



INTERIOR UPGRADES WITHOUT PENALTIES

Paint is relatively inexpensive, quick to produce and dries rapidly. Available in a wide range of colours, gloss levels and textures, it is ideally suited for upgrading cabin interiors during planned maintenance downtime. **Jim Rowbotham** explains why

Cabin interior repair and refurbishment is (or should be), a serious business for both airlines and the MRO contractors which serve them. First impressions are important if an airline is to maintain a level of confidence among its customers, and if it shows detailed attention to creating quality cabin interiors that reflect a level of cleanliness and care, then an airline's image is significantly improved.

The most economical and flexible way to quickly improve or transform an aircraft's internal appearance is by repainting. Simple cabin decorative upgrades can be achieved while aircraft are positioned for engineering checks, or exterior repaints, without extending total downtime, providing that care is taken over planning and the selection of materials.

This presents an opportunity for the MRO provider to offer cabin improvements to the airline as a parallel option to essential maintenance, allowing for an additional economic return without prolonging AOG time. It is a win-win situation as the airline gets an image boost without incurring penalties.

In order to present a variety of textures and surface characteristics, an airline may prefer to trim some of the panels with decorative laminates or vinyls. Nevertheless it is possible to paint every type of interior cabin panel, and most materials can be over-painted. Surfaces particularly suited for this treatment are ceilings, bulkheads, dados and galley/toilet walls. Window reveals and sidewalls can have complex shapes – painting is therefore much easier than trying to retrofit a vinyl film.

Repainted in-situ

Depending on available time, repainting can be accomplished by removing the cabin parts from the aircraft and processing them in a dedicated prepa-

ration and paint facility. Alternatively, the cabin can be repainted in-situ.

The removal of cabin parts for painting allows for some improved processing. Visibility of all sides and panel corners allows for complete access and, because of this, a good appearance can be achieved over the whole surface. Masking requirements are reduced and parts can be thoroughly prepared, sanded and filled under intense lighting, which will improve the final appearance.

Nevertheless, removal of the cabin interior is time consuming and can only be achieved around a longer maintenance check or a full exterior repaint. As access is restricted in both these situations it is not always possible to enter and leave the cabin as required. In addition, a fully equipped paint shop is necessary.

For these reasons there is an increasing trend to repaint cabins in-situ – removing the seats and easily detachable parts and leaving the main cabin exposed for painting. The interior of the aircraft then becomes a 'mini paint shop' as the surfaces are washed and sanded, filled and masked off for repainting. Shifts of painters can enter and leave the aircraft, and work during or between maintenance shifts with minimal disturbance to the programme.

Workflow and selection of materials should be based on certain criteria:

- **Mandatory Requirements**
 - Aviation authority cabin flammability regulations
 - Health, safety and environmental regulations
- **Optional Requirements**
 - Mechanical performance
 - Work throughput time
 - Appearance

Each of these factors brings into play a set of considerations for the MRO provider, including aviati^ on



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authority cabin flammability regulations that state all materials used inside the cabin must conform to the requirements of FAR/JAR 25.853 and UK CAA AN 61, and be pertinent to the combination of paint and substrate to which it is applied. These requirements are described in the table below.

Heat release must be measured using the OSU (Ohio State University) testing chamber process. This was developed in response to the risk of cabin fires caused by external flames penetrating the fuselage and igniting furnishings.

The tests must be conducted at specialist facilities approved by the JAA/FAA/CAA. The main airframe manufacturers' specifications also duplicate these requirements.

In a maintenance situation it is frequently impossible to test the specific furnishing panels found inside the aircraft, as large pieces would need to be cut from the interior. In response to this problem, reputable manufacturers of cabin paints test their products on a

wide range of cabin plastics and composites in order to demonstrate that the requirements are met on the diverse range of materials typically used in cabin construction.

MRO facilities should ask for this information as part of the coatings selection process.

Hazardous exposure

It is important to minimise the risk of exposure to hazardous substances during the repaint process. The painters can be well protected, but co-workers in surrounding areas can also be affected.

