



Briefing Report

Aviation & Shipping



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This year, Innovation Zero is introducing new forums to its event, and we wanted to make sure we were fully informed on the latest trends and topics so we can deliver the best content possible to our audience.

Following the success of our [Towards Zero Carbon Aviation](#) panel at Innovation Zero 2023, we were really excited at the prospect of bringing an Aviation & Shipping Forum to our next edition. After all, they are a substantial cause of worldwide GHG emissions and an undeniable nemesis of our fragile climate.



Key Statistics:

- Aviation accounts for around **2.5% of global CO₂ emissions**.
- According to the European Commission, the aviation sector creates 13.9% of the emissions from transport, making it the second biggest source of transport GHG emissions after road transport. **If global aviation were a country, it would rank in the top 10 emitters.**

- With the maritime industry responsible for transporting no less than **90% of world commerce**, it causes about **3% of global greenhouse gas emissions – even more than airplanes.**

So, in order to create thought-provoking conversations and help to catalyse a much-needed net-zero transformation, we've been doing heavy research, and spent the summer speaking to some of the most important and intelligent voices in the industry, getting their expert opinions on what's happening in their sector.

Who have we been speaking to?

- Freya Burton, Chief Sustainability Officer, Lanzatech
- Paul Hutton, Chief Executive Officer, Cranfield Aerospace Solutions
- Aaron Robinson, Vice President – Sustainable Aviation Fuel, U.S, International Airlines Group (IAG)
- James McMicking, Chief Strategy Officer, ZeroAvia
- Andrew Chadwick, Acting Ecosystem Director – Air Mobility & Airports, Connected Places Catapult
- Tom Anderson, Managing Director, CalPac Resources
- Tony Foster, CEO, Marine Capital
- Gihain Ismail, Director, Marine Capital
- Stephen Turnock, Head of School of Engineering, University of Southampton

What have we learned?

Speaking to our advisors, attending events and researching online has revealed to us how deep and expansive the conversations around net zero are in aviation and shipping; how promising the innovations are, and what an opportunity Innovation Zero has as a platform to catalyse tangible results by bringing the relevant stakeholders together. Here are some of the conversations we discovered...

There's a big debate around fuel...

A big debate is going on in Aviation: Should we proceed with Sustainable Aviation Fuel (SAF) or move onto Hydrogen-Electric? There are strong voices on either side. SAF – the most developed pathway for aviation decarbonisation – is [strongly supported by the Government's Department for Transport \(DfT\)](#), with UK's SAF programme being one of the most comprehensive in the world.

- **What is SAF?**

Sustainable Aviation Fuel is a biofuel produced from sustainable feedstocks (including forestry and agricultural waste, used cooking oil and captured carbon) and is very similar in its chemistry to traditional fossil jet fuel. Over its life cycle, SAF reduces greenhouse gas emissions by up to 80% compared to fossil jet fuel.

Meanwhile, some industry giants like Airbus, easyJet and Rolls-Royce are [plotting a different course to decarbonisation](#), trying instead to position Britain at the forefront of hydrogen-electric-powered aviation.

Proponents of SAF argue it's the only viable route to achieving 2030 and 2050 goals given it can be used in any aircraft that currently uses standard jet fuel, whereas adopting hydrogen-electric on a mass scale would require a complete conversion of all aircraft, as well as an expensive and decades-long planning and construction of the necessary supporting infrastructure.

Opponents of SAF argue that it still uses conventional jet fuel in the final fuel product, and take issue with the use of plants and crops as biomass feedstocks. They also argue that since hydrogen is used anyway during the refining process of SAF, we should just commit 100% to hydrogen.

"If we want to get to Net Zero by 2050 we will have hydrogen and electric in the mix, and we need to promote those and get them scaled up as fast as we can."

- *John Holland Kaye, CEO, Heathrow Airport
Speaking at Innovation Zero 2023*

Others do not see it as an either/or situation; that SAF is a necessary short-term solution, and hydrogen-electric is the long-term solution; that both can work in

conjunction, and that different forms of fuel can be used for short-haul and long-haul flights. British Airways, for example, includes both SAF and hydrogen-electric in its [net zero roadmap](#).

And it's the same with shipping...

There is a race to decarbonise the maritime industry. The International Maritime Organisation (IMO) has set international shipping decarbonisation goals, as its "IMO-2030" targets a minimum 40% reduction in carbon intensity by 2030 while pursuing efforts towards 70% by 2050, compared to 2008 levels.

Here, it's not so much an either/or, and the debate doesn't seem as volatile, but there is a big conversation around fuel, and *which* fuels work for *which* types of ship. There's been a lot of trial and error along the way. 7 years ago, for example, the Singapore government made a huge play for LNG, building a multi-billion dollar bunkering terminal. LNG didn't pick up, and [it proved to be a terrible investment](#).

