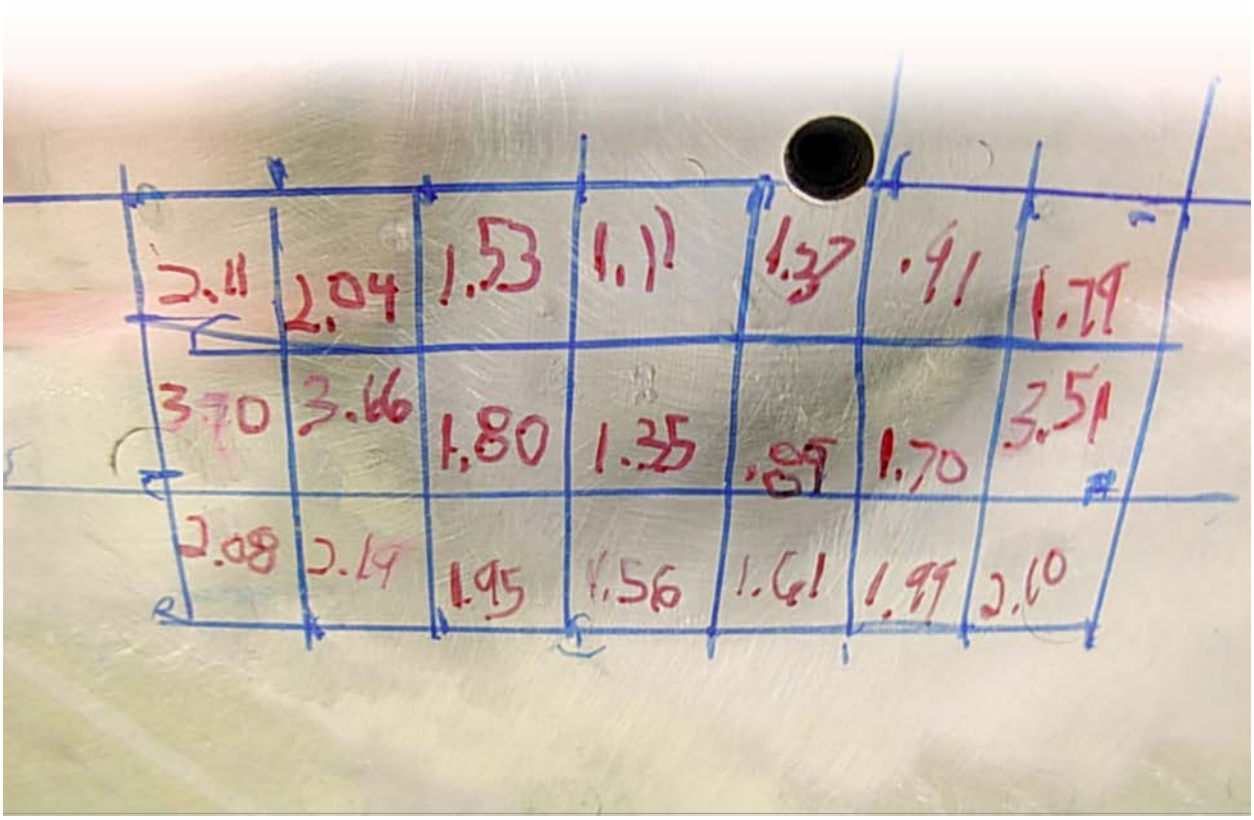
CORROSION DETECTION:

HOW TO PREVENT SCHEDULING DISRUPTIONS ON MAJOR AIRFRAME INSPECTIONS

By Suzanne Hawes, Pete Hubbard,
Brian Campbell and Kris Lash



DUNCAN AVIATION

www.DuncanAviation.aero/airframe

The potential for hidden damages and corrosion increases as an aircraft ages. Several makes and models are reaching maintenance intervals where unforeseen damages and repairs can extend service schedules significantly.

Corrosion is usually discovered when an aircraft is stripped for paint, typically after aircraft maintenance is complete. When this occurs, the aircraft is returned to the hangar for structural repair, which adds several weeks to the project schedule.

By stripping an aircraft before maintenance begins, surface corrosion can be detected and in many cases repaired without disrupting the project schedule.

AGING AIRCRAFT

As business aircraft fleets have aged, Duncan Aviation's maintenance teams have observed more and more instances of corrosion, says Suzanne Hawes, Paint and Interior Modifications Representative at Duncan Aviation's Battle Creek, Mich., service center.

