



# Escape slides and slide rafts

## A330/A340 Family

### Scheduled maintenance operational test

Each door on a passenger aircraft is fitted with an escape slide for emergency evacuation of passengers and crew. Most of the slides may also be used as life rafts in the event the aircraft lands on water. For simplicity in this article, slides includes slide rafts. Slides can be compared to parachutes: they are packed to work once. Following use, it is necessary

to repack them to be ready for the next deployment. And, before each deployment, there is no absolute certainty that they will work. Since they are not used often it is necessary to have a means of gathering information on their reliability and particularly to identify potential deployment failures: the only way is to perform scheduled deployments of slides.



**Sebastien Asse**  
Group Manager Cabin Interior  
Customer Services Engineering

#### WHEN AND WHERE SLIDES ARE TESTED

Today, deployment tests are performed at different stages in the life of the slide.

#### AT THE MANUFACTURING FACILITY

During the manufacturing process by the supplier, Goodrich, all slides are tested before delivery to Airbus. This acceptance test consists of deploying all units from a mock-up of the aircraft door. After inflation the slide is checked in order to correct any anomalies such as bonding and leaks between pieces of material. In the event of deployment failure, the slide is reconditioned and tested again. Each deployment is video recorded and the tape is archived by Goodrich.

#### SAMPLING ON NEW AIRCRAFT DURING AIRBUS A330/A340 FINAL ASSEMBLY

Since 2002 a sampling programme was organized during A330/A340 final assembly in order to test in real conditions, from the aircraft, the newly installed slide. Before delivery of a new aircraft to the customer, one door is selected at random and the corresponding slide is deployed. All the tests are video recorded from three different angles (inside the aircraft, outside in front of the door and on the side). This permits identity of potential issues, which are not linked to operational or in-service conditions.

#### WHEN FITTED ON IN-SERVICE AIRCRAFT (MAINTENANCE REQUIREMENT)

The Airbus Maintenance Planning Document (MPD) requires that operators perform a scheduled operational test on the slide fitted on their A330/A340 Family. The minimum requirement is to perform one deployment per fleet (A330/A340), per door position (1, 2, 3 and 4 left or right) every 36 months. However, depending on national regulations, some authori-

ties request their local operators to perform more deployment tests than Airbus requires.

Airbus requests each operator to report all deployment tests (successful or unsuccessful) through SIL 25-061. Also, every 36 months, each slide has to be overhauled in a qualified shop approved by Goodrich, and listed in their Component Maintenance Manual(CMM)

#### TESTING THE SLIDE

The tests have to be done on the aircraft by opening the relevant door in armed mode to allow the deployment of the slide. The Aircraft Maintenance Manual (AMM) operational test task and SIL 25-124 describes the procedure to follow and the corresponding safety precautions.

It is important to follow the rules in performing this test in order to ensure that slide deployment will occur in the best conditions (close to an emergency situation).



#### Slide deployment sequence

- Door handle lever is lifted with door in armed mode.
- Door booster is activated.
- Gas under pressure goes into the door damper.
- Door starts to open quickly and move forward.
- Release-pin lanyard is under tension, and then the two release pins are pulled.
- The slide packboard drops on to the door sill and the rail adapters are extracted from the rails.
- The packboard is detached from the door.
- Door moves to the side and allows the packboard to drop outside the aircraft.
- The packboard starts to rotate and then the parachute pin is pulled.
- Soft cover lacing opens (packboard rotated about 90 degrees).
- Packboard continues to rotate to a total of 270 degrees so that the top outboard corner of the packboard (rail adapters) is pointing towards the fuselage.
- The aspirators detach from the packboard and the cylinder is then extracted from the pack.
- The firing lanyard being under tension, the firing pin is pulled out of the regulator valve and the inflation is initiated.
- Pressurised gas (3290 psi of mixed nitrogen and CO2) passes from the cylinder through the aspirators to the inflatable part of the slide and opens the aspirators' flapper valve with the help of a venturi.
- The aspirators' flapper valve draws in external air.
- The mix of gas under pressure and external air starts to inflate the slide.
- Inflation is finished when the slide raft has reached the requested pressure controlled by a pressure relief valve(PRV).



The complete deployment sequence, from the door opening until the full inflation of the slide, should not exceed 16 seconds. Actual slide inflation from the packboard being released until deployment is complete takes less than six seconds.

The Goodrich method is to extract the complete packboard from the aircraft, let it drop against the fuselage and then commence inflation. During the deployment and inflation, the packboard, which is built from hard composite material, may come into contact with the fuselage

skin. Dents on the fuselage (or belly fairing for door 3) may result from this contact. It is therefore necessary to protect the aircraft during test slide deployments.

