

AIRCRAFT PAINT EXPECTATIONS

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Paint serves a purpose that goes far deeper than a glossy exterior. It's also a thin protective shell that serves as an aircraft's only line of defense against the elements.

When that shell is improperly maintained or begins to fail with age, the risk of corrosion increases and the structural integrity of an aircraft's aluminum skin is in jeopardy.

This document explores best practices and frequently asked questions to better educate aircraft owner/operators on aircraft paint expectations. Leaders within the business aircraft industry collaborated on this educational piece.

APPEARANCE STANDARDS

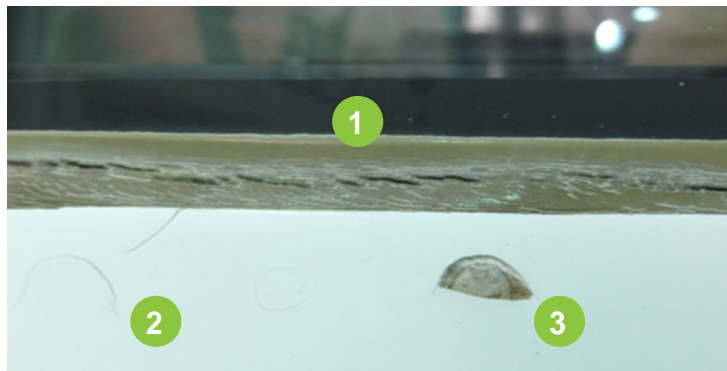
Will debris be evident in my paint job?

Yes, dirt specs should be expected. Your paint service center will provide a guide of the aircraft divided into zones so you know how much debris you should expect.

There are two options to address debris in your aircraft paint job: Repaint or sand and polish. If you choose to repaint, there is no guarantee that the area repainted won't have debris when completed. If you choose to buff keep in mind some paints are designed to be buffed, but doing so does present some long-term issues related to hazing/staining of the polished areas.

Why do sealer seams crack on aircraft?

Aircraft are purposely designed to flex and you should expect paint cracks. Sealer seams crack on aircraft due to the expansion and contraction of the aircraft skin. Skin temperatures can range from 130 degrees on the ground to -50 degrees in the air. The environmental changes cause the expansion of aluminum, composites, sealers and even the paint. When the sealer expands under the surface of the paint, the extra volume causes stress on the paint surface and eventually cracks. And, as an aircraft ages, cracks increase.



This photo is of 890 sealant, which was not painted. As you can see, the sealant will crack over time (1). Imagine what would happen if this area was painted. Also, on the bottom left (2) is an example of a rivet cracking and on the bottom right (3) paint has "popped" from a rivet.

**Why do the composites on my aircraft have cracks in the paint?
I see other aircraft and the composites on them look fine.**

Over time, expansion and contraction slowly degrade the integrity of the paint surface. This is especially noticeable on composites, which can expand and contract more than aluminum surfaces, causing micro cracks. As aircraft age, these cracks transfer through the paint surface and cause paint cracks. This is why you see more cracked composites on older aircraft than on newer aircraft.

It is always important to understand the manufacturers' requirements for composites and paint mil thickness. In general, the phrase "less is more" will apply when painting composites. Applying minimal amounts of paint will delay the cracking but not completely prevent cracking. Cracking from the stress on composites during flight will happen.

With thinner paint you may see the honeycomb texture of the composites telescope through the paint once it cures. Don't be alarmed. Although the paint isn't a smooth mirror finish, the composite patterning is much better than excessive cracking, which will show with thick primer and paint layering.



Visible paint cracking on a composite surface.



Stress lines remain visible on a composite surface after existing paint and primer are removed.

Is more paint better?

Aircraft are lighter than ever to help increase fuel efficiency. Because of that thin skin, paint application has to be thin as well. Also, the more material on your aircraft skin the more likely there will be popped rivets and cracked seams.

What can I expect with different types of fasteners?

Aircraft are assembled using a variety of fasteners. For post-production access many panels are attached to the airframe using a variety of screw types. It is very important when removing and reinstalling that the proper screws be used.

Different fasteners are used for different reasons. Steel fasteners may be used in more structural areas. Cadmium screws are used in areas that will be painted. And stainless steel fasteners may be used on panels that will be accessed often.

Although there's a preferred use for each type of fastener, you may see unintended consequences from the options. Stainless steel fasteners may be very effective on inspection panels that get removed often, but they may develop corrosion between the screw and the nut plate. This causes the screws to seize in the nut plate, making it difficult or impossible to remove, and requiring the nut plate to be replaced. Structural steel fasteners used for their strength may corrode around the head of the screw or the screw itself may corrode or rust, requiring the fastener to be treated or replaced.

Why are most aircraft painted white?

Most aircraft owners choose to paint their aircraft white for maintenance purposes. White is easy to touch-up after maintenance is completed on the aircraft. Far less heat builds up on a white aircraft when it is sitting in the sun; therefore, the cabin is cooler than an aircraft painted a dark color.

There is also some concern that dark colored wings will increase the temperature in the wing tanks causing fuel expansion. This could limit the amount of fuel held in the tank or the fuel could expand enough to cause minor fuel seepage from tank rivets.

If you're an owner/operator who wants a dark base color make sure you know the color restrictions for your aircraft from the aircraft manufacturer.

Can metallic/pearl paints be used as a base coat?

