

Session 1 Q&A: Decarbonising aviation in context - The economic and regulation issues

Chantal James 04:06 PM

Hello Shaila - you can find more on the CERT tool here: <https://www.icao.int/environmental-protection/CORSIA/Pages/CERT.aspx>

Robert McLachlan 03:23 PM

Tim: isn't it irresponsible for governments to put out roadmaps that are (a) unrealistic and (b) don't include policy recommendations? (Does this happen in other sectors to the same degree?) If so, the problem should be tackled further upstream.

Tim Johnson 03:31 PM

Yes, roadmaps are useful to work out when action is required but there is a danger that the public assumes they will happen. So, tackling upstream is needed, switching the focus towards emissions limits that the industry has to operate within - so it's the industry that takes the risk rather than env outcomes.

Dale B's iPhone 03:23 PM

According to the Travel Foundation, most emissions come from a relatively small number of long-haul flights. How can agreement be reached to reduce the most emitting flights?

Tim Johnson 03:34 PM

Yes, this is true. In Europe, 50% of emissions from aviation come from 6% of the (longest) flights. These routes typically won't have hydrogen or electric opportunities in the future, so there is a stark choice between using alt flights or thinking about how we use - or how often we use - long-haul travel

Steve Smyth 03:24 PM

Hi Tim, do you have the equivalent picture from the developing world where growth is accelerating with greater wealth and growing populations?

Tim Johnson 03:39 PM

Yes, double digit growth in many of those regions but from a relatively low base in terms of international travel (but huge domestically). This is why these regions want to see the mature aviation markets taking the lead but - as I mentioned - this is where the tension lies in terms of competition. Personally, I think the mature markets must take the lead.

Chris Watson, NZ 03:26 PM

Tim,

Would it be practical for us (in New Zealand) to recommend that air traffic control modify air traffic routes to avoid contrails in the Auckland Oceanic Flight Information Region?

Tim Johnson 03:46 PM

Good question. While there is uncertainty about the precise warming effect of contrails, we don't need to wait for an answer to think about how to avoid them. Weather prediction systems are improving, and trials suggest we can predict and deviate to avoid contrails. Potential CO2 penalties here, but typical estimates are less than 1%. We usually associate contrail formation with longer-haul flights, and persistent contrails are associated more with the northern hemisphere. But as the tools develop, all regions could adopt contrail avoidance plans, including New Zealand working with its regional partners.

Phil Potterton 03:27 PM

Tim with the zero-emission technology share of planned reductions so low, shouldn't governments be directly funding the necessary R&D, rather than as apparently is the case leaving it almost entirely to the companies? Thanks for the informative presentation, Phil Potterton

Tim Johnson 03:52 PM

The UK Jet Zero plan is misleading - the share of emissions reductions in 2050 is low - about 4% - but that's because their application is limited to very short flights. But even at that level they are estimated to represent 1 in 4 take-offs so a sizeable proportion of the fleet. But yes, more R&D needed to scale, especially hydrogen to make this a reality. At present, any incentives/subsidies are devoted almost entirely to SAF. We issued a report on possible levers to accelerate uptake <https://www.weforum.org/publications/target-true-zero-government-policy-toolkit-to-accelerate-uptake-of-electric-and-hydrogen-aircraft/>

Safe Landing 03:40 PM

Q for Tim: is there a recognition (particularly within ICAO) that the costs of 'greenhouse gas/carbon removals' are in the order of 100x more expensive than offset credits (<\$10 under CORSIA vs. >\$1000 for GGR) to tackle 1 tonne of CO2?

How do they square this and the expectation they'll need to quickly jump from one to the other as carbon offsetting presumably eventually banned, and carbon removals are probably needed for every tonne of CO2 going forward from mid-2030s?

Tim Johnson 03:59 PM

Good questions! Yes, engineered removals in CORSIA and emissions trading schemes make little sense in terms of their cost ... unless your goal is repackaging nature-based solutions from offsets to removals which would be more competitive. But restoring the ecological deficit needs to happen anyway, not be credited as an offset/removal. And you are right about the transition too. CORSIA ends in 2035 - no discussions yet on a post-2035 mechanism or continuation of CORSIA. So big questions to answer for ICAO and states.

Steve Smyth 03:44 PM

Is there real value in supporting carbon offsets when we travel? Obviously, it's hard to be specific, but in general.

Tim Johnson 04:10 PM

Despite CORSIA, it feels to me that there is a move away from offsets, especially those based on avoided emissions. In the corporate market, there appears to be a transition towards paying a premium for the use of alternative fuels rather than offsetting. Uptake is also very low in voluntary offsetting - typically less than 1% of passengers.

santosm 03:48 PM

Hi Ivan ... about metrics, is there a way to visualize (public reports) the progress of the company targets?

This question has been answered live

santosm 03:49 PM

To Ivan ... Is there any action in the tourism sector to reinforce the aviation transitions of aviation companies?

Professor Ivan Diaz-Rainey 03:58 PM

Thanks for both your questions. Investors and their data providers are trying to develop metrics to see if companies are on target, but these are at an early stage and not publicly available. on the second question. yes, for companies that have to report IFRS s1 and s2. So, this is for all sectors. which companies need to report to it will vary by jurisdiction but in most countries, it is usually not just listed companies, large private companies can also be captured

Anonymous Attendee 03:50 PM

Hi Ivan, do you know how companies (airlines) will be managing climate reporting requirements across multiple jurisdictions? For example, we have mandatory reporting to begin in Australia from 1 January 2025 under the AASB - would airlines have to report against this + IFRS or EU reporting requirements if they operate internationally?

Professor Ivan Diaz-Rainey 04:01 PM

I am aware that there is effort to try to harmonize efforts. People in the EU would argue that IFTS s1/2 are a minimum standard and those operating in the EU will need to go beyond that but on the minimum standards there will be harmonisation (at least eventually as companies and investors will push for it)

Safe Landing 03:50 PM

Q for Ivan: we've noticed that aviation companies present climate/'sustainability' risk registers in their financial reports - these seem too massively downplay risks e.g. increased costs due to carbon pricing, limits on air traffic, and direct climate risks e.g. sea level rise on airports - I'm wondering what the process is for anybody (investors or otherwise) to challenge these risks (and impact/probability scorings)? E.g. would it be at the finance report sessions themselves, or at

shareholder AGM? etc. And is there precedent of env groups doing this for other types of companies (e.g. energy/fuels)?

Professor Ivan Diaz-Rainey 04:07 PM

The escalation ladder I showed from Client Earth is relevant - starting with public and private engagement with firms all the way up litigation. NGOs like this and investors have not had a big emphasis on Aviation so far but as I noted in my presentation this is starting to change and we have seen a big uptick in related shareholder resolutions. Pressure from investors and NGOs is going to intensify as the climate change news becomes worse and worse

Indy 03:52 PM

Sorry the sound came through digitized on my end. What was that quantitative emissions benefit from Virgin's 100% SAF flight?

Tim Johnson 04:06 PM

In terms of emissions into the atmosphere from the back of the plane, no benefit - SAFs emit the same when combusted as kerosene. But the assumed lifecycle net savings for these alternative fuels is typically 70% if you credit the carbon absorbed for example in crop-based fuels. For the Virgin flight, Virgin claim the SAF's used "saved the lifecycle equivalent of 95 tonnes of CO2 or 64% of the emissions of a standard London Heathrow to New York JFK flight"

Phil Potterton 04:05 PM

Thank you very helpful. Fast tracking the necessary R&D seems to me very important.

Chantal James 04:07 PM

You are welcome, Phil! We appreciate your engagement.

Sybilla Grady (Australian Airports Association) 04:11 PM

How do you assess the trade-offs between emerging alternative fuels, such as hydrogen and sustainable aviation fuels, and their potential impact on existing aviation infrastructure and ecosystem dynamics, particularly in terms of lifecycle emissions and economic feasibility?

Chantal James 04:18 PM

Great question, Sybilla. The panel will now discuss a response. We appreciate your engagement!

Chris Watson, NZ 04:19 PM

Tim,

Thank you.

Are you aware of the extent of GHG reductions could be expected from contrail avoidance - based on the google or any other trials?

Tim Johnson 04:25 PM

If non-CO2 impacts at least double the net warming from aircraft CO2 on a global basis, and contrails dominate non-CO2 ... then you could have a significant temperature impact from avoiding contrails.

Sybilla Grady (Australian Airports Association) 04:25 PM

My apologies but I have been having hardware issues and our IT team are able to assist me now, so I'm going to sign out. Thank you for a fascinating session!

Emma Whittlesea 04:26 PM

Thanks for joining us, we hope to see you next week!

Mark Major - Kühne Climate Centre 04:25 PM

Thanks all for a very engaging session - a plea: please also think explicitly about air freight in your work. There may well be specific economics/technology/operational options for air freight decarbonisation that are distinct to passenger aviation.

Tim Johnson 04:26 PM

We are guilty of talking almost exclusively about passengers - freight noted!

Emma Whittlesea 04:27 PM

Great point and consideration, thank you for sharing.

Session 2 Q&A: Managing future environmental impacts: in the air and on the ground

Tim Ryley 03:15 PM

Yes, the recording will be available, typically the week afterwards, on the Aviation Reimagined website. The first webinar is already available there, posted a few days ago. Tim

Simon Coburn 03:19 PM

How significant are the nitrogen oxide emissions from SAF and (green) hydrogen combustion in gas turbines in terms of greenhouse effect? Should SAF and (green) hydrogen combustion claim zero carbon emissions but not zero greenhouse gas emissions?

This question has been answered live

Alejandro Block 03:36 PM

the claim is for carbon emissions (not climate, nor ghg) as both SAF and H2 only reduce CO2 - but as Keith is showing now, there are also non-CO2 effects. H2 used with fuel cells could also eliminate NOx.

Robert McLachlan 03:23 PM

Is enough being invested in H2 aircraft tech?

Tim Ryley 03:46 PM

Been answered live.

Michael K 03:25 PM

Apologies for the silly question, but with the difference in density of H2 fuel (vs kerosene), will there be an issue with keeping a hydrogen fuelled aircraft balanced as it uses up the hydrogen during flight?

Alejandro Block 03:30 PM

great question! indeed this is being looked at in detail, luckily the hydrogen fuel is much lighter than kerosene (about 1/3rd of the weight) so this helps, but of course careful design is required to keep the aircraft balanced.

Vicky Smith | Earth-Changers.com 03:26 PM

How long is the average length of life of an aircraft? How long is the order/lead time by an airline and then how long is it in service? Thanks!

Alejandro Block 03:32 PM

Length of life on an aircraft is around 25 years on average, and it takes manufacturers about 10 years to develop a brand-new aircraft (rule of thumb), this is in part the reason why the contributions of H2 aircraft by 2050 are more modest, as aviation moves on very long timeframes

Yvonne Weeber 03:27 PM

Isn't the real issue the amount of energy used to create hydrogen making an unsustainable energy source and economic and environmental unviable.

This question has been answered live

Alejandro Block 03:40 PM

Thanks for the question, yes energy needs are a challenge, but this is independent of the "decarbonization route", even if H2 aircraft never exist, we would still need massive energy quantities (10,000 TWh) by 2050 for SAF. We think that renewable energy will be a key enabler for aviation to meet the climate targets.

Anonymous Attendee 03:30 PM

Interesting presentation, thank you. IATA policy and the timeframes you've shared suggest hydrogen aircraft won't be apparent really until 2040. Doesn't this inhibit investment and progress, especially as numerous companies are trying to advance hydrogen electric technology and aircraft now? We have an urgent need to decarbonise, so how can IATA and governments help activate this technology quicker and facilitate more ambitious policy that recognises the key role of green hydrogen for the future of aviation? (including in SAF which doesn't seem to be recognised)

Alejandro Block 03:35 PM

While the graph I showed only seemed to have a hydrogen aircraft contribution at about 2040, our scenario assumes that small aircraft start operating on hydrogen in the 2030s timeline, except because the aircraft are smaller and enter service very slowly, the contributions towards global aviation CO2 emissions are not noticeable until post 2040. But if we don't invest now heavily and mature those technologies, then those platforms won't be ready on-time, so the urgency cannot be overstated :)

Anonymous Attendee 03:39 PM

The emissions graph Alejandro shared looks at different energy types in aviation, but only seemed to cover CO2, not other GHG emissions, is that correct? Is this misleading in a time of concern around greenwashing - Qantas has just been challenged on their sustainability claims.

