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A Splash of Livery

Talking about aircraft painting

By Swaati Ketkar

When we see a plane with beautiful livery glide past us at an airport or fly past us when up in the sky, the colourful gleaming tails, or the images on an airframe that glitter in the airport lights, the breathtaking beauty and enormity of the plane leaves us mesmerised to the point we absorb that feeling and take a mental image to be remembered forever. For most of us who thought painting beautiful, complex livery on an aircraft was a piece of cake, it is far from just taking a paint brush and splashing paint all over a plane.

Painting may be a form of art, but painting an aircraft is a different story altogether. It is no longer about a piece of metal and some paint. Aircraft painters require special training involving specialised painting technics, different paint to watercolours and acrylics, and a host of other things.

Let take a dip in the colourful world of aircraft painting and discover more about what goes on behind the scenes in an aircraft painting hangar, the different patterns and technics of aircraft painting, the types of paint, the sustainability quotient, and more

White or 'other' wise?

If we scan the airport while waiting for our flight to arrive, we can easily spot that

majority of the planes are painted white, and there is an obvious high-school science behind it. White reflects the sunlight, keeps the large fuselage of the planes cooler thus minimizing heat damage. The effects of the sun combines with the heat generated by aerodynamic friction causing the aircraft to heat up when airborne, and the white colour helps to mitigate this effect to a considerable extend.

If we look closer into the history of aircraft, they were not painted white initially, but aircraft retained the sleek aluminium colour of their fuselage. This trend slowly began to change towards the 1970s when Air France introduced their Euro-white livery with 'all-white' fuselage which slowly gained widespread appeal.

Since then, most aircraft have been painted white, but the current trend is changing towards more a colourful livery. "White is usually the go-to colour based on heat reflection, maintenance visibility, cost-effectiveness, and branding visibility," says Allen Neufeld, Director of Business Development, Ascent Aviation Services. "Of lately, customers often like custom schemes that show the owner's personality or a specific theme to mark a particular occasion," adds Colleen Back,

“White is usually the go-to colour.”

Allen Neufeld, Director of Business Development, Ascent Aviation Services



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“Aircraft are parked and deactivated in the hangar, then cleaned and masked for chemical or mechanical stripping.”

Richard Neath, Vice President Operations, Dean Baldwin Painting

Vice President Customer Programs for StandardAero’s Business Aviation division. For example, Air Nippon Airways, Air China, Scoot, etc., wore special Pokémon liveries and that increased the popularity of the Japanese cartoon characters around the world. But does special livery require special care and maintenance? What about the time and costs involved? “For special colour, products such as metallic paint or clearcoat finishes are used which might lead to maintenance challenge down the road,” Back advises. Speaking about the costs involved Neufeld points out that the more specialized the paint scheme, the greater the cost involved.

When asked about the maintenance challenges for specialised livery, Back goes on to explain that “Over time, should there be chips in the paint from normal wear and tear, it is very difficult to ‘match’ metallic paint, and tasks may require more labour hours and dollars to touch up paint after a maintenance inspection.” Back further adds that “The seamless metallic look may have some variations after the touch up simply due to the nature of clearcoat and metallic products.”

Richard Neath, Vice President Operations, Dean Baldwin Painting LLC sums up by

telling us that “livery complexity adds a small amount to the overall process, but the main cost in refinishing an aircraft is in the preparation.”

Painting an aircraft!

Once the colour, the livery design, painting costs and time to be taken has been agreed upon, then comes the actual process of painting an aircraft. Let us find out how it is done!

“Aircraft are parked and deactivated in the hangar, then cleaned and masked for chemical or mechanical stripping,” says Richard Neath “After the stripping process, the remaining parts that will be painted are sanded and then the whole aircraft is rewashed. The aircraft is then masked, pretreated, primed and top-coated,” he adds.