Many paints approved by aircraft

A) Heat Release (OSU) Chamber (JAR 25.853 Appendix F Part IV)		Aviation authority cabin flammability regulations					
Total (mean) heat release at 2 mins kW.min/sq.m Requirement <65	Peak Heat Release in 5 mins kW/sq.m Requirement <65						
B) Smoke Emission/Density (JAR 25.853 Appendix F Part V)							
DS Specific Optical Density at 4 mins Requirement <200	C) Burn Length (JAR 25.853 Appendix F (a) (1) (iii)) Burn Length (mm) Requirement <200						
D) Toxic Gas Emission (ABD0031 Issue C)							
Toxic Gases (4 minutes)							
Gas	HCN	CO	NOx	SO2+H2S	HCl	HF	HBr
Limit (ppm)	150	1000	100	100	150	100	0
HCN	Hydrogen Cyanide						
CO	Carbon Monoxide						
NOx	Nitrous Gases						
SO2+H2S	Sulphur Dioxide						
HCl	Hydrogen Chloride						
HF	Hydrogen Fluoride						
HBr	Hydrogen Bromide						



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manufacturers have a second 'hardener' component, which helps with long term durability. However, hardeners are usually sensitising agents and are labelled hazardous, requiring respiratory protection for any staff working nearby. For this reason, single component products are preferred for in-situ application.

Paints based on a mixture of polyurethane and acrylic resin, precured so that a hardener is not required, offer the best combination of durability with the lowest risk to health. Unpleasant odours are also undesirable to other workers and coatings with a low-level of smell should be specified.

Inside a confined space, solvent vapours can build up and present a fire risk. For this reason, water based coatings should be selected wherever possible.

Environmental legislation is now in place in many countries, which limits the amount of solvent released into the atmosphere from painting processes. The latest generation of water based cabin maintenance paints have a solvent content of only 250-350 grams per litre, which is half that of conventional paints. This feature should also be a criterion for the selection of the cabin coating.

Coating performance

The mechanical performance of a coating defines its durability and longevity in service. Factors such as knock/chip resistance, cleanability, staining and wear resistance needs to be taken into consideration.

The performance of the coating can be improved in these respects by increasing its cross-linking (reaction of resin to paint to form a matrix that is

resistant to attack). The negative consequence of this can be greater health and safety risks, longer drying times and an increased difficulty of carrying out routine touch-up of the paint in service.

A coating should be selected which has a proven good performance durability, combining this with the minimum number of negative process implications. This is a key differentiator between the various coating materials available.

Aircraft MRO has different drivers than an aircraft OEM. Overhaul times must be faster, but work is not always completed in purpose facilities with high-technology paint shops. Materials which fit into the aircraft maintenance cycle therefore may often be different from those approved and used by the aircraft manufacturer. Providing that account is taken of conformance with the other key factors, this should not be a cause for concern.

Work throughput time is a critical issue, particularly if cabin redecoration is to be achieved during an engineering slot.

Materials chosen need to have a quick drying time for masking at normal temperatures and humidities. The best available technologies are touch-dry in around half-an-hour.

Single component products do not need mixing and can be used direct from the tin. This means that rapid response can be achieved to the cabin interior during maintenance. Also, unused paint can be put back into storage, reducing waste and costs.

It is very important that the materials are delivered on schedule and the supplier has the ability to produce matching colours within a very short time. If the MRO provider has been assured by the paint OEM that it can comply with these conditions, finalising paint requirements with the airline can be made when an aircraft is positioning for maintenance.

A coating with no hazardous labelling should be selected if a quick service is required, as this allows shipping through standard carriers with no risk of hold-ups caused by hazardous packaging/shipping regulations.

There are a number of techniques for speeding up drying time; for example, portable heaters can be used to warm the surrounding air (check the flammability of the paint). In the case of water based paints an air-blowing nozzle can give the coating much faster drying at minimum energy costs.

Small areas can be roller-painted, which means that the surroundings need not be masked – this can save significant time in the programme.

Appearance

It is important that all panels in the aircraft have a uniform colour and gloss level. This can be difficult to achieve when different levels of wear and tear and dirtiness are evident. To overcome this, all panels should be thoroughly cleaned and filled, and if different appearances are observed, consideration must be given to using a primer before painting, particularly if the substrate is a plastic with low adhesion properties. In most cases however a primer is not required.

With almost any colour being possible, innumerable choices of decoration can be made, including a gloss finish, although semi-gloss is preferred by most airlines. It is also possible to achieve a texture effect with a basic colour and then a light spattering of the same colour over the surface, or the addition of one or more additional colours, to give a more decorative or varied appearance.

The skills of the painter are very important and the MRO provider should take steps to ensure its operatives are trained and ready to adopt decorative techniques in refinishing interiors. For some decorative effects HVLP (high volume low pressure) or gravity feed spray guns will be necessary. The installation of adequate extraction and lighting is also important as this allows good visibility and removal of spray-dust. Paints with a high flash-point provides more flexibility during the installation of such portable equipment. □

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