Initially the only recommendation was to use a "protective mat" for the fuselage during slide deployment, without giving a material specification. Most of the time just before deployment test, mechanics had to find something in the hangar to tape to the aircraft skin. Usually plastic sheet, a piece of carpet, cardboard or bubble wrap were the most easily available materials and were quickly taped to the fuselage below the doorsill.

**IN SERVICE EXPERIENCE**

Several reports have been received from the field showing that the use of such materials has allowed damage to the fuselage and in some cases prevented normal deployment of the slide raft:

- damage to the fuselage and particularly to the belly fairing was due to a protection that was too light (Figure 1) or not located where contact would occur,
- deployment failures were mainly due to the slide pack being caught in protective material (particularly bubble wrap), which decreased the drop inertia and stopped the deployment before inflation (Figure 2).

**RECOMMENDATIONS**

Further to these reports, Airbus reviewed in detail how to protect the aircraft skin during a deployment test. The first step was to determine the fuselage area to be protected at each door position. The second step was to define a material able to protect the fuselage structure without disturbing the deployment sequence.

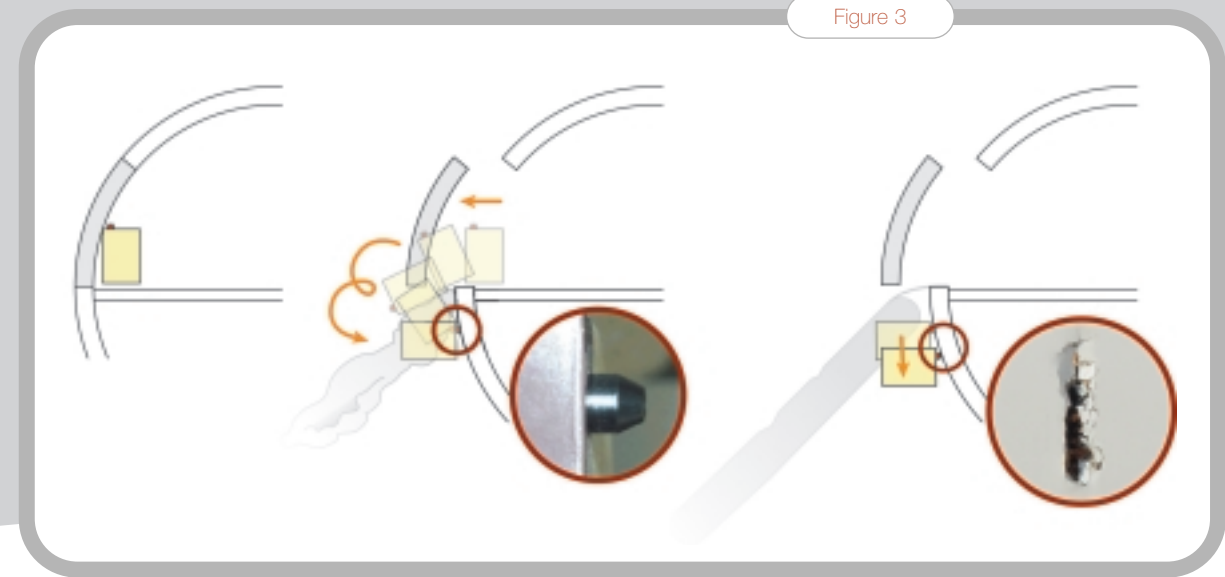