Alejandro Block 03:41 PM

Thanks for the question, indeed the graph is only about CO2, I did mention that it's not only about CO2, as other non-CO2 effects exist :) so far, the IATA commitment is for net zero CO2 emissions so that's where my focus was on this presentation, but we do have work ongoing on non-CO2 emissions as well.

Chris Watson, NZ 03:48 PM

Rather than forecasting contrails, could contrails be observed from following aircraft, satellite or other means?

Professor Keith Shine 03:51 PM

Yes, they can be observed but the issue is that any re-routing strategy (at least ones that I believe are practicable) require advance knowledge of where the ISSRs are, and so are reliant on the quality of the forecasts. I realise I didn't make this clear, so thank you for your question.

Yvonne Weeber 03:57 PM

Isn't the challenge to find other ways to travel e.g. fast trains, and faster ship travel rather than projecting only aviation increases. Surely small trips and unperishable freight should not be via aviation travel.

Anonymous Attendee 04:01 PM

Question for Keith and the panel please. Do you have a view that CO2 minimisation should be the absolute priority given long lifetimes and how do you think we can activate more rapid reductions?

Robert McLachlan 04:05 PM

Do you consider scenarios in which air traffic decreases because of pro-climate policies and action?

Anonymous Attendee 04:05 PM

What are the broader GHG and non-CO2 climate impacts of hydrogen aircraft in relation to aircraft running on kerosene and SAF?

Simon Coburn 04:06 PM

Hi Rachel - do you think tourists would be prepared to fly more slowly (e.g. 500km/h instead of 800km/h) if it conserved (valuable renewable) energy?

Anonymous Attendee 04:12 PM

To the panellists. If you had one wish, what is the critical action or outcome you would want to see activated or happening, that you believe will accelerate decarbonisation in the aviation sector.

Session 3 Q&A: Social licence to fly - maximising the benefits of a low-carbon transition

Georgine Roodenrys 03:28 PM

Hi Ella. We have very little SAF production at the moment and are reliant on imports, but we do export feedstock for SAF production in other countries. The industry and government are trying to work out SAF production now and all the things I have mentioned are being discussed - certification, regenerative ag, use of municipal solid waste etc. There is a big desire here to ensure that this industry is developed in a way that is sustainable. It's a very exciting time

Yvonne Weeber 03:17 PM

Are you looking at non-aviation sustainable alternatives of transport into/out and Australia. e.g. maritime and rail?

Georgine Roodenrys 03:33 PM

Hi Yvonne, yes - this is being discussed. There are some challenges. We have a lot of fresh produced that is flown out of Australia that wouldn't be possible on maritime. We have a lot that is shipped but shipping has the same challenge as aviation in terms of trying to replace fossil fuels. Rail has been controversial here because of the distances between major cities (over 1000km). High speed rail is very expensive over this distance and the view is that it can't compete with flights. (we fly a lot between Sydney, Melbourne and Brisbane for business). So yes, all these things being considered but no great solutions yet!

Claudia Haenel 03:22 PM

This is amazing, is there a copy of this report that we can share?

Georgine Roodenrys 03:33 PM

Thanks Claudia, I think the slides will be provided online.

Chantal James 03:38 PM

Correct - the slides will be live on our website next week:

<https://www.griffith.edu.au/research/business/institute-tourism/our-research/aviation-reimagined-2024>

Anonymous Attendee 03:43 PM

Hi Georgina,

Thanks for an interesting presentation, especially your mention of future exportation of hydrogen.