Yes, but metallic/pearl paints are difficult to match. Pearl tri-coat paint consists of a base color, clear with pearl in it and a final layer of pure clear. The additional clear coat required adds mil thickness and chipping is a possibility.

When applying the pearl coat the amount of material applied to the surface can greatly affect the overall finished look. If you need to repaint or touch-up before or after delivery, color matching is not guaranteed.

It is possible that the paint may degrade if it's exposed to chemicals such as fuel, Skydrol, etc.

PAINT MAINTENANCE

How do I properly clean my aircraft paint?

An aircraft paint system needs constant attention. In a perfect scenario, your aircraft should be kept in a hangar out of the sun and washed after every flight. Always wash your aircraft after de-icing fluids have been applied. Aircraft coatings are tools to help your aircraft maintain a like-new appearance. Touch-up any small chips or cracks immediately. Do a quality touch-up job after any maintenance event.

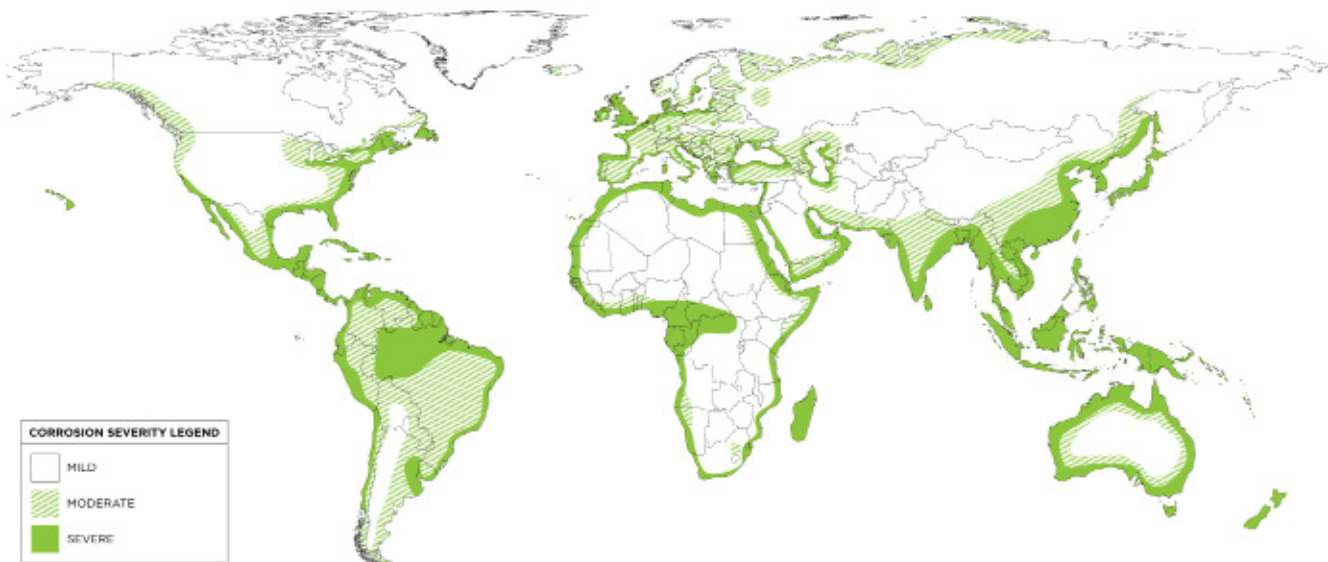
Use products approved by the paint manufacturer. Recommended cleaners will have a neutral pH level. Avoid waxes that contain silicone as they may prevent paint from adhering when you touch it up.

How often should I get my aircraft repainted?

Our observation is that most aircraft are painted every 5-7 years, but realistically it depends on the environment where your aircraft is located and the areas of the world to which you're traveling. If your aircraft is based near an ocean, you definitely should consider painting your aircraft more often than 5-7 years due to exposure to salt. Extreme temperatures, flight hours, corrosive environments and sun damage compound the wear, shortening the lifespan of an aircraft paint job by years.

How can I help prevent corrosion?

- Minimize exposure to the elements (UV, rain, snow, etc.) whenever possible.
- Properly clean your aircraft to remove aggressive agents (salt, de-icing fluid, etc.).
- Apply a recommended paint coating on painted surfaces once a year in ambient corrosive severe areas.
- Touch-up paint cracks and flakes as soon as possible.
- Prevent corrosion by removing pitting, pollution, dirt and scratches. A polished surface on a microscopic scale is flat (relatively) compared to a dull surface. The dull finish comes from many microscopic scratches, and these would appear as mountains (under a microscope). In those valleys between the mountains, contaminants can gather. A polished surface retains fewer contaminants.
- Reinforce the protection of out-of-sight areas where moisture and contaminants can reside, like gear wells, slat/flap well, wing trailing and leading edge boxes, S-duct lower skin, rudder accessible service doors, wing accessible service doors, etc. Follow recommended procedures from your aircraft manufacturer.



Even aircraft that are not based in these locations should at least have a water rinse after flying through them or even better a wash.

PLANNING**What do I need to plan for when scheduling new paint?**

Make sure you're giving your owner/operator adequate time to work with a designer and approve a paint scheme. Understand that if you find corrosion, fuel leaks or other problems prior to painting your aircraft, those issues could affect downtime and cost.

Aircraft paint requires maintenance, but your paint experts are here to help. If you have a question, ask. Your paint shop would love to give you tips and tricks to keep your aircraft paint as flawless as possible.