Figure 3

**WHICH AREA TO PROTECT**

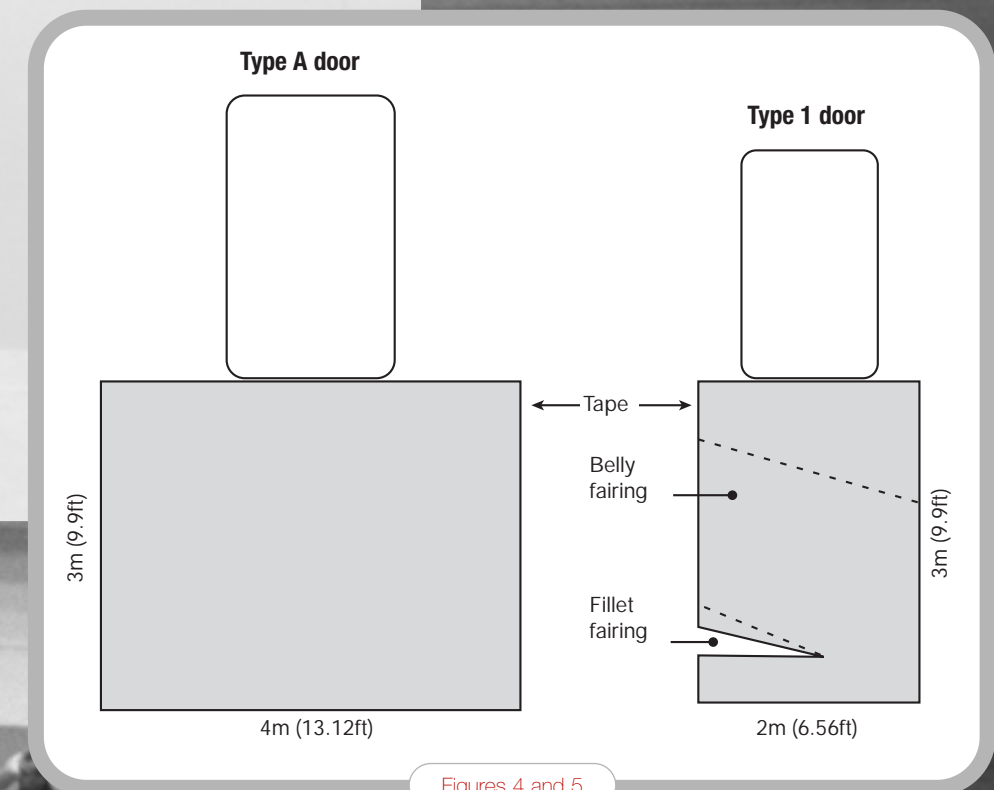
During the deployment sequence, the packboard may hit the fuselage and cause damage. This happens when the packboard is rotated a total of 270 degrees, and its top outboard corners (rail adapters) point towards the fuselage (figure 3). The degree of contact depends on the dropping inertia. At the door 3 position, due to the contour and composite material of the belly fairing located below it, a heavy dent may result.

**PROTECTIVE MATERIAL**

Having determined the area to be protected, the type of protection chosen is also important to ensure adequate protection without disturbing the deployment sequence. The protective material should simulate the aircraft skin. After review of existing materials and some tests on the final assembly line during a sample deployment, it has been decided to use two different materials, bonded together, to provide the required protection.

After review of the different conditions it has been decided to have a specific protection fitted during the test, just below the doorsill and covering the maximum area of packboard movement:

- for passenger exit (Type A door equipped with slide raft) the protection dimension should be 3m deep x 4m wide (figure 4).
- for emergency exit (Type 1 door equipped with slide) the protection dimension should be 3m deep x 2m wide (figure 5).