How do you envision this hydrogen exportation happening? Would the finished hydrogen 'product' be exported?

I understand that this is a long way off and there might be confidential stuff that can't be said in public. However, could you provide just a brief general snapshot of how this could work. Thanks

Georgine Roodenrys 03:58 PM

Hi there. Exporting hydrogen is quite challenging. I've tried to keep this explanation simple but it's not a simple business. Hydrogen can be shipped as a liquid but to turn it into a liquid is very energy intensive as the gas becomes a liquid when it's refrigerated. It can also be shipped as a liquid if mixed with toluene but again, there is energy required to separate the Hydrogen from the Toluene when it arrives at its destination. It can be shipped as a solid as ammonia. This option is useful because ammonia is shipped a lot. The hydrogen can be extracted from the ammonia, or the ammonia can be used directly in a power generator (i.e. it can be used in a coal fired plant to make it less emissions intensive). It's a complicated business but we also ship liquid natural gas at scale around the world.

Yvonne Weeber 03:44 PM

I have travelled by both rail and air in Australia. Like New Zealand the constant underfunding of rail is the main reason that our countries have third world rail that are not like Europe and Japan who use fast rail. We need to do more

Georgine Roodenrys 03:46 PM

I hear you, Yvonne. It does seem to be a difficult issue here.

Yvonne Weeber 03:55 PM

Living near Wellington airport the planes not flying during Covid lockdowns was awesome and really improved the environment that I live in. The lack of noise, ability to hear the birds and the environment was so good. The lack of land transport (mainly private cars) to and from the airport was good for cyclists and walkers. Reducing flights should be a business scenario rather than increasing number of flights.

Georgine Roodenrys 04:00 PM

Thanks Yvonne. I spoke to a company recently that is giving its employees carbon budgets for business travel. They then have to make choices on how much they travel to fit within their carbon budget. This sounds like a good idea to me.

Tim Ryley 03:57 PM

Do people feel that the unintended consequences of decarbonising aviation are well understood (including hydrogen vs SAF)? What type of research would be needed to get a full picture of the costs versus benefits?

Georgine Roodenrys 04:03 PM

Hi Tim, we model our economies, but we don't model the economy in the context of our environment. Every economic decision we make has an environmental impact. When we start using proper accounting and consider the environment as part of the economy, we'll have a lot better view of some of the trade-offs. Many people are trying to work on this, and I think it will develop this decade.

Emily Hanrahan 03:44 PM

Can you please expand in why only the first flights under the google example will be seen as 'green' with the rest sold being shown as grey or not as sustainable? If the ticket emissions are split between each seat depending on the seat chosen (economy, business, etc) as well as the freight, why would these go up after the first seats are sold? Thank you!

Paul Peeters 04:08 PM

The point is that in the example Transavia has only some 180 seats. So, when all consumers want green tickets, these small number of seats will be sold out first, as soon as they come online. Those booking later will no longer see these tickets! But they still want to fly and will go for the grey ones.

Robert McLachlan 03:47 PM

Paul - the EU is mandating CO2 labelling of flights. From your talk, you are not expecting this to have any great effect.

Paul Peeters 04:09 PM

No, indeed, the direct effect will be very minor. This is because the European fleet is not affected by it and will keep flying. Airlines cannot react to changes in demand except for raising the number of seats which will of course reduce the CF per seat. It would be much more useful if tour operators were forced to label their products because that might directly affect demand for flying, while only green flights do not reduce demand.

Of course, an airline could react by accelerating fleet renewal. But if you order an aircraft today, it will not anymore arrive this decade! New more efficient washing machines come on the market within a year, so that industry can swiftly react.

Sally Dixon 03:56 PM

How do we factor in air cargo? Short haul flights are frequently by LCCs who do not carry cargo. Long haul almost always includes belly hold cargo. If we stop flying long haul (the most polluting) what happens to cargo capacity/capability?

