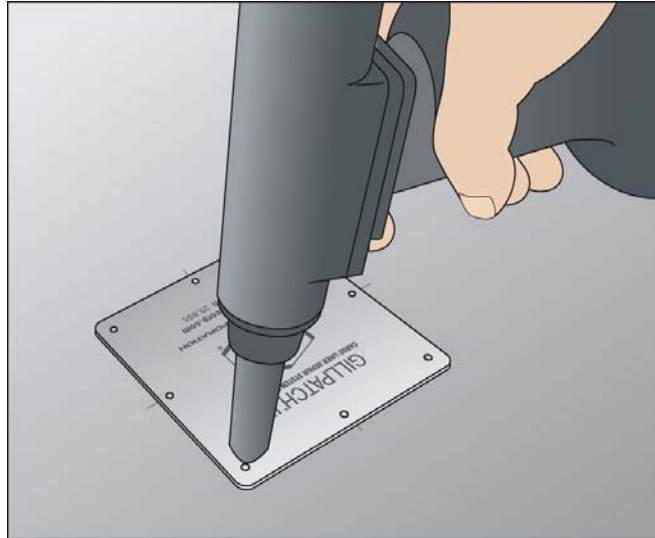
- 4.6 Use only a stainless steel rivet available from the M. C. Gill Corp. Part No. TR802, shown in Figure 6. The rivet diameter is 3.18 mm. (1/8”), and will fit tightly into the holes drilled in the liner panel.

Figure 6 – Rivet, M. C. Gill Corp. Part No. TR802



- 4.7 Install 8 rivets in the pre-drilled holes around the edges of the repair patch using a rivet gun such as Cherry Model G784; alternate rivet guns may be used provided they can accommodate the 3.18 mm. diameter rivet with a 31.8 mm. (1 ¼”) shaft length. The rivet gun will cause the formation of a flange on the underside of the facing, resulting in strong attachment points, while, at the same time, shear off the shank flush with the face of the rivet. See Figure 7.

Figure 7 – Installation of Rivets



- 4.8 The finished repair patch installation is shown in Figure 8.

Figure 8 – Installed Gillpatch III with Rivets



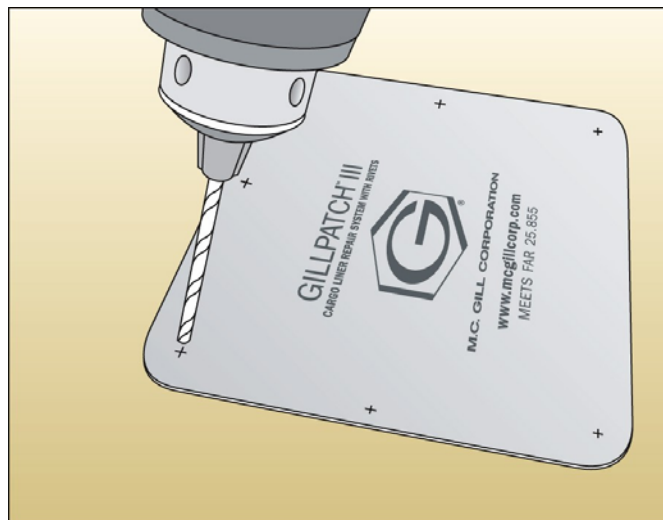
5 Repair Procedure for Gillpatch III Without Pre-Drilled Holes:

While Gillpatch III With Rivets repair patches are preferable to reduce installation time and margin for error, in the absence of the pre-drilled patches, acceptable patches may be fabricated by drilling holes in the appropriate sized material cut from Gillpatch III flat stock or pre-cut patches, e.g., from a kit of assorted patch sizes. The same limits of repairable damage as followed for Gillpatch III With Rivets apply - pay careful attention to the extent of the damage, cleaning the panel to obtain maximum adhesion, and placement of the patch. For the repair of the ceiling liner panels in Airbus aircraft, damage assessment and extent of repairable damage described in the Airbus Maintenance Manual (AMM) 25-00-00 must be followed.

Remember – the edges of the patch must extend at least 38 mm (1.5 ins) beyond the edge of the damaged area.

- 5.1 Place a patch on a suitable surface for drilling, and drill 8 holes approximately 0.156” (5/32”, 4 mm) diameter, and 0.0375 ± 0.039” (3/8 ± 0.039”, 9.5 ± 1 mm) from the patch edges. Drill a hole in each corner, and another one halfway between each of the corners, maintaining the distance from the edges. See Figure 9, below.

Figure 9 – Drilling Holes in Gillpatch III



- 5.2 After drilling the holes in Gillpatch III, follow the instructions shown in section 4, above, for installation of the repair patch. Only the rivet specified in section 4.6 may be used to attach the patch to the liner panel.

Carefully following the procedures described above will result in a permanent repair of through-damaged (both faces penetrated) cargo liner panels in overhead locations in the cargo compartments of Airbus aircraft.





Gillpatch™ 1367P Cargo Liner Repair System

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Description

Gillpatch™ 1367P System is a low smoke and toxicity, fiberglass reinforced, phenolic laminate patch for repair of limited damage to cargo liner sandwich panels in Airbus aircraft – refer to specific Airbus AMM for application and limitations.

In other aircraft, Gillpatch 1367P may, also, be used to repair damaged laminate liner sidewalls in cargo compartment classes A, B, and E as defined by FAR 25.857.

Applications

- Approved for repair of Airbus cargo liner sandwich panel sidewalls with damage on one face only.

Reference: Airbus Service Information Letter (SIL) 25-097 and Airbus AMM 25-00-00.

- Liner damage in cargo compartment classes A, B, and E of non-Airbus aircraft.

Features

- High mechanical strength, puncture resistance and corrosion resistance.
- Service temperature range: To 220°F.
- White Tedlar overlay on face side for surface reflectivity.
- Peel and stick application.

Specifications

- FAR 25.853 – Part 25, Appendix F, Part I, IV, and V.
- FAR 25.855 – Part 25, Appendix F, Part I
- Airbus Individual Product Specification IPS 08-07-002-02; Qualified on the Basis of AIMS 08-07-000, AIMS 08-07-002, and ABS 5666.
- M. C. Gill Corp. Airline Instruction Manual MCG-AIM-2001 for Airbus Aircraft.

Availability

Thickness:	0.028", including pressure sensitive adhesive and release paper.
Length:	Sheets up to 168".
Width:	Sheets up to 72"
Color:	White on face side, pressure sensitive adhesive on back side.



Construction

Resin: Modified phenolic.
Reinforcement: Woven fiberglass cloth.
Surface: 1 mil Tedlar overlay.

Standard Tolerances

Thickness: +/- .005"
Length: + 0.5", - 0"
Width: + 0.5", - 0"
Warp Twist: 3% of dimension measured

Alternative Gill Products

Product Number	Difference
Gillpatch™ III and Gillpatch III With Rivets Repair Systems	FAA approved for repair of cargo liner laminates in Classes B, C, and E cargo compartments and sidewall panels in Airbus aircraft – meets requirements of FAR 25.855 (FAR part 25, Appendix F, Parts I and III). Gillpatch III With Rivets is approved to repair ceiling panels in Airbus Aircraft.
Gillpatch 6006	Fiberglass reinforced polyester laminate with a pressure sensitive adhesive on the back side. Thinner, lighter and lower cost. Approved for use only in Classes B and E cargo compartments as defined in FAR 25.857.
Gillpatch 6160	Gillpatch II Made obsolete by Gillpatch III. Original peel and stick patch meeting FAR Part 25, Appendix F, Part I and Part III (burn-through). Thicker, heavier and less flexible than Gillpatch III. No longer available.
Gillpatch 6167	Made obsolete by Gillpatch II. Fiberglass reinforced phenolic patch installed using monel rivets. Expensive, labor intensive to install.



Properties of Gillpatch™ 1367P Repair Patch
Typical Property Values

PROPERTY	UNITS	TEST METHOD	MEASUREMENT
Weight	lb/ft ² (kg/m ²)	GTP 085*	0.121 (0.59)
Thickness	inches (mm)	GTP 086*	0.013 (0.33)
Water Absorption	%	ASTM D 570	0.8
Impact Strength	ft-lb (N-m)	BSS 7326	11 (14.9)
Climbing Drum Peel, Interlaminar, Warp	in-lb (N-m)/3 in width	BMS8-223	56 (6.3)
Fill	in-lb (N-m)/3 in width		---
Edge Bearing Strength, Warp	ksi (MPa)	BMS8-223	37 (255)
Fill	ksi (MPa)		34 (234)
Tensile Strength	ksi (MPa)	ASTM D 638	54.5 (375.8)
Tensile Modulus	msi (GPa)		3.16 (21.8)
Flammability -60 Second Vertical Self-Extinguishing Time	seconds	FAR Part 25, Appendix F, Part I	0
Burn Length	inches (mm)		2.3 (57)
Drip Extinguishing Time	seconds		None
45° Test, Flammability Extinguishing Time	seconds	FAR Part 25, Appendix F, Part I	0
After Glow Time	seconds		1.7
Flame Penetration	---		None
Smoke Density, Flaming Mode	D _s , 4 minutes	FAR Part 25, Appendix F, Part V	22
Flame Penetration, Oil Burner	---	FAR Part 25, Appendix F, Part III	No Penetration

* M. C. Gill Corp. Test Procedure

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