

Cow Farts and Aviation

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Did you know that **cow farts** are one of the major contributors to global warming?

Go ahead – google it. Just know that your search history will take some explaining later.

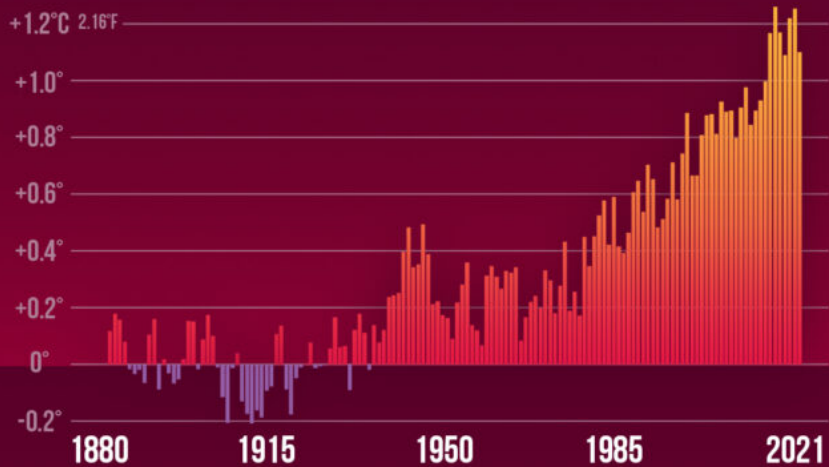
In fact they account for eighteen percent of the problem. They're flatulent creatures, and their trouser coughs contain methane gas which is almost one hundred times more powerful at trapping heat than good ol' carbon dioxide. In fact their flatulence is so strong, it can cause acid rain. Umbrella anyone?

Why are you reading this on an aviation website? Fair question.

Because regardless of where you stand on the cause of global warming, we know for a fact that the earth *is* heating up. **And aviation is poised to be one of the victims.**

GLOBAL TEMPERATURE

DEPARTURE FROM 1881-1910 AVERAGE



Source: NASA GISS & NOAA NCEI global temperature anomalies averaged and adjusted to early industrial baseline (1881-1910). Data as of 1/13/2022.

CLIMATE CENTRAL

Regardless of the cause, the figures don't lie...things are heating up.

Let me explain.

Bumpy Road

As the earth warms, jet streams will become **stronger** – along with wind shear. As we hitch a ride on those long routes eastbound, **clear air turbulence** is set to become much more frequent, and much more dangerous.

They've done studies, you know – and those jet streams are already fifteen percent more sheary than they were back in the 70s. And things are **accelerating**.



Jet stream related wind shear is already 15% stronger than the 70s...

The bottom line is this: scientists believe there is going to be two to three times as much severe turbulence in the next few decade thanks to cow farts (and of course all other contributing factors).

How severe is severe?

We're not talking light chop.

There are two levels of turbulence we're most concerned with. The first is **severe** - essentially large and abrupt changes in altitude or attitude. Your aircraft may even be out of control momentarily.

Beyond that turbulence can also be **extreme**. It doesn't make for pleasant reading, but the official definition is when the aircraft is violently tossed about and almost impossible to control. You may even take damage.

Both are nasty.



The increase in reports of severe and extreme turbulence are cause for concern.

What does this mean for ops?

Perhaps the most at risk are **flight attendants**. The NTSB reckons they are twenty-four more times more vulnerable to injury from CAT than their passengers. They account for eighty percent of all turbulence related injuries. This make sense as they are often on their feet, pushing carts that can weigh upwards of 300lbs.

Here's another startling statistic – between 2009 and 2018, in almost thirty percent of turbulence related incidents, **there was no warning**.

CAT is the enemy you cannot see, because it mostly happens in clear air. It isn't associated with storms or clouds, and weather radars need moisture to work. Our eyes are useless too.

Granted, planes aren't about to start falling from the sky. But we can expect the amount of time spent in turbulent conditions on an average flight across the Atlantic to exceed thirty minutes in the years to come. **Darn cows.**

Great, what can we do about it?

Actually three things. Protect your crew, predict where it will happen, and care about sustainability. Let's dig a little deeper.

Crew

The absolute best way to protect everyone on board during CAT is to have them **seated** with their belts on. The head of a major flight attendant union is calling for changes. It is becoming increasingly dangerous for them to still be on their feet, while passengers are strapped in.

The NTSB agrees and is recommending more stringent rules when those seatbelt signs turn on – especially

for crew. The notion is a seat for everyone – including infants and young children who may be sitting on an adult's lap and riding gratis.

While it may feel reassuring that all pax are safely seated, don't underestimate how at risk cabin crew are if they are still up and working.



Unions and the NTSB are calling for stricter rules when the seat belt signs are on in flight.

Spotting the stuff.

Predicting CAT isn't an exact science, and this ain't no met class. But in a nutshell it is caused due to the difference of speed at high altitude (usually well above FL150) when flying near the boundary of two air masses.

Jet streams are typically strongest in colder months, and weaker in warmer ones.

Two things to look out for: dramatic changes in **temperature**, and dramatic changes to **wind** speed and direction.

Both are tell tale signs of CAT.

Along with that information in your flight plan, shear rates, sig wx charts and pilot reports (pireps) are also valuable sources of information.

Likewise, if you find some let ATC (and the traffic around you) know.

There are also turbulence information sharing platforms available to crew which provide real time updates on where the rough air is.