Paul Peeters 04:11 PM

Most of belly freight can go to shipping, which saves 90% of emissions per ton anyway. Some will disappear (how necessary is moving flowers thousands of miles around. Or clothes: why is fashion so important? Is that the essentiality of human life?)

Tim Ryley 03:57 PM

Do people feel that the unintended consequences of decarbonising aviation are well understood (including hydrogen vs SAF)? What type of research would be needed to get a full picture of the costs versus benefits?

Paul Peeters 04:12 PM

Added to this: I believe, technically we know what to do. While destroying the eco-services to humanity of our planet does not seem to me an option. That cannot be assessed in monetary terms. So let us simply do what we need (keep aviation as it is, not growing anymore, redistribute where fair, develop e-fuels and develop the hydrogen fuel cell electric aircraft. That scenario has bene

developed in our paper "Pathway to zero emissions in global tourism: opportunities, challenges, and implications". <https://www.tandfonline.com/doi/full/10.1080/09669582.2024.2367513#abstract>

Anonymous Attendee 03:59 PM

Is air travel essential to ensure we achieve the Sustainable Development Goals?

Paul Peeters 04:13 PM

Great question! Humanity is globalised for millennia: the Romans already went everywhere in the world known to them. Globalisation was invented partly in the Netherlands in the 17th century. All this without a single flight. So, I would tend to say No. Aviation provides a lot of convenience, but it is not essential. There are always alternatives on the ground, the sea or by going somewhere else, though maybe less convenient.

Robert McLachlan 04:10 PM

Georgine - could you expand on your opening remarks on values? Are you thinking of things like an entitlement to an annual overseas holiday for those who can afford it, or something more fundamental?

Georgine Roodenrys 04:20 PM

Values is an interesting one isn't it. Yes...I think at the moment - for some societies - we have a value that says that people can fly for any reason they like. They don't have to consider the consequences of that choice or pay for the consequences of that choice. Everyone is talking about the emissions impact of Taylor Swift flying all over the place. My daughter, a teen, thinks that this is ridiculous. She queries how this superstar is allowed to do this. It's a question of values, I think. What matters more.... Taylor Swift concerts or human existence? :)

Kushla Gale, Tilma Group (regional tourism development) 04:18 PM

What would enable politicians to make unpopular choices to deliver a safer climate (guaranteed to have them replaced at the next election)?

Georgine Roodenrys 04:20 PM

It will be the physical impacts of climate that will enable this I think

Maria Santos 04:15 PM

to Jeremy: Have you research what would it be the response of the destinations when the idea of shifting CO2 footprint responsibilities is proposed?

Jeremy Sampson 04:25 PM

only a little, in that we engaged destinations in some focus groups to test our recommended solutions. a wider research set would likely be veery valuable!

s2847494 04:23 PM

Hi Jeremy, loved your presentation, thank you! You raise really good questions including fairness and perspective in relation to tourism and tourism impacts on the environment. In consideration of AI and if we were to apply a quantum leap (in terms of where AI will be in the future) has the impact of Virtual Reality (as an alternative to tourism) been considered in the aviation industry research? By way of example, if VR is what I think it will be (2035/2040/2050) I think overseas travel will no longer be necessary in the future to get that international destination experience (example I love wildlife and I think VR will deliver a similar experience in time)! Good to get other thoughts. Shane

Kushla Gale, Tilma Group (regional tourism development) 03:56 PM

When can we expect a carbon tax on flights?

Anonymous Attendee 04:14 PM

How should we consider social licence for air cargo, in terms of the parcels/goods that individuals buy which are delivered by air?

Maria Santos 04:17 PM

to Jeremy: What is the reason that the south and middle countries pay the massive climate change risk rather than the northern countries?

Jonathan Acosta 04:24 PM

I work in the Air Cargo industry, and we are seeing a very big increase in demand for fast, cheap, e-commerce. The points you touched around sustainable tourism, resonate with the gap we see between people's expectations around the cost/price of receiving their online orders quickly. An added problem is that air cargo aircraft are one generation behind their passenger counterparts. We've just upgraded to Next Generation 737's that were launched in 1993, while passenger aircraft have moved to 737 max.