

Mothballs & Maintenance: The Risks of Long Term Storage

OPSGROUP Team
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It's a strange time for aviation right now: closed countries, fewer passengers, and a lot of aircraft being moved into hangars – not to see the sky again for some time. The long-term storage of aircraft is leading to some unforeseen issues...

We reported on some of these before, but we thought now might be a good time to give another quick summary because **aircraft are starting to fly again** – in particular the 737 Max which is back in the skies of Canada, the US, and soon Europe as well.

The Dangers of Long-Term Storage...

There have been a lot of incidents attributed to aircraft coming out of long-term storage. Wizzair fell foul of some bugs in 2020, an Aeroflot had a bit of a mishap after it was only partially ready to go back flying...

Both the US and EASA safety regulators have **raised concerns about certain issues for aircraft coming out of long-term storage**, so in case your airplane is currently stashed away, read on.

Nesting Nasties

We mentioned this one before, but with Covid dragging on, we figured it might be worth a reminder.

It sounds nightmarish, but insects have been known to build lairs deep inside aircraft probes, where even the most eagle-eyed walk-around check might not spot them.

And these critters have led to an alarming trend of **airspeed problems for aircraft new out of storage**.

Check out our earlier article on the risks of this here, and be sure to do an **in-depth check** of your aircraft's nook and crannies before taking to the skies again.



Wasps, bugs, beetles... all kinds of nasties in your nooks and crannies

Batteries Not Included

Aircraft with **Nickel-Cadmium batteries** (which is most of them, unless they have newer lithium ion ones) are suffering from **premature power loss**.

Embarrassing for the batteries, and dangerous for the pilots.

When disconnected, these batteries can lose their capacity, and when they are plugged back in again, they might not regain it – leading to **a lot less time of usefulness** that you think you have.

A battery not providing the performance you are expecting on that already bad day when you drop down to emergency power levels, is going to make it a really, really bad day...

What can you do? Well, EASA recommend that aircraft approval holders work with battery manufacturers to check out this new found phenomenon, but in the meantime – if you are waking your airplane up from a long term hibernation, make sure its ticker is ticking properly with **a full maintenance check**, before you head out for a spin.



From the classic 1987 movie 'Batteries Not Included'

Clean as a Whistle

Disinfecting is big right now, what with this old pandemic thing. But a lot of the cleaning agents that can kill Covid, can also **damage your airplane**.

Damage to screens, fogging and misting from liquid pooling in out of sights areas, and some alcohol based substances 'crazing' up windows (alcohol crazes most of us up, but on windows it can cause fine cracks, and permanent damage) are all risks of using the **wrong cleaning fluids**.

There is also a chance long-term use of certain cleaning agents might start to corrode parts and **increase the flammability of the interior**, and even cause some shorting of the circuitry.

So, the FAA and EASA have issued guidance suggesting you **check which disinfectants are suitable for your aircraft type**. That seems sensible. Their recommendations on how to clean are here, and you can find links to anti-Covid approved cleaning agents that you can check with your aircraft manufacturer before spritzing your plane.

Check your flappers

Back in July 2020, the FAA issued an airworthiness directive for 737 Classics and NGs because, when stored for just 7 days, they can start to suffer from **corrosion on the Bleed Air 5th stage check valve**.

What's the risk here? Only a little case of **double engine failure**, according to the directive. Thankfully, they also recommend a fairly straight forward check to confirm your valve and its flapper plate are flapping as they should.



The poor A380 is not hangared so much as retired at this point

What else can you do?

EASA recommend operators carry out **extra checks when bringing an aircraft back into service**. These include engine runs, flight control manoeuvrability and brake checks.

To be safe, they suggest you do it on **20% of your fleet**, and to be extra safe, they suggest you consider flight checks on **the first 10% returning to the skies**. Don't rush these checks. It takes 3-5 days to ready an aircraft for long term storage, so it probably takes the same to bring them out again.

And don't forget about your pilots! Pilots don't fare much better in long term storage either. Like their aircraft, they need consistent use, and without it, you're going to have to spend a bit longer getting them airworthy again. (We would suggest you let them clean themselves though, and it's probably best not to ask how their flapper valve is functioning ☺)

Some other stuff to read

- IATA Operations Info
- FlightGlobal Airworthiness concerns



A sad site but the yards are filling up

Unreliable Airspeed and the Hidden Risks of Aircraft Storage

Chris Shieff
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The dramatic effect that Covid-19 has had on the aviation industry has **grounded an unprecedented number of aircraft**. They have been placed into storage whilst the world waits to recover. The pandemic emerged without warning, and some operators were likely not prepared for what was coming.

Now travel bans are lifting, airports are reopening, and airlines are **scrambling to return aircraft to the skies**.

EASA recently released a disturbing Safety Information Bulletin. There has been an alarming trend in the number of aircraft experiencing unreliable speed and altitude indications during first flights after storage, caused by **contaminated air data systems**.

The result has been multiple rejected take offs and airborne returns. Most of the events have been caused by nesting insects in the pitot static system - **even after covers were installed**.

Modern flight instruments provide large amounts of information to crew with great precision, while automation makes flying transport category aircraft almost routine. Flight envelope protections and aural/tactile warnings keep us safe even in most abnormal scenarios.