Stripping an aircraft before an inspection allows for early detection of surface corrosion, potentially saving weeks of downtime.

"We work on a lot of Falcons, and we've noticed an increase of corrosion in the past few years," says Suzanne. "We've also observed it on all aircraft makes and models."

All aircraft are subject to hidden damages and corrosion, says Brian Campbell, Paint Shop Manager in Battle Creek. "This is part of what happens with aging aircraft. Some models are more prone than others."

THE PROBLEM OF CORROSION DETECTION

Aircraft corrosion is not always obvious to the naked eye, says Kris Lash, Paint Shop Scheduler in Battle Creek. Sometimes pitting can occur under the paint without any noticeable change in appearance. While vigilant maintenance of aircraft paint is always beneficial, "it's not realistic to find all corrosion with a visual inspection until after the aircraft is stripped because the surface is concealed by paint," says Kris. "In some instances, corrosion has to become severe before it begins to show through."

Even then, the only effective means of detecting corrosion is to strip off the paint. "We don't truly know what's under the paint until we remove it," says Suzanne. "Some aircraft show major signs of corrosion and it is actually very minimal. Others look clean and they have a lot of corrosion."

During a typical maintenance and paint event, the aircraft is stripped after the inspection is complete. However, if corrosion is detected during the paint process, the aircraft must be removed from

the paint cycle and returned to the hangar for structural repairs. Then it can re-enter the paint cycle… if there is paint labor immediately available.

"What if you were at a facility that only painted aircraft and you ran into corrosion issues?" says Suzanne.

PROACTIVE CORROSION DETECTION

Stripping an aircraft prior to maintenance is a proactive approach to corrosion detection that buys extra time for repairs. Duncan Aviation refers to this method of interrupting the paint cycle as an "out-of-sequence strip and paint" event.

Early corrosion detection allows engineering solutions and structural repairs to take place during the inspection.

By inspecting for aircraft surface corrosion early on, engineering solutions and structural repairs can take place during the maintenance inspection. An out-of-sequence can save four or more weeks of downtime in cases where corrosion repairs can be completed during the project schedule.

If an operator is concerned about corrosion on their aircraft, they may want to consider stripping the aircraft prior to inspection. "We can address the corrosion and minimize the impact to the customer," says Suzanne. "It can really save downtime in the long run."

OUT-OF-SEQUENCE BENEFITS

- Makes an aircraft easier to inspect.
- Identifies surface corrosion before maintenance begins.
- Allows engineering solutions and structural repairs to be worked during the scheduled maintenance.
- Can reduce downtime significantly.
- May prevent the loss of a paint schedule.

WHEN IS IT RECOMMENDED?

The older an aircraft is, the higher the risk of corrosion. Aircraft nearing 12 years of age may benefit from an out-of-sequence event. For example, it's typically recommended for Falcon 4-C inspections because the aircraft is older and likely to be more prone to corrosion. It is usually not recommended for the first C inspection.

Some factors are known to increase the risk of corrosion. Aircraft with high flight hours, that operate in salt water environments or that are allowed to sit for long periods of time outdoors may benefit from the out-of-sequence program.

Paint discoloration or bubbling is cause for concern, as it may indicate existing skin damage or an increased risk for damage to occur.

Paint exceeding six years of age may not offer as much protection against the elements as newer paint finishes (see "sacrificial anodes"),[1] although meticulously maintained

[1] "Chrome-Free Aircraft Paint Systems: Why & How Aircraft Paint Systems Are Changing." Duncan Aviation. http://www.duncanaviation.aero/files/whitepapers/Chrome_Free_Paint.pdf. pg 8.

paint finishes may be able to go for longer periods between paint jobs.[2]

Recently acquired aircraft approaching their 12-year inspection intervals may also benefit from the program, especially if their paint maintenance histories are not entirely known.

CUSTOMER EXPERIENCES

In 2011, Duncan Aviation performed 16 out-of-sequence strip and paint events at its full-service facilities in Lincoln and Battle Creek, says Suzanne. Some operators have saved a month or more of downtime on corrosion repairs, while others did not encounter corrosion issues.

Downtime is saved when corrosion repairs are required. Some operators have saved a month or more.

