# Written Evidence Submitted by Airbus
# (HNZ0051)

## About Airbus

Airbus is a global leader in aerospace, defence, space and related services. We are the largest aeronautics and space company in Europe and a pioneer of cutting-edge technologies and products for our global customer base. Airbus operates in roughly 180 locations worldwide, employing 134,000 people and supporting 12,000 direct suppliers.

The UK remains a market of strategic importance for Airbus and we are exceptionally proud of our 100-year British aviation heritage and our 12,500 strong UK workforce. Airbus is the largest commercial aerospace company in the UK, as well as its biggest civil aerospace exporter. We are also Britain's largest space company, a world leader in cyber security, and the biggest supplier of large aircraft to the RAF, through the A400M Atlas and the A330 MRTT Voyager. Airbus Helicopters make up 100% of the UK National Police Air Service and 60% of the Air Ambulance fleet, while our share of the military helicopter market is 29%. As Britain's civil helicopter hub, Airbus also represents around 50% of the UK's civil helicopter fleet. Through these contracts and our exports, Airbus makes a significant contribution to the UK economy, with our GVA to GDP totaling £7.8 billion in 2019.

## ZEROe Overview

At Airbus, we have the ambition to develop the world's first zero-emission commercial aircraft by 2035. Hydrogen propulsion will help us to deliver on this ambition. Our ZEROe concept aircraft enable us to explore a variety of configurations and hydrogen technologies that will shape the development of our future zero-emission aircraft.

All three ZEROe concepts are hybrid-hydrogen aircraft. They are powered by hydrogen combustion through modified gas turbine engines. Liquid hydrogen is used as fuel for combustion with oxygen. They are short haul in range at 2000 nautical miles for the larger concepts. In addition, hydrogen fuel cells create electrical power that complements the gas turbine, resulting in a highly efficient hybrid-electric propulsion system. All of these technologies are


complementary, and the benefits are additive.

**Hydrogen Overview**

Hydrogen combustion—either via gas or liquid—is emerging as one of the most promising options to decarbonise the aviation sector. Airbus is exploring the technology's potential in preparation for its zero-emission aircraft programme.

Research into hydrogen as a potential energy carrier to power future zero-emission aircraft has been intensifying in recent years. But the road to hydrogen-powered aircraft requires significant effort inside the aviation industry and beyond. From hydrogen storage, cost and infrastructure to public perceptions about safety, the aviation sector is working to mature the technology while tackling some major challenges.

Hydrogen has been safely used in the aerospace and automobile industries for decades. The aviation industry's challenge now is to take this zero-emission energy carrier and adapt it to commercial aviation's needs.

At Airbus, we see two primary uses for hydrogen:

- Hydrogen propulsion: Hydrogen can be combusted through modified gas-turbine engines or converted into electrical power that complements the gas turbine via fuel cells. The combination of both creates a highly efficient hybrid-electric propulsion chain powered entirely by hydrogen.

- Synthetic fuels: Hydrogen can be used to create e-fuels, which are generated exclusively through renewable energy. Hydrogen produced using renewable electricity is combined with carbon dioxide to form a carbon fuel with net-zero greenhouse gas emissions.

**Key Challenges**

From the technical side, aeronautical engineers will need to take the technologies developed in the automotive and space industries and make the technology compatible with commercial aircraft operations, notably by bringing the weight and cost down. One specific challenge is how to store hydrogen on board the aircraft. Today, liquid hydrogen storage is among the most promising options, while storing hydrogen as compressed gas poses challenges with current aircraft weight and volume requirements.

In addition, the aviation industry will need to achieve the same or better safety targets than what has been achieved with existing commercial aircraft. Indeed, extensive safety precautions are currently taken into account in the design and operation of today's kerosene-powered aircraft. This stringent approach has ensured the industry's consistent safety record throughout the years. Future hydrogen-propulsion systems will thus need to achieve equivalent or better safety levels before hydrogen-powered aircraft can take to the skies.

All of these challenges will require significant investment to overcome them.

**Ensuring hydrogen availability at airports worldwide**

For hydrogen to really achieve widespread adoption across the aviation industry, it must be made available at airports worldwide. One main challenge is developing the large-scale transport and infrastructure solutions required to supply airports with the necessary quantities of hydrogen needed to fuel aircraft.

Airbus is currently collaborating with both airports and airlines to ensure the necessary hydrogen infrastructure is in place. This includes research into how all airport-associated ground transport (cargo trucks, passenger buses, aircraft tugs, etc.) could be decarbonised throughout the 2020s timeframe using a stepped approach, which is expected to pave the way to hydrogen availability for aircraft over the 2030s timeframe.

**Need for Green Hydrogen**

Today, more than 70 million tonnes of hydrogen are produced every year, the primary extraction source of which is natural gas (grey hydrogen). When extracted via fossil fuels, hydrogen production is energy-intensive, responsible for around 830 million tