Any Single Pilots Out There?

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The big talking point of the moment – Airbus and Cathay Pacific's project to have **only one pilot in the cockpit during cruise.**

So let's take a look at what this might mean for **safety**, **operations** and **pilots** worldwide.

The headlines are misleading

Cathay and Airbus have **not** designed a new A350 which no longer needs pilots operating it. There is **no** mega computer AI robot involved which is stealing our job.

The plan is to simply allow **one pilot to go and rest during "quiet cruise" phases**, while another pilot remains in the cockpit vigilantly monitoring (and probably with toothpicks propping their eyes open). This will allow them to potentially reduce the number of crew required on long haul flights, and while it means a change to procedures it is not really, as many are reporting, a leap towards pilotless flight decks.

Maybe just a small step

So, what are the considerations here that people are talking about?

Cathay Pacific are in talks with Airbus on this project

GermanWings

The GermanWings accident resulted in a rule that there must be two persons in the cockpit at anytime. So if a pilot needed a bathroom break, a cabin crew member was required to come in. This was fairly contentious at the time because, as many pointed out, **what is a cabin crew member going to do** if a "situation" arises?

This **rule was eventually revoked**, in part because EASA and other authorities brought in new regulations relating to pilot psychometric testing. However, with only one pilot in the flight deck, this does raise various safety concerns – from events similar to the GermanWings accident, to the question of pilot incapacitation or even, what do they do if they need the loo?

What about the AF447 accident?

AF447 was, in part, **attributed to the experience levels of the two crew in the flight deck** – both First Officers while the Captain was out sleeping.

Using cruise relief pilots is not a new thing though, and in order to operate with a single pilot, that pilot will presumably need to meet a minimum experience level. Additionally, the Captain will maintain the decision as to when they leave the flight deck in their First Officer's hands.

Big storms on the horizon? Maybe stay in for a bit longer.

The lonesome pilot can also recall their colleague to the flight deck should a situation require it. So the question really comes down to whether a situation is likely to arise where, by **having only a single pilot the result is more critical or catastrophic** than if two had been present and therein lies the problem – because years of aviation safety studies have shown time again that there is a reason we operate with two crew.

Safety in numbers

Modern aircraft, and the A350 in particular, have **many levels of safety and redundancy** to support the crew. They can automatically fly TCAS maneuvers. They can carry out an emergency descent at the push of a button. In addition, Airbus are working to demonstrate that their aircraft and systems are robust enough to basically not really fail. They are also designing them to be able to **autonomously handle any situation without pilot input for 15 minutes.**

This will be a big deal. It will mean, should something fail, *and* the single pilot be incapacitated, that there is time for the second pilot to wake up and make it to the flight deck to solve the situation. However, **recent aviation accidents involving malfunctioning systems** (designed to minimize pilot workload), and ongoing concerns about automation complacency highlight the potential downside of such advancements.

Can ETOPS can teach us something?

The A350 was certified for 370 minutes ETOPS. That's a long time. It is over 6 hours. 6 hours on one engine potentially. So what leads to this?

ETOPS is given to the operator, not the aircraft, and it is based on the operator's ability to demonstrate necessary airworthiness, maintenance and ops requirements. **It is really a statistical thing.** If an operator hasn't had an engine issue in a really long time then they are probably going to be able to get a better ETOPS approval.

So what does this have to do with only one pilot in the flight deck?

Well, it boils down to the same thing – statistics and procedures:

- How often does something go wrong in the cruise (which requires two pilots to handle it)?
- What procedures will be in place for ensuring safety and redundancy levels are maintained?

The answer to Question 1 might be *"hardly ever"*, but aviation safety improvements are built on the fairly simply idea that **if there is a risk, find a way to mitigate it.**

Even if that risk is minute, if it can be removed it should be. This is why astronauts have their appendix out before heading into space. This is why we have redundant systems onboard, or each pilot eats a different meal. Statistics might suggest an event occurring which a single pilot cannot deal with and which then results in a fatal accident or hull loss is tinier than a hair on a fleas back…

But if a risk exists that can be mitigates simply by retaining two pilots in the cockpit, then two pilots should remain.

A Disco onboard

They gave the A380 a bar and showers, now the plan is to have Discos…

DISCO actually stands for Disruptive Cockpit (I am not sure that sounds any better). This is the Airbus project looking at enhanced cockpit design to enable single-pilot operations on new aircraft.

The DISCO concept is looking to place core technologies into the flight deck in a 'multi modal' way. Things like pilot monitoring systems which track eye movement, voice recognition for commands, improved ground collision avoidance systems, new navigation sensors.

And of course pilot health monitoring systems.

An integral safety aspect of this concept lies in the monitoring of the sole pilot, and the availability of a system to detect if they become incapacitated, and to alert the remaining crew member.

Not an entirely new concept

It is only happening in 2025

The plan is to implement this in 2025. That is **3 and a bit years of procedure writing, regulation making, testing and trialling** before it is put into action, and there are a fair few obstacles that stand between now and that day :

- Regulators will be looking at their procedures with a fine tooth comb
- The pilot will probably need monitoring, particularly to ensure incapacitation does not occur (or if it does, the other pilot can quick-foot it back)
- There will need to be pilot training in place
- Airbus need to hit that 15 minutes of safe autonomy.
    - And these systems will also need to deal with situations where ‘Black and White’ failures do not occur. When you consider the multiple, varied and often “illogical” failures which can arise from a lightning strike, a bomb onboard, or multiple computer failures this does not look as simple as Airbus might say
- The approvals for this do not just sit with the Hong Kong authorities. Any state that the airline might overfly with only one pilot in the driving seat is going to have to be convinced as well
- Passengers will need convincing…

And they still need to answer the question of the toilet. We all want a little more information on how that

‘specially designed unisex toilet’ to be used ‘in coordination with ATC’ will work.

A new flight deck concept?

If this happens, they won’t need pilots anymore

This is a contentious one to raise right now. Say ‘single pilot’ or ‘autonomous systems’ and a lot of pilots break out in a sweat, seeing themselves replaced by AI computers. But aviation has always been very innovative and those in it have always had to adapt to new technologies. Take a glance back to the 1980s and flight engineers were still a relatively common site in flight.

Ignoring the rather decimating impact of Covid though, **aviation was growing, and it was growing fast.**

Chances are it will again.

There are around 200,000 active pilots and forecasts suggested upwards of 500,000 would have to be trained over the next two decades to meet forecast growth demands. Even if every (long haul) flight deck sees the number of crew in it halved, it is still probably safe to say none of the current or new generation of pilots will be out of work anytime soon.

But we still are not convinced

There are unresolved questions here. **The main one being “Why?”**

You see, there is already this rather marvelous thing in an airplane – it can watch the pilot, it can monitor aircraft systems, and it can take over no matter what the failure or the complexity of that failure might be…

It is called “the other pilot”.

There is a good reason why aircraft are multi-crew machines. So why are Airbus and Cathay Pacific investing millions into developing systems which can do this?

It isn't for safety…

This is being driven, not by manufacturers looking to increase safety, but by **an operator looking to reduce costs.** And for many, that appears an unwise and arguably unethical reason. Even if the statistical impact on safety is a 0.0001% decrease, that is still an unacceptable decrease when it is made for business reasons. There are also a great many places within an airline or operation where costs can be cut, and when cuts are made these should never occur at the price of safety, even if that price does seem negligible.

The main photo is of a pair of VietJet co-pilots who got married – because we think that's nice, but also because we liked the play on 'single pilot' in the flight deck idea. Congrats to them both for their lovely day!

Bad Air: Fumes and Contamination

Chris Shieff
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Fumes. Chances are if you've been flying for a while you've already experienced them. A recent study showed that in the US alone there are on average five fume events reported every day, and those are just the ones we know about. NASA previously eluded that these reports are just the 'tip of the iceberg.'

It's an industry-wide issue and there's no magic bullet in sight to fix it. As long as we continue operating aircraft that use bleed air, the risk will persist and we need to take it seriously.

Each time we hop in an airplane we run the risk of being exposed to bad air – a threat that has potential to incapacitate both pilots. It's happened before – just google Spirit Airlines Flight 708.

What do we actually mean by 'fumes'?

It's important to understand they are not the same thing as a smell. **Smells** can be unpleasant but are not necessarily a cause for concern. Your first officer may be to blame, or perhaps a dirty oven. They can also indicate a fume, but aren't necessarily dangerous on their own.

Fumes on the other hand – *are* dangerous. In a nutshell, they are anything that produce physiological symptoms when inhaled. Fumes can be colourless, odourless and difficult to detect until they are already affecting you.

What about the regs?

So if it's that bigger deal, **why aren't we testing the air?** Both FAA and EASA airworthiness rules require cabin air to be free from harmful or hazardous gases and vapours but fall short of ongoing testing.

Detection systems are also required for safety critical systems but they have never been enforced for monitoring bleed air. Which is surprising considering it is what we breathe. Both IFALPA and ICAO have previously expressed concern at the lack of regulation out there to protect us and our passengers from contaminated air.

The reality is that **most airplanes don't have air detection – nor are they required to**. Essentially it has become an acceptable risk that we need to deal with.

So, what can we do about it?

Knowledge is key. The more we know about fumes, where they come from and what to do in the air, the better we can deal with them safely.

Where are they coming from?

(Almost) all turbine aircraft in service use heated air drawn or 'bleed' from the engines or the APU for air conditioning and pressurisation. This is air is taken through ports before being cooled and mixed with recirculated air and distributed into the cabin and cockpit.

We rely on seals to keep the air clean of a load of nasty chemicals that turbine engines need to operate properly. Unfortunately when those seals leak or fail they allow toxic substances to enter the air we breathe.

What kind of substances?

Modern aircraft are complex, and we can be exposed to a surprising variety of chemicals – none of which do our bodies any favors.

Here are some of the major ones:

Synthetic engine oil. The number one culprit. Engines need it for lubrication and to keep bearings spinning smoothly. While accessories such as starter generators and accessory gear boxes rely on it. The problem is that it contains organophosphates – manmade chemicals that are toxic when inhaled. Oil contamination is often described as smelling like dirty socks, mustiness or 'wet dog.'

Hydraulic fluid. Leaks and spills on the fuselage can be drawn into the APU inlet along with air intended for the cabin. They also contain organophosphates and are often characterised by a very acrid, bitter and oily smell.

De-icing and anti-icing fluid. Be careful of this one. There are usually some pretty specific procedures

to follow. If they're not done properly fumes can enter the aircraft through a running engine or APU intake. These fluids often contain chemicals that are dangerous to humans such as Diethylene Glycol.

Fuel. Fuelling operations at the airport, tank venting and failed relights can all allow fumes to enter the cabin. Excessive build ups will start to make people feel very unwell very quickly. Ventilation is your friend here.

Electrics. Electrical fumes can be caused by failed or faulty electrical systems and may precede a fire. Recirculation fans are also known to fail and produce smoke in the cabin.

Speaking of which, **don't forget the cabin!** There are lots of things in there capable of producing fumes including what passengers have brought on (nail polish remover is a classic), cleaning products, galley equipment (dirty ovens, anyone?) and the lavatories.

Know the signs…

How badly fumes affect you depends on what you have been exposed to and how much of it was in the air. Generally speaking, most "fume events" result in some of the following:

Here's the **good news**. In the overwhelming majority of cases, bad symptoms will last a few hours or perhaps a few days. Long term effects are possible but rare. The initial actions should be about protecting yourself and those in your aircraft.

So if you think you have fumes, what should you do?

Get on Oxygen. And 100% too. Don't dilute it as you'll still be breathing in what you're trying to keep out.

Communicate. Get in contact with your cabin crew. At this stage you need to figure out what it is. Your two biggest clues will be where is it coming from, and it's odour. Also talk to ATC – let them know you have an issue.

Run your safety procedures. Get that QRH out and look for a fumes removal checklist. Be careful if your checklist is combined with smoke removal. In some cases you will increase pack flow. But if that's where the problem is coming from, it may make things worse.

Think about health. You may have incapacitated crew or passengers. If it's a pilot, you likely have a procedure for that too. Consider getting help from a service such as MedLink. If things have gotten really bad, you may need to declare an emergency and divert.

You're back on the ground and breathing that good ol' fresh air again. Here's what you need to do.

De-brief your crew. Find out whether anyone felt unwell or couldn't perform their duties properly. If so they should stop operating right away until they have seen a doctor.

Report it! As much as you can, no matter how minor. Most operations have a form which will help you. Try and include as much detail as you can as trying to find a 'bad smell in cabin' is like trying to find a needle in a hay stack. Don't forget the tech-log too – help the engineers help you.

Consider **visiting your doctor**, particularly if you have persistent symptoms.

What can the industry do to stop this happening?

The ultimate solution is **bleed free design**. And the future is now – check out the Boeing 787. It's the poster boy/girl of this huge leap forward. But for most of us out there, we're stuck with it.

Filtration. They're not 100% effective but bleed air filters are a far cry from simple recirculation filters which are about as useful for fumes as a glass hammer.

Better chemicals. Okay, this one is out of our hands, but the industry should be prioritising this.

Detection and monitoring. The smoking gun. We are literally surrounded by chemicals that are bad for us in our tin cans up there. More needs to be done to make sure the air we are breathing is *good* air. We need to be able to know when something bad is in the air we breathe. It's a no-brainer.

The elephant in the room. Which airplanes are the worst?

The moment you've all been waiting for. Don't shoot the messenger. But statistics show that the **BAe 146** and **Boeing 757** appear to be the worst culprits. But the reality is if you are flying any airplane, you are at risk of fumes.

What about Aero-toxicity?

The question of long term effects from exposure to chemicals in planes is beyond the scope of this article and the research is inconclusive. But if you're worried about it, the Aerotoxic Association is a good place to start.

There's a ton of reading out there too if you want it. Here are a few good ones.

- ICAO Circular 344 – Learning, training and reporting fume events.
- IFALPA Human Performance Briefing – IFAPLA's guidance of fumes.
- What the FAA have to say about it.
- Some good stuff from the friendly folk 'down under'.