For example, an out-of-sequence event was performed on a Falcon double wing demate, which revealed extensive corrosion on the aircraft, says Suzanne. The project workscope was extended significantly to develop engineering solutions with Dassault and accommodate repairs. However, detecting the corrosion early on saved the customer at least four weeks or more of additional downtime.

By contrast, another aircraft had large sections of paint missing, and Suzanne and the customer were concerned corrosion would be an issue. The out-of-sequence event revealed a clean aircraft.

"I recommend this for any aircraft going through a major inspection and paint job," says Pete Hubbard, Airframe Service Sales Rep. at Duncan Aviation's Lincoln, Neb., service center. "Corrosion is not specific to any aircraft make or model, or age."

HOW IT WORKS

During an out-of-sequence event, the inspection and paint processes are the same. The paint process is simply interrupted after the aircraft is stripped.

The aircraft typically arrives for an out-of-sequence event on Wednesday or Thursday, and all the incoming runs and checks are performed. The aircraft is then masked, seams are taped and the stripping agent is applied and allowed to work for the prescribed period. Once the aircraft is stripped, it's rinsed and the metal surfaces are sanded.

"The metal really needs to be sanded for any corrosion to be visible," says Suzanne. "If there is surface corrosion, we have the time to work with the manufacturer to identify a repair scheme. We can usually do this in the two to six weeks the aircraft is down for maintenance."

When the maintenance and repairs (if needed) are complete, the aircraft returns to the paint shop and continues the paint process. An out-of-sequence event

---

2 "Paint, Maintenance & Turbine Aircraft Value." Duncan Aviation. http://www.duncanaviation.aero/files/whitepapers/Paint_Maintenance_and_Aircraft_Value.pdf. pgs 2-4.

does duplicate some of the paint labor, particularly re-masking and taping the aircraft, says Pete.

DOWNTIME & PAINT SCHEDULE

An out-of-sequence event is a method of detecting possible corrosion. While it does add two to three days to the overall schedule, if corrosion is found it provides a window of opportunity to complete the inspection and repairs in the original scheduled downtime, says Suzanne.

A limited number of out-of-sequence events are available each year. Events should be scheduled six months in advance.

Minor corrosion can be addressed during the inspection downtime and meet the scheduled paint slot, says Brian. However, major structural repairs may cause a project to miss its paint schedule. In these cases, the engineering, airframe, structures and paint teams work together with the project manager to coordinate the best schedule for the customer.

SCHEDULING CONSIDERATIONS

"There will be limited out-of-sequence events in 2012," says Suzanne. Splitting the paint process requires additional manpower, which impacts paint shops, says Brian.

To secure dates operators want, scheduling should be done four to six months in advance. "I highly encourage people to schedule at least six months out to secure the timeframe and location they want," says Suzanne.

AVAILABILITY

Out-of-sequence events can be performed for any aircraft, says Pete. The program is typically paired with 2-, 3- or 4-C inspections on Falcon 50, 900, or 2000 series, says Suzanne.

Recommendations for the program will likely be extended to include Doc 10 inspections on Citations.

WHAT TO LOOK FOR

Ask if the aircraft will be sanded after the stripping process. Sanding the exposed skin reveals corrosion.

Paint shop flexibility is essential, as shifting manpower between strip, maintenance and paint processes can strain the schedule.

Facilities with more or larger hangars help accommodate an out-of-sequence paint event and prevent aircraft exposure to the elements.

Correct tooling and test stands are essential.

Experienced engineers working on-site to develop solutions for corrosion repairs are beneficial.

Manufacturer relationships improve the approval process for engineering solutions.

DUNCAN AVIATION'S AIRFRAME MAINTENANCE & PAINT REFURBISHMENT SERVICES

The out-of-sequence program was developed by Duncan Aviation after observing increased instances of corrosion in aging aircraft, and is provided as an additional service to our customers.

Duncan Aviation's on-site engineering teams are experienced with coordinating structural repairs with OEMs.

Duncan Aviation provides major and minor airframe inspections and paint refurbishments on most popular makes and models of business aircraft. We hold service center authorizations for several major Original Equipment Manufacturers (OEMs). Our on-site engineering teams have extensive experience working with OEMs to coordinate major aircraft repairs, including corrosion repairs.

Out-of-sequence events may be scheduled at Duncan Aviation's paint facilities located in Lincoln, Neb., and Battle Creek, Mich.

Work with some of the most experienced corrosion repair teams in the industry. Contact a paint modifications sales rep. today at +1 402.475.2611!