Neufeld goes on to explain the aircraft painting process by mentioning several key steps. “The painting process starts with thorough cleaning and preparation of the aircraft’s surface, followed by priming to enhance paint adhesion and protect against corrosion.” Once the paint adhesion is applied then comes the actual painting process in which several layers of paint



Richard Neath, Vice President Operations, Dean Baldwin Painting

are applied using advanced techniques like electrostatic spraying for even coverage, and then finishing with a clear coat for durability.

Timeframes and factors influencing aircraft painting

A paint job’s primary task is to protect the aircraft from corrosion, but there are many aesthetic

reasons for an aircraft to be painted, especially in the corporate and private aircraft segment. Back goes on to list several factors that lead to re-painting like length of time in service, the level of quality of the last paint job, and environmental factors that may affect the paint such as extended exposure to the sun, sand, or humidity.





According to Back, the following factors eventually lead to aircraft painting –

- Its most common to re-paint in conjunction with a large maintenance inspection, avionics installation and/or interior refurbishment work scope to minimize overall downtime for the aircraft.

- When an aircraft is changing hands, and the new owner wants to refresh the livery to their desired scheme.

- Corporate and private aircraft owners generally set a very high visual quality standard since these aircraft are a business tool and are frequently used with clients and business partners where the aircraft can be scrutinized closely on the ramp, as compared to an airliner that is seen from a jetway most times.

- Corporate and private aircraft typically have large inspections every 6-8 years, and this is often when aircraft are repainted.

- There is generally no set requirement for the paint interval, but is highly recommended to do with some regularity for corrosion control.

- When an aircraft is grounded for major scheduled maintenance, it is often dismantled to some degree during the inspection process, which can expose corrosion.

- Additionally, the removal of components and fasteners during inspection and maintenance tasks can lead

to exposed skin on the aircraft.

- Although reputable maintenance facilities normally touch up such degradation, the aircraft paint and primer degrade over time from wear and tear from weather, large temperature and air pressure swings between ground operations and flight operations, and time spent in harsh climates vs in a hangar during its life cycle.

“Airlines may also choose to repaint their aircraft to reflect new branding, updated logos, or livery designs,” adds Neufeld.

“Aircraft are generally repainted every 7-10 years, sometimes sooner as operators/owners change and require a livery update,” says Neath. Apart from these, he sides with Back in terms of several other factors that can impact the timeframe like airline’s maintenance practices, the type of paint used, and environmental conditions.

Neath further breaks down the painting schedule based on narrow-body or wide-

body aircraft. “Narrow-body jets or regional jets are painted more often than wide-body aircraft due to the stress of more ground-to-air cycles,” Neath adds.

- Narrow-body aircraft – 8 to 10 years
- Wide-body aircraft – 10 to 12 years
- New composite aircraft – 5 to 6 years.

“Historically, aircraft need to be repainted every four to five years,” says Richard Marston, Chief Commercial Officer, MAAS Aviation. “But, using the latest technology products coupled with our OEM-standard painting techniques and processes, we are seeing finishes that are still looking great and performing well seven and even eight years after being painted.” On an average, Marston concludes that for MAAS aviation customers the average length a paint scheme lasts is now between six to eight years.

“All-in-all while general guidelines exist for repainting, the decision often depends on the specific needs of the aircraft and the operational requirements of the airline,” Neufeld concludes.

“Historically, aircraft need to be repainted every four to five years.”

Richard Marston, Chief Commercial Officer, MAAS Aviation

But then again, protection and proper care of the aircraft with regular scheduled washes plays a vital role in extending the life of an aircraft's paint. Marston further explains that the use of UV technology in the latest basecoat clearcoat systems also have much better colour stability and gloss retention than the formerly used high-solids topcoat systems. "So, you don't see powdery, flat looking colours after time anymore, they stay bright, vibrant and shiny through the course of the paint scheme life," Marston adds.

Painting downtime

Another important factor in the painting process is the turnaround time (TAT) taken to paint the entire aircraft.

The TATs depend mostly on the following

- Type of aircraft
- Technology used for painting
- Livery selected

"The type of aircraft and the complexity of livery selected are crucial time-deciding factors," explains Neufeld. He further goes on to explain with the different aircraft models – "Larger commercial jets like the Boeing 737 or Airbus A320 may require 7-10 days and wide body aircraft, A330 or B747 usually require 14-18 days," he adds.