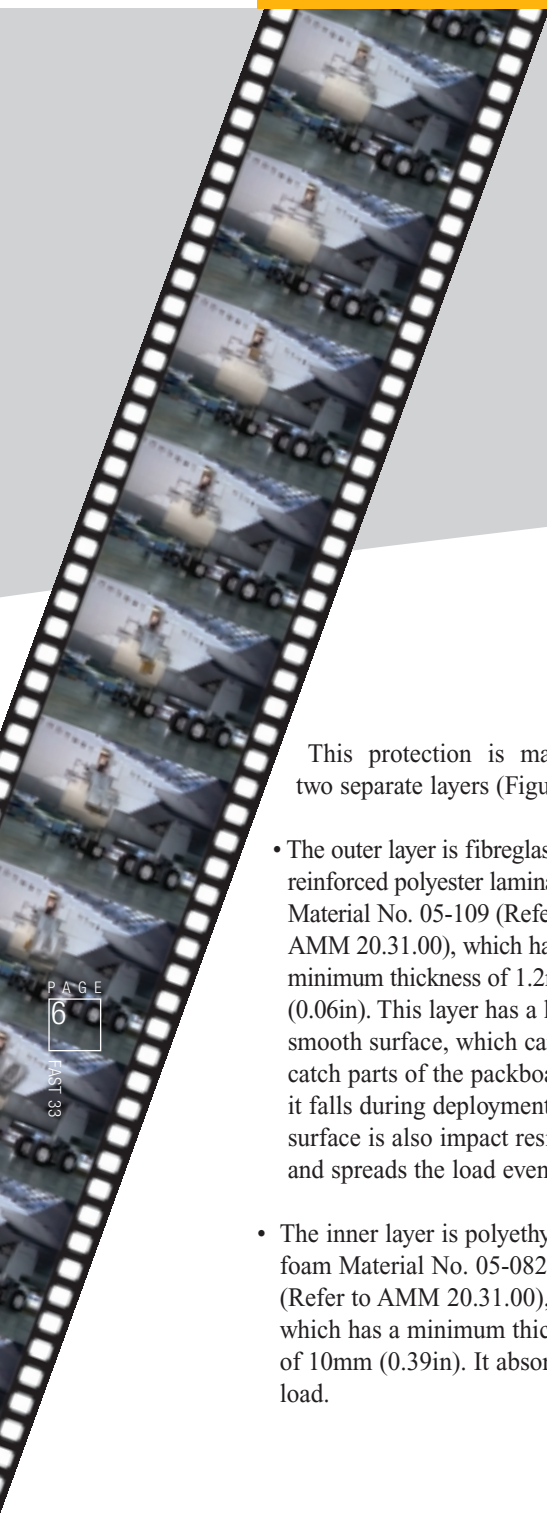
Figures 4 and 5



Figure 1



Figure 2



This protection is made of two separate layers (Figure 6):

- The outer layer is fibreglass-reinforced polyester laminate Material No. 05-109 (Refer to AMM 20.31.00), which has a minimum thickness of 1.2mm (0.06in). This layer has a hard smooth surface, which cannot catch parts of the packboard, as it falls during deployment. The surface is also impact resistant and spreads the load evenly.
- The inner layer is polyethylene foam Material No. 05-082 (Refer to AMM 20.31.00), which has a minimum thickness of 10mm (0.39in). It absorbs the load.

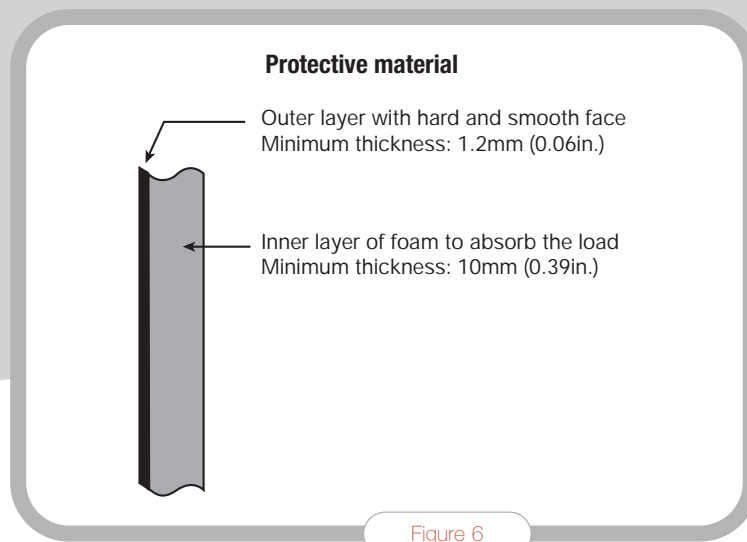


Figure 6

### HOW TO BUILD AND FIT THE PROTECTION ON THE AIRCRAFT SKIN

Refer to figures 4 and 5 for the dimensions and position of the protection required for each type of door. Three different sizes of protection can cover all A330/A340 door types: (one for all Type A doors 1, 2 and 4; one for Type A door 3; one for Type 1 door 3). However the protection for door 3 Type A can also be used for Type 1 if both door types are present in the fleet. Then cut both outer and inner layers to the appropriate dimensions. Attach the self-adhesive foam sheets to the polyester laminate sheets.

Use an adjustable access platform to help position and attach the pro-

tection cover: Make sure the protection is correctly attached with tape to the aircraft structure. This prevents the suction of loose protection material into the aspirator during the deployment test. Loose protection material can cause damage to the aspirator, with the risk that the deployment test will not be satisfactory.

Use adhesive tape (Material No. 05-069) or ADETEC 5350 to attach the protection sheets to the fuselage below the doorsill. Make sure that there are no gaps between the edges of the sheets and that the self-adhesive foam sheet goes against the fuselage.

Follow all safety instruction provided in AMM 25-62-00-501.

## Conclusion

Since the preparation of this article, Sébastien Asse has moved on an other group and therefore questions on slides should be sent to:

#### CONTACT DETAILS

**Philippe Le Bigot**  
 Group Manager Cabin Interior  
 Customer Services Engineering  
 Tel: +33 (0)5 61 93 44 59  
 Fax: +33 (0)5 61 93 44 38  
[philippe.le-bigot@airbus.com](mailto:philippe.le-bigot@airbus.com)

Being a system designed to be used in emergencies, slide deployment is fast and quite violent, as the slide has to be ready to evacuate passengers from the aircraft very quickly after the door opens. Because of this deploying a slide or slide raft for test requires some precaution in order to prevent any

fuselage damage or interference in the sequence. Making a video of the tests in order to be able to investigate possible failures is recommended.

Airbus would be grateful for feedback on all deployments, successful or otherwise, as described in SIL 25-061.