Now, [shipping giants like Maersk](#) are experimenting with the likes of methanol, ammonia, and hydrogen. There's even innovation happening in nuclear, with [CORE Power](#) developing nuclear power from thorium for VLCCs (Very Large Crude Carriers), where one rod could power a vessel for twenty years.

But again, each come with their own pros and cons. Ammonia, for example, has no CO₂ emissions during its combustion since it doesn't contain any molecular carbon, and is suitable for 'green' production with hydrogen and renewable power. However, it is extremely toxic and thus comes with huge safety concerns. And while it doesn't contain carbon, it does contain nitrogen, and the GHG impact of nitrous oxide (N₂O) is nearly 300x than CO₂.

Regulatory and funding gaps

When speaking to one member of our Shipping advisory board, we were told that "the maritime industry is the biggest unregulated industry on the planet" with "the biggest collective of billionaires that don't know about sustainability".

Therefore, it proves very hard to instigate new rules, set precedents, and establish norms. After all, the IMO's authority gets instilled through the [IACS \(International Association of Classification Societies\)](#) of which there are eleven different

classifications. Not to mention different rules and regulations apply to domestic shipping and international shipping.

Does this mean worldwide zero carbon shipping is even possible? Well, shipping is ultimately a relationship and reputation based industry. Now, with global corporates seeking to reduce their scope 2 and scope 3 emissions – or being mandated to do so – the maritime industry is having to decarbonise by default. After all, ships are the lifeblood of any supply chain, and the green credentials of any end product must be judged in relation to how they were transported.

But how are shipping companies supposed to fund their transition? This is another conundrum we heard time and again. Governments, it seems, tend only to provide early-stage, venture capital support, whereas large-scale investors wait for proof of concept before committing funds. That means there is a funding gap for companies, and there is a plea to investors to help [bridge this gap](#). Not only this, but investors need understanding of *where* the funding is required; there is currently a mismatch between where investors want to invest, and what the industry needs.

Similarly, in aviation, we are told UK government provides a lot of initial support for R&D, wanting to establish the UK as a testbed for innovation, but the regulatory and funding frameworks required for bringing these to commercial reality is currently lacking, and the industry finds itself hampered by policy bottlenecks, red tape, and the daunting '[valley of death](#)' for scale-up companies.

The Latest Innovations

It's not just green fuel which is changing the game; there is a whole range of exciting innovations coming to the fore which we are excited to showcase at Innovation Zero.

In Aviation, there is growing consensus that the non-CO2 effects of aviation on our climate have been overlooked. For example, contrails – the thin, white lines you sometimes see behind airplanes – have a surprisingly large impact on our climate. [According Dr Edward Gryspeerd](#), Research Fellow and Lecturer in the Grantham Institute, "The warming effect of the contrails in the atmosphere today is more than all the CO2 that has been emitted by aircraft since the dawn of flight." Thankfully, innovations are being developed by the likes of Google and SATAVIA to help analyse these effects with the goal of ultimately mitigating these impacts. In other news, we see airships returning to our skies – with Hybrid Air

Vehicles' Airlander revolutionising [zero-carbon luxury aviation](#) – with [potential defence applications](#) also on the horizon.

In shipping, the community is learning how improving efficiency could be an important factor in transforming to net zero, with [trim optimisation](#) proving to be one of the easiest and cheapest methods for ship performance optimisation and fuel consumption reduction. Meanwhile, other innovators are looking to our seafaring past to design our net zero future. Wind-powered cargo ships is now being seen as a solution, with shipping firm Cargill [launching its maiden voyage with British-designed sails](#) earlier this year.

Learning from Each Other

As this report shows, both industries face similar challenges and opportunities. But does this mean their conversations should share a platform? As we are running Aviation & Shipping as a joint forum on the same day, we therefore wanted to ask our board members from each community: do you want to hear from each other? Are there lessons you can learn from each other?

To our delight, every person said *yes*. As it turns out, there is in fact a huge appetite amongst the aviation *and* shipping community to share best practices and discover how both juggernauts of transport are racing to decarbonise.

It is for this reason *Innovation Zero* is including a cross-industry panel in its forum, featuring representatives of aviation *and* shipping, where experts can exchange insights on the necessary funding, policy and innovation levers required to make zero carbon transport a reality.

Conclusions

Just as we'll be running a panel about what aviation and shipping can learn from each other, we'll also be hosting sessions reflecting the other points raised in this report, including:

- "Industrialisation: Moving from R&D to Commercial Reality"
- "Fuelling Flight: Discussing SAF and Hydrogen-Electric"
- "Considering the Non-CO2 Effects of Aviation"
- "The Investment Conundrum: Bridging the Funding Gap"

- “Alternative Fuels & Infrastructure for the Shipping Industry”

Not only this, but we’ll be featuring “Innovation Showcases” from the most exciting enterprises on the market, offering the latest net zero technologies and products.

We hope to bring people together, break down siloes, drive the conversations forward, and ultimately resolve some of the key challenges raised here, thus pushing the needle towards zero carbon transport even further. We look forward to seeing you there.