Sustainability

There is a lot of noise at the moment about sustainability, alternative fuels and 'net carbon zero.' It can all

get a little dry.

But it is the operational impact of global warming that is really going to matter to us on a day to day basis, which is why we need to care. **More than numbers.**

Asides from clear air turbulence, as the jets grow stronger, westbound flights will take longer, burn more fuel and cost more. Not to mention more time away from being poolside at the Holiday Inn.

Then there's the **sea level**. It is rising as the polar ice cubes melt. One study suggested by 2100, one hundred airports around the world will be below sea level, and close to half a thousand will be at serious risk of flooding and storm surges unless things change – affecting up to **twenty percent of all routes**. That's a lot of water.

Where to from here?



Don't be mis-steakin, that air will keep on moo-vin.

The cows aren't about to stop farting, so we need to **mitigate**. This may mean spending more time and attention on the risk that clear air turbulence poses while we flirt with the time saving benefits of the world's jet streams on a daily basis.

We can also support the overall industry push to operate cleaner in the long run. A great no-nonsense source to keep track of these industry trends are **IATA updates** – you can view those [here](#).

Contrails, Chemtrails and Climate Change

OPSGROUP Team

16 February, 2023



Putting 'climate change' in the title of a post on an aviation page probably isn't the best way to draw in the readers. But this is not a lecture. Promise.

So, what is it about?

It isn't about **chemtrails**. They aren't a real thing.

It is about **contrails**. The wispy bits of whatever that your airplane engines fart out as you fly, or the 'engine plumes' if prefer to imagine your airplane resembling something like a peacock.

Contrails are basically water vapour. They form when the exhaust gases from the engine starts to cool and mix with the air around them. The humidity rises, the water cools and condensation occurs.

A small, small proportion of what is burped out of the engine is not water though, but impurities from inside the engine.

Things like sulphur particles. It only makes up about 0.05%, but these tiny particles give the water something to freeze onto and they cause tiny ice crystals to form.

So why do we care about this?

They are quite a useful indicator of **possible wake turbulence** for us, but aside from that (and unless you are one of the pilots who likes to draw amusing pictures in the sky with them) then we don't really care that much.

But maybe we should care a bit, because some contrails loiter up there for ages – these are known as *homomutatus* contrails. Frankly, anything which sounds a little like 'mutant' should cause concern, and these definitely do, because they are responsible for the word we shall not utter.

Ok, we will, just to be clear – **global warming**.

Not here to lecture though! Promise!

A little bit of science (still not a lecture)

So, the airplane burps out the water, it turns into contrails which then hang up there in the stratosphere. Aviation causes only about 5% of the water present in the stratosphere, so it isn't a terrible culprit.

Unfortunately, though, those homomutatus contrails, plus the extra water, plus the ice particles – all that stuff left up there by airplanes – causes terrestrial radiation to backscatter. It also stores up some of the radiation coming in and the result is something they call '**radiative forcing**'.

Basically, extra heating-up happens.

So, airplanes are spitting out CO2 and contrails, and the contrails are thought to be responsible for something between 20% to about 40% of all the radiative forcing aviation causes to occur (they don't really know how much, but they reckon about that amount).

So... why are we actually telling you if this isn't a lecture?

We're getting there, stay attentive!

Free Route Airspace (a big open area between 2 waypoints where you are routed in a straight-line between them) has already helped reduce fuel burn and CO2 emissions. They reckon it saved about 40 tonnes of fuel a day, and reduced the CO2 by about 150 tonnes a day.

So, the helping-the-environment plans are already helping you because it means **less fuel burn**.

ICAO and Eurocontrol, in conjunction with EDYY/Maastricht have now set up a project called the **Contrail Prevention Trial**.

The Contrail Prevention Trial will initially only take place in Maastricht and the plan is to sometimes **re-route aircraft** around atmospheric conditions that are most conducive to contrails.

The Contrail Prevention Trial

If you are routing through Maastricht airspace **you might find you are given a re-route**. It won't be huge, it might mean a little bit of an **increase in fuel burn**, but it will hopefully mean a **decrease in the contrails** your aircraft produces.

You won't really know, but some clever science person down on the ground hopefully will.

So, a little bit of science, no lecture, and some info on why, if you are routing through Maastricht sometime in 2021, you might be given a tactical diversion. Now you know why ☐

Here is the **official announcement** on it, found on the Eurocontrol homepage:

CONTRAIL PREVENTION TRIAL – MAASTRICHT UAC (EDYY) AIRSPACE

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IN AN EFFORT TO MINIMISE THE IMPACT OF AVIATION ON THE
ENVIROMNT, MUAC WILL BE RUNNING A CONTRAIL PREVENTION TRIAL FROM
18TH JANUARY 2021 UNTIL 31ST DECEMBER 2021 BETWEEN 1500-0500UTC
WINTER (1400-0400UTC SUMMER).

FLIGHTS MAY BE TACTICALLY REQUESTED TO DEVIATE FROM THE PLANNED/REQUESTED
FLIGHT LEVEL BY THE SECTOR CONTROLLER.

ANY FLIGHT FLYING VIA MAASTRICHT UAC SECTORS BETWEEN THESE TIMES
MAY BE CHOSEN. THE TRIAL WILL GO AHEAD DEPENDENT ON THE WEATHER
CONDITIONS.

MUAC AO HOTLINE +31 43 366 1428

NMOC ON BEHALF OF MAASTRICHT (EDYY) FMP

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