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Growing Old Gracefully

"Senior" Care for Aging Airplanes

You know your plane is getting old when:

1. Your marquee avionics component is an ADF
2. The tiny foreign flags painted on the side aren't a homage to your heritage
3. You remember flying it for a $25 hamburger
4. Your owner's manual was published the same year as *Catcher in the Rye*
5. You have a "blip switch" to control your taxi speed

While the list above might elicit a chuckle, aging aircraft problems are a stark reality for an increasing number of aircraft owners.

Comedian George Burns once said, "If I'd known I was going to live this long, I'd have taken better care of myself." Burns, who lived to be over 100, also quipped, "You can't help getting older, but you don't have to get *old*."

Both of these quotes can resonate with aging aircraft owners. In aviation's early days, few aircraft manufacturers imagined a period of usefulness that would exceed 20 or 30 years for new aircraft rolling off the line — let alone 40, 50, or even 60 years! But as we've seen in the general aviation industry, that type of longevity is more and more common. It stands as a tribute to sound construction and design standards, as well as proactive maintenance practices.

Getting Started

Preparing your aircraft for its "golden years" requires a keen understanding of what can cause aging-related issues in the first place. And, given that 40 is now the average age for more than two-thirds of aircraft in the GA fleet, staying ahead of this aging curve has never been more important.

"There are several factors that can affect when, where, why, and how an aircraft shows signs of aging," says Marty Bailey, manager of the National FAASTeam's Airworthiness Branch of the FAA's Aircraft Maintenance Division. "Everything from environmental factors — like what type of climate an aircraft operates in, to how an aircraft is used — like banner towing or flight instruction, can affect the aging process."

As the GA fleet continues to age, more owners are understandably concerned about whether an

airplane designed prior to life limit requirements will somehow exceed its useful life expectancy. Many GA aircraft were designed under Civil Aviation Regulations (CAR) part 3, which did not mandate service life limit requirements. Even with newer aircraft, many pilots are concerned with how aging can affect more modern construction materials and methods.

To address these issues, the FAA, along with industry, has invested considerable time and resources studying various aging factors that can impact aircraft over time. As a result, much has been discovered about corrosion, fatigue, and inspection techniques — the key factors for mitigating the effects of aging in general aviation aircraft.

So How Old is Too Old?

There might be a few more of the figurative gray hairs and wrinkles on the average aircraft these days, but according to safety records, the GA fleet shows no evidence of any systemic safety issues. Solid design and construction characteristics are a major factor in the longevity of these aircraft. But that can also be a rationale for complacency.

Inspection processes are a good example where this complacency can creep in. Although there is no requirement for an annual inspection to be any different for an aircraft that's 40 years old, it doesn't necessarily mean a 40-year-old plane should get the same type of inspection. Certain areas that aren't required to be checked should still be inspected. Owners and mechanics should ensure that inspections include *all* areas of the aircraft, not just the ones that are easy to reach and labeled on a checklist.

Also keep in mind that as an airplane ages, the inspection methods and techniques may change and require "special attention" inspections. These special inspections, focused on areas prone to aging problems, become even more critical when an aircraft is subjected to conditions like outdoor storage, inactivity, or modifications. If applicable, be sure to expand your normal inspection checklists to include these special attention items. For assistance, recruit help from the manufacturer, a mechanic, or a type club, and be sure to reference Advisory Circular (AC) 20-106, *Aircraft Inspection for General Aviation Aircraft Owner*. There's also a good baseline checklist at the back of the *Best Practices Guide for Maintaining Aging General Aviation Airplanes* (see link at the end).

A Corrosive Mix

Corrosion — the degradation of metals from a chemical reaction — is probably the most visible effect aging can have on an aircraft. Knowing what causes it and what corrosion looks like on different parts of your aircraft will help you identify, treat, and prevent it from doing further damage.

Many airframe structures use high-strength aluminum alloy coated with a corrosion-resistant pure aluminum coating (alclad). However, when you introduce airborne salts and pollutants along with moisture, the alclad can break down, resulting in the deterioration of the aluminum alloy below it. Protective primer is another method used to mitigate corrosion, however, it too is not a permanent protection. Corrosion on aluminum parts will generally appear like a crusty white or gray powder and can be removed by mechanical polishing or brushing with materials softer than the metal.

Another common material in aircraft construction is steel, which exhibits the familiar reddish brown rust when corrosion is present. Corrosion on steel can be controlled by removing it mechanically and by maintaining its protective coating (usually a cadmium or zinc plating).

Areas of where corrosion is likely to occur

Your chances of having corrosion are also highly dependent on where an aircraft is flown and stored. For example, owners who operate or store their aircraft in the warm, humid conditions found in coastal states like Florida or Louisiana need to keep a more watchful eye for corrosion. Take a look at the map on page 9 to see areas in North America where corrosion is most likely to occur. For detailed photos on corrosion types and control methods, have a look at AC 43-4A, *Corrosion Control for Aircraft.*

Cracks Kill

Another leading factor in aging aircraft issues — fatigue — can be a lot harder to detect. While many GA aircraft owners are not overly worried about the punishing stress of pressurization common to air carrier operations, there are many other causes of fatigue germane to GA. These include wind gusts, unpaved runways, and yes, the occasional student pilot. If left unchecked, these damaging forces can have deadly consequences.