At the heart of all of this is the **air data computer (ADC)** - a small piece of hardware that **needs accurate information from outside of the aircraft to work correctly**. They are the "Achille's heel" of modern electronic flight information systems. In a nutshell, these small computers obtain and process information from the aircraft's pitot static system, and supply critical systems with information such as airspeed, altitude and temperature.

Like all computers, they don't think for themselves. They are only as accurate as the information they receive. So, when the pitot static system is contaminated, they can only respond to what they sense. **They can't look out the window**.

History has shown that unreliable airspeed events are dangerous:

February 6, 1996. Birgenair Flight 301, a Boeing 757, departed Puerto Plata in the Dominican Republic, on a routine flight. During the climb out, the Captain's airspeed indicator began to increase dramatically. The autopilot reacted as designed, and increased pitch to reduce airspeed, while the auto-throttles reduced power.

In the meantime, the co-pilot's ASI indicated a dangerously slow airspeed which was decreasing. Almost

simultaneously, an overspeed warning was generated. The autopilot reached the limits of its programming and disengaged. The stick-shaker activated, warning the confused crew that the aircraft was flying critically close to a stall.

The Captain responded by applying full thrust. The excessively high angle of attack resulted in insufficient airflow to match demand and the left-hand engine flamed out. The right-hand engine developed full power and the aircraft entered a spin. Moments later the aircraft became inverted, before impacting the Atlantic Ocean. The three pilots had 43,000 hours of experience between them.

The cause of the accident was a **blockage of a single pitot tube**. The likely culprit was the black and yellow mud dauber - a small wasp known to nest in artificial cylindrical structures. **The aircraft hadn't flown in 20 days.**

The threat of similar events is greatly increased by **improper storage techniques** and **rushing to return to service**.

Getting aircraft flying again is a **complex process** and presents **major risks**. It is up to operators to ensure adequate procedures are in place to accomplish it safely. They must anticipate the difficulties and rapid adaptation to internal procedures that this entails.

Don't know where to start? We don't blame you. Thankfully, EASA has published guidance which can help mitigate some of these risks. Here is a brief rundown of their recommendations:

- **Assemble your A-team.** Everyone needs to be onboard. Flight operations, CAMOs, maintenance organisations, type certificate holders and aviation authorities are your first port of call. Find out what needs to be done for each individual tail number and communicate with human resources for manpower, supply chain for the tools, and flight ops for hangar spacing and crewing. Think about who you need to talk to and get started early.
- **Similar aircraft stored in similar conditions will invariably behave in the same way.** Safe return to service begins with **good data**. It is vital that defects are reported and linked. If a nest is found in an aircraft's pitot tube, the odds are there will be many more. The data needs to be analysed, and operating procedures (**such as additional checks**) need to be changed to reflect it.
- **Storage Procedures.** It is possible that aircraft were not fully stored in accordance with manufacturer procedures. Implement a **rock-solid audit programme** to make sure things are being done properly. EASA recommend extra inspections, ground runs and flight testing of **at least ten percent** of aircraft before release to service.
- **Storage Environment** The storage environment presents significant hazards to airworthiness. Insects, sand, salt, dust and humidity can all damage aircraft. There may not have been enough protective covers to go around. Was there biocide in the fuel? Is it even useable? It is advised that extra checks be carried out on aircraft parts that are susceptible to contamination, **particularly pitot/static systems**. Get additional support to add those inspections.
- **Remote Storage** This presents unique challenges. Engineering services may be limited, and staff may become overwhelmed with the large number of aircraft waiting to become airworthy. You may need to send additional manpower or require ferry permits to move aircraft around. Is enough equipment on hand to complete extra checks?

- **Time.** Nothing happens in a day. **Commercial time pressure is a major risk factor.** Getting an airplane airworthy can cause delays and rushing has a profound effect on safety. Plan ahead and make sure your deadlines are realistic. Communicate them with your staff to ensure confidence.
- **Inappropriate decision making.** This is hazardous, particularly with unfamiliar procedures. Storage on this scale has never happened before and **answers may not be in existing manuals.** Key personal may not be immediately available to help. Remind staff not to act alone and create a team responsible for making decisions in this challenging scenario
- **Limited staff experience.** Remember that **this has never happened before** and you may need the help of staff who are new to your organisation. Make sure they are aware of internal procedures that they need to know beforehand. It is a good idea to **properly supervise them** and assess their work.
- **The elephant in the room. Covid-19.** The virus has changed the way we can work. Staff can't move around as freely and there may be restrictions on how many people can work together. You may need to plan ahead and establish isolated teams who work remotely if practical.
- **Overdue maintenance.** Airworthiness directives, MELs, routine maintenance, inspections, ground runs, test flights. There is a lot to do. Start with comprehensive **airworthiness reviews** of each individual tail number.
- They will be under the same pressure that you are. Communicate with them ahead of time and **check their availability.**
- **Pilot training.** It is likely they are uncurrent, and operating aircraft which have just come out of long-term storage. **Simulator training should be relevant to the challenges they will face in the current operating environment.** Consider critical systems vulnerable to damage in storage and the affect that these might have on the first flight. In other words, expect the unexpected and provide them with the ability to **react quickly and with confidence.**

Covid-19 has created a lot of unknowns in our industry. Amongst the noise of statistics and global media, it is important to **remain vigilant** to the risks specific to aviation that the virus has created. Most of us will have heard by now that aviation itself is not inherently dangerous, but terribly unforgiving of complacency. Never has this been more important than when returning 75% of the world's fleet from storage to the skies.