Agreeing with Neufeld in this analysis, Neath adds "A narrowbody typically takes 7 to 10 days, Widebody takes about 10 to 12 days to paint while a complex versus simple livery can add mostly two more days unless it is highly specialised like a mural which can add two to three weeks more to the process."

Back provides a pictorial representation of the average downtime required to paint based on the aircraft size. "StandardAero maintains, modifies and paints large-cabin corporate aircraft like Gulfstream, Bombardier Global/Challenger and Dassault Falcon Jet. (See item 3)

The complexity of the livery also plays a crucial role. Neufeld explains this with different livery examples like simple, single-color designs that can be finished more quickly while more intricate graphics and multiple colours can extend the process. Adding to Neufeld's explanation, Back further breaks down the downtime based on each large corporate aircraft scheme. The uniqueness of the theme decides the time. "Typical downtime is 32-28 calendar days for a typical scheme," says Back.

Hence she reasons that paint events are often paired with other major modifications

such as interior upgrades so that the downtime is efficiently planned with that event."

Short-cuts in livery painting

Neufeld throws light on some short-cut methods used for livery painting that can reduce time and costs, but he also cautions that their feasibility depends on various factors.

Vinyl Wrapping – This allows for vibrant graphics and designs to be applied more quickly than traditional painting, while also being removable for easy updates

Selective painting – Specific sections of the aircraft are refreshed, saving both time and labour costs, however blending new paint with existing colours may pose challenges with this method.

Simplified designs with fewer colours – This can also expedite the process, offering a quicker way to refresh branding without the complexity of intricate graphics.

Electrostatic painting – Though this requires an investment in equipment.

Neufeld goes on to give a brief overview



by comparing all of the above techniques with examples: "Vinyl wraps may not last as long as traditional paint, they offer flexibility in design updates." Neufeld also places emphasis on durability, aesthetic quality, and regulatory compliance.

Ultimately, while these shortcut methods can be effective, careful consideration of the desired outcomes and long-term implications is essential.

Difference between painting an old aircraft and a new one?

The process of painting a new aircraft differs significantly from that of repainting an old one. Neufeld explains the difference.



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Old Aircraft	New Aircraft
- older aircraft often necessitate extensive surface preparation, including stripping off old paint, repairing corrosion, and ensuring a clean and smooth base for the new paint	- The surface typically comes with a factory finish that requires minimal preparation, allowing the focus to be on applying paint over a smooth, unblemished surface.
- older aircraft may need multiple layers to achieve adequate coverage, particularly if the previous paint has degraded.	- When it comes to paint layers, new aircraft generally require fewer layers due to their optimal condition.
- older aircraft may experience extended curing periods due to additional repairs and environmental factors.	- Curing time - new aircraft benefit from controlled conditions.
- time-consuming and costly due to the extensive preparation and repairs.	- quicker and less expensive
- The priming process is also more critical for older aircraft, as it serves to protect against corrosion and ensure proper adhesion.	

When asked, Neath, he too is in agreement. "The difference is clearly visible on the composites and subsequent cracking," he says. Explaining in details, he expands: "For many years the industry would just scuff and paint and the paint thickness began to build beyond its ability to remain flexible. Now, the industry spends tens of thousands of man hours trying to restore the aircraft to the original specs."

Latest technologies in aircraft painting

Productivity developments in the aircraft paint application process have greatly enhanced efficiency and quality in recent years. If we were to go back in time and look at the evolution of aircraft painting technology over the years, we can see that

the industry has evolved significantly. "The shift is more towards lighter and more durable paint formulations, including low-VOC options that are more environmentally friendly," Neufeld says.