Certain parts and components like engine supports, or wing spar attachment fittings can become fatigue hot spots. The key here is to know the hot spots specific to your aircraft and to keep these areas thoroughly inspected. A good way of doing this is to stay on top of pertinent FAA and manufacturer-based notices, like ADs, SAIBs, and service bulletins. Type clubs can also help keep you in the loop.

The effects of fatigue are also cumulative, meaning airplanes can't heal from being stressed. And since fatigue is based on load, which is not necessarily related to age, even owners of newer aircraft need to be vigilant and proactive in their inspections.

Get Some Knowledge

It's also a good idea to have detailed information about your aircraft's history as aging issues aren't limited to the number of years or flight hours an aircraft has accumulated. Among the questions you should ask during your research are: Where has the aircraft been geographically? Has it been hangared? Was it flown in any special or severe usage capacity? If that information proves hard to come by, try looking at some of the aircraft's maintenance records. You might find that it once had floats, or belonged to a flight school. The address of the owner or the repair facility should also provide clues to its whereabouts and the climates it has been exposed to.

Australia's Civil Aviation Safety Authority (CASA) is currently developing a program that will help with some of this time-consuming sleuth work. Last year CASA began testing a new prototype risk matrix tool for GA aircraft that helps owners see the likelihood of their aircraft being impacted by aging issues. An aircraft owner simply plugs in their aircraft type, serial number, and whatever additional background information he or she can provide. That information will be combined with existing information from CASA databases to provide owners with a color-coded risk assessment score. The FAA will be monitoring the success of the program to see if a similar type tool

would be beneficial here in the United States. (For more information on CASA's aging aircraft program, go to www.casa.gov.au/ageingaircraft.)

An important information gathering tool that the FAA already has at its disposal is the Service Difficulty Report (SDR) system. This massive public database contains thousands of aviation maintenance and service problem reports submitted directly by aircraft owners and mechanics. And soon the FAA will be rolling out an exciting new system called Aviation Data Exchange, or AVDEX, that may eventually take the place of SDR. This system will be simpler to use, more engaging, and will provide a real-time reporting environment with instant feedback and data availability.

"We are pushing for a cloud-based system that accepts data from all kinds of sources, including SDR," says Barry Ballenger, an aerospace engineer at the FAA's Small Airplane Directorate. "We're providing anytime, anywhere data availability using technology people already use, including smartphones, tablets, and laptops. And with AVDEX, instead of aircraft owners having to seek out and pull in information, the system will push this information directly to the user."

Having a system with this level of scalability, together with real time data processing, will also help the FAA to better spot trends and be more proactive in addressing potential unsafe conditions. AVDEX is in a concept refinement stage now, but stay tuned for more information soon.

Use It or Lose It

Another factor worthy of researching is how *much* an aircraft has been used. While it is true that special uses like moving heavy loads, low altitude flying, or flight instruction can exacerbate the effects of aging, certain areas of an aircraft can develop problems from being underutilized.

Regular flying keeps the engine parts lubricated and aircraft system components working as intended. In contrast, an aircraft sitting idle on a ramp may have components that deteriorate and age faster than those on a similar aircraft that sees a fair amount of routine flying. Sounds like a good excuse to get out and fly!

Tools You Can Use

As you can see, there are a great many details to master when it comes to aircraft aging. Thankfully, there are tons of resources and tools you can use to help you become better educated on how to properly care for older aircraft. But if you prefer one-stop shopping, the FAA-sponsored website (www.aginggeneralaviation.org) provides a single access point to type-specific aging aircraft maintenance information. In addition to providing an extensive list of aging-related documents, training curricula, type club information, and database links, the site also features a "War Stories" section where viewers can read, or even add a personal account of an aging-related aircraft incident.

To sum up, there's no silver bullet when it comes aircraft aging problems. The best you can do is to learn as much as you can about your aircraft. Know where it's been, keep it maintained well, and never stop assessing the need for additional inspections.

To paraphrase the earlier quote from Burns, aging is inevitable, but with the proper tools and the right mindset, it doesn't have to get the best of you. Now say goodnight Gracie!

Test Your Knowledge

What type of corrosion appears as a worm-like pattern beneath a paint or organic film?

A. Pitting corrosion
B. Filiform corrosion
C. Intergranular corrosion

Answer: B

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For More Information

Best Practices Guide to Aging GA Aircraft
http://1.usa.gov/1gPJhV0

FAA's Service Difficulty Reporting Site
http://av-info.faa.gov/sdrx/

FAA Advisory Circular (AC) 43.13-1B, Acceptable Methods, Techniques, and Practices - Aircraft Inspection and Repair
http://1.usa.gov/OJFWjq

AOPA/Air Safety Institute Online Course for Aging GA Aircraft
http://bit.ly/1hvKGpU