

FOUR REASONS WHY HYDROGEN IS A FUTURE FUEL

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Recent forums and industry events, from the Sustainable Skies World Summit at Farnborough to the Fully Charged series, have seen panels focus on the benefits of hydrogen in the future of air transport, as opposed to sustainable fuels and batteries. Hydrogen can be used as a source of electrical power through use in a fuel cell, or as a direct fuel for the aircraft by being combusted in a jet engine. We take a look at four factors to consider when choosing hydrogen for future aviation, and how Airlander can lead the way.

1. Hydrogen is an energy-dense fuel

Today aviation runs on kerosene, a fossil fuel that is very rich in energy. Batteries, in contrast, pack in far less energy per kilogram. Hydrogen though is the best of all – it has about twice the energy density of kerosene. This means that aircraft using hydrogen could be lighter and might need smaller wings than the equivalent aircraft of today. For Airlander, the choice is clear - lightweight and energy-dense hydrogen will be the best zero-carbon emission power source.

2. Hydrogen needs a lot of storage space

Hydrogen is the lightest atom of all, which means storing it takes up a lot of space. On aircraft it will be chilled to a liquid and stored in cryogenic tanks. Airlander's advantage is that it has a lot of space available to accommodate such cryogenic tanks and fuel cells. Jet aircraft are a harder challenge. Fuel is currently stored in tanks in the wings, but this won't be possible for hydrogen. Despite that, the UK Aerospace Technology Institute's FlyZero project (led by HAV's Advisory Board member Chris Gear) concluded that hydrogen is the most viable zero-carbon emissions fuel for aviation. The ATI concluded that over time brand new aircraft designs, optimised to store hydrogen in their fuselages, could replace today's long-haul aeroplanes. Their smaller wings will make them light enough to offset the increased weight and drag from the larger fuselages and cooling systems that will be needed for storage.

3. Hydrogen is likely to be available and affordable

While hydrogen is expensive today, over time it could become cheaper than conventional jet fuel. The cost of producing "green" hydrogen is primed to fall, in line with similar changes that have been seen in the price of renewable energies, such as solar and wind power. Investment in clean and green hydrogen production is scaling up rapidly with many organisations in the US investing heavily in its development and infrastructure. However, today's uncertainty about how fast aviation will transition to hydrogen means that demand is uncertain and so the economics of supply aren't yet assured. Our aim is that Airlander's electric motors, fuel cells and storage tanks will be ready for "green" hydrogen as soon as supplies become readily available.

4. Hydrogen will require large infrastructure investment

Shifting to any alternative fuel is going to require a huge investment, with the majority of that going towards the development of new infrastructure. For larger international hubs or major regional airports, the World Economic Forum has found that the capital costs of changing an airport over to hydrogen would be roughly equivalent to building a new terminal. Putting that into perspective that would be roughly equivalent to 20% of the projected cost of London Heathrow's third runway - so although a big project, this will likely be seen as a reasonable spend to enable zero-emission flight. By comparison, we foresee that road deliveries of hydrogen will be enough to serve the early market for Airlander, minimising infrastructure costs. Airlander operators will want fast refuelling times too, and hydrogen refuelling can deliver similar refuelling times to current aircraft with jet fuel.

Meanwhile, the last word goes to HAV's CTO, Mike Durham: *"There is much to be done to bring this technology to a large production (100 seat) aircraft but at Hybrid Air Vehicles we feel that Airlander - a lightweight and efficient aircraft with lots of space - is an excellent candidate to be the first."*