Agreeing with Neufeld, Marston adds, "The biggest developments in recent years have been in the actual paint systems, where we have seen huge technical advances." Marston further reasons that this has led to a real shift in preferred materials and today the market predominantly uses basecoat clearcoat paint systems and the latest SRM (Structural Repair Manual) systems. Further explaining the process with examples like Socogel and Bogel, Marston throws light on how these products have replaced the chromated Etch/Wash primers and are a lot more reliable and give greater longevity

of paint finish as well as being much more environmentally friendly.

Neath explains the pretreatment processes that provide an excellent surface for adhesion. "Old-technology pretreatments had very specific times and ranges that could cause catastrophic failure if dwell times or mixtures are precise. Basecoat clearcoat systems have also reduced the time between colours allowing for more complex liveries to be accomplished in less time."

Neufeld further points out various spraying and coating technologies which are a game-changer in aircraft painting.

- Electrostatic spraying technology further boosts productivity by using an electrostatic charge to attract paint to surfaces, improving transfer efficiency and reducing waste.

- High-performance advanced coatings, often requiring fewer layers for effective coverage and featuring faster curing times that allow for quicker turnaround between application and return to service.

- Lean manufacturing practices have streamlined workflows, optimized paint booth layouts, and minimized waste, contributing to overall efficiency.

- Additionally, digital tools for colour matching and application planning enhance accuracy and reduce errors.

- Investing in training programs for workers on the latest techniques and technologies has improved skills and efficiency, leading to higher productivity levels.

Together, these advancements have transformed the aircraft painting process, resulting in faster turnaround times, reduced costs, and improved quality.

Looking ahead, automation of certain parts of the painting process is likely to be the next big jump forward. Marston mentions about the possibilities for 3-D printing and aircraft wrapping that are currently being explored by all the OEMs, as they look at how the process can be enhanced. Neufeld also mentions about the introduction of automated systems, particularly robotic painting that has increased precision and consistency, allowing for even layers of paint while minimising overspray.

“But this is all still a long way off in my opinion as there are many challenges ahead, not to mention huge investment needed, before these advances become economically viable and a reality in the mainstream,” Marston says.

He goes on to explain the way of working and technology inculcation at MAAS. “We actively track new technical innovations in the sector and are working with a number of partners to understand what could be coming available in the years ahead and how these developments might integrate into our facilities in the future.”

However, he says that even today the actual painting process of an aircraft at MAAS is still a very manual process. “For us at MAAS, our present focus is on refining our in-house training programmes and continually fine tuning our methods to ensure we’re always delivering the highest quality paint finish in the fastest turnaround times possible.”

Glimpse of an aircraft painting hangar

A high-quality paint hangar is very different to a standard aircraft hangar. The hangar is often environmentally controlled by regulating the temperature, humidity and airflow to ensure that the temperature stays at optimum level as per the paint manufacturer’s recommended metrics, despite the changing weather conditions outside.

Back emphasises the use of an efficient painting hangar with proper tools, to ensure best results. “Some paint shops reduce costs by not installing enough ventilation and filtration to accommodate the size of the hangar. Although the customer will pay less at those shops, they may also encounter issues with paint adhesion and visual imperfections in the paint itself from not having a high level of environmental control during the paint



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process,” Back concludes.

Changing Trends in aircraft painting

Advancement in technology, sustainability and branding strategies are driving the global trend in the aircraft paint industry segment. Back feels that “Paint schemes on corporate and private aircraft are becoming more personalized, and utilizing effect paints such as metallics, micas, and pearls.”

Some of the latest market trends are –

- Use of custom schemes – Use of a different base colours apart from white.

Custom schemes can range from the use of a different colour for the belly and top (split-base scheme), highly complex stripe layouts, fades or gradients, logos or patterns on large area.

- Innovative finishes – Like matte and satin textures, iridescent paints are becoming popular, allowing airlines to create visually striking branding.

- Eco-friendly products - Low-VOC paints and coatings align with the aviation industry and commitment to sustainability.

- Lightweight paint formulations – They are gaining traction as they help reduce overall aircraft weight, leading to improved fuel efficiency

- Digital printing – Enables intricate designs and custom graphics to be applied more quickly and precisely.

- Reflective, and heat-resistant coatings – They are gaining attention for their ability to improve energy efficiency.

With regulatory compliance becoming increasingly stringent, manufacturers are developing products that meet these standards, driving innovation in paint formulations. Neufeld adds that “airlines are increasingly opting for custom and complex designs to enhance their brand identity, while maintenance-friendly products that resist scratching and fading are in demand to prolong the appearance of the aircraft.”

Overall, as airlines seek cohesive fleet branding strategies and a commitment to environmental responsibility, these trends are shaping the future of aircraft painting.

Qualifications/Training/Standardisation for aircraft painting

Specialised qualifications, training, and standardisation procedures for aircraft painting are essential to ensure safety, quality, and compliance with industry standards. Painters often need certification from relevant aviation authorities, such as the FAA in the US or EASA in Europe, which typically requires completing a recognised training programme and passing examinations. Back gives the example of Standard Aero’s Springfield, Illinois MRO facility that has an FAA-approved paint process. The process was reviewed by an FAA Designated Engineering Representative (DER). Back says that this approval ensures the company is using industry-accepted material and process standards. “The approved process is then implemented via

job cards which identify the tasks for each phase of the paint process, and each job card is signed off as the work progresses," Back further adds.

Many airlines and maintenance organisations offer specialised training that covers surface preparation, application techniques, material usage, and safety protocols.

Speaking about specific skills Back says, "Corporate aircraft paint projects require different skills than airline livery paint projects." Every corporate and private aircraft has a unique paint scheme, which is quite different than an airline livery that utilizes the same scheme across a fleet. Back explains this with an example, "StandardAero does not use lasers for stripe layout assistance. This allows the technician team to make tape adjustments for components on the aircraft that are not depicted on the customer-approved rendering. The stripe layouts can be quite complex, and require a specific skill from the technician team."

Neufeld goes on to mention about the safety factor. "Given the hazardous nature of some materials used, safety training is

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Colleen Back, VP Customer Programs for StandardAero’s Business Aviation division

crucial, including instruction on personal protective equipment (PPE) and proper handling of chemicals." He feels that additionally, painters must be trained in specific application techniques, such as spray painting and electrostatic painting, as well as understanding the properties of various aviation paints and coatings.

Quality control training is also vital, encompassing inspection methods and the ability to identify issues like adhesion problems. Familiarity with regulatory compliance, including standards set by aviation authorities, is necessary to meet safety and performance criteria. Neufeld stresses on continuous education to keep skills updated with advancements in technology and materials. In addition to upskilling, adherence to standard

operating procedures (SOPs) and industry best practices is essential for maintaining clean work environments and ensuring safe painting processes.

Speaking about the new certification on the horizon, Neath excitedly talks about the one that is sponsored by SAE engineering group. "The new training specification is AS 7489. This will become the global certification from the EASA, FAA and DOD," Neath adds.

Neath further goes on to explain its importance, "This certification will ensure customers get quality trained technicians at any given MRO where the technicians have the certification."

Together, these qualifications and



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training prepare aircraft painters to perform their jobs safely and effectively, contributing to the overall safety and quality of aviation operations.

Sustainability & Painting

With CORSIA targets heading closer, aircraft manufacturers, airlines, OEMs and MROs are finding newer and more innovative ways to reduce carbon emissions and painting an aircraft plays a major role in it. In the aviation sector there is of course an ever-increasing focus on sustainability and ESG

Issues, says Marston, "At MAAS this has been a key part of our business plan for many years and we work hard to be as 'green' as possible in all our operations and facilities. As we design, build and operate our own paint shops, environmental systems are included in our site plans from day one and I'm proud to say that all MAAS facilities are ISO 14001 Environmental Management certified," Marston adds.

"Advances in automation and robotics have improved precision and reduced waste, while new coating technologies enhance resistance to fading, chipping, and corrosion," informs Neufeld. Explaining the developments in paint technology that are actually making headway in improving sustainability Marston explains: "The introduction of non-chromate pre-treatments plus the latest primers and basecoat clearcoat systems are in themselves more environmentally friendly products, but they also deliver huge adhesion improvements."

Marston further explains that this in turn means that the aircraft don't need to be painted as often, which clearly brings its own environmental benefits. "These systems also reduce the weight of the paint on the aircraft which over time reduces fuel burn. We are currently working with customers to assess the impact of these weight and fuel burn savings over the longer term, and look forward to sharing data on this with the industry when available," Marston reasons.

Neath tells us about the very promising new chrome-free technologies that enhance employee safety as well as minimising the environmental impact. "It will be 20 years before the industry is able to see a substantial reduction in hazardous waste due to the current in-service fleets and the slow progression of the latest

technologies," Neath further adds. However Marston begs to differ, he says that MAAS has already adopted sustainable practises to the fullest extent and the company is reaping the benefits. He further goes on to explain how sustainability is at the helm of operations at MAAS

- Across the sites, MAAS has a number of recycling initiatives already in place to reclaim and reuse materials. The latest example of this is a water treatment plant to process chemical waste from its daily operations and separate the water from the contaminants, enabling cleaner and easier disposal.

- Furthermore, all of the paint bays at MAAS have underground sump systems built below the hangar floor to ensure no waste chemicals or contaminated water ends up on the apron or local area.

- MAAS has also developed their own unique recycling technology which allows to recover 80% of the used solvents. These solvents are then redeployed for cleaning equipment such as paint guns, lines and pipes.

- All the dry materials used in the painting process, such paper, plastic sheeting and tape, are also recycled.

Marston further adds that "There is an Executive Leadership Team member at MAAS responsible for driving our ESG roadmap forward with the objective of making a meaningful contribution to combating the impact of CO2 and other greenhouse gas emissions generated through our business practices."

All-in-all, many companies are adopting sustainable practices, focusing on eco-friendly paint choices and recycling waste materials, making the painting process more efficient, cost-effective, and environmentally responsible.

Rising demand for painting slots

The increased demand for aircraft painting services is driven by several key factors, including the growing global fleet of commercial and private aircraft due to rising air travel demand. "Airlines and operators are placing greater emphasis on branding, using unique liveries to enhance visibility and differentiate themselves in a competitive market," adds Neufeld. Aesthetic upgrades are also essential, as airlines refresh their fleets to maintain passenger appeal and modernise older aircraft. Also, a very clean and aesthetic

looking exterior is very pleasing to a potential buyer, so leasing companies sometimes opt to get a clean paint job accomplished prior to putting a plane on the market.

Agreeing with Neufeld, Back adds, "When the resale market is active, new owners often want a different paint scheme applied to fit their taste after the purchase."

Sustainability trends are influencing the industry, with a shift towards eco-friendly paint technologies, while mergers and acquisitions create a need for rebranding and repainting to reflect new corporate identities. Furthermore, the aviation industry's increased focus on maintenance ensures that regular repainting is part of comprehensive upkeep strategies. As per Neufeld, "Technological advancements in painting processes make repainting more efficient and cost-effective, further encouraging operators to seek these services."

Most importantly, in the post-COVID years, some older aircraft retirements have been postponed by owners as demand for private aviation hit record highs. Now, with demand slowing just a bit, some of those older aircraft are receiving some investment in paint and other modernisation steps such as new interiors, upgraded avionics, etc.

Collectively, these factors contribute to a robust market for aircraft painting services in the aviation industry. Additionally, regulatory compliance mandates periodic repainting to address wear and tear and ensure safety standards.

However, the current supply chain constraints are impacting the aircraft paint industry in various ways. "Material shortages, particularly of specialized paints and coatings, have led to delays in painting projects as suppliers struggle to meet demand," says Neufeld. These shortages contribute to increased costs for raw materials due to scarcity and rising transportation expenses, which may be passed on to customers.

Additionally, logistics disruptions have extended lead times for the delivery of essential supplies, complicating maintenance schedules for airlines. The industry is also facing labour shortages, making it difficult to find skilled workers for painting projects, further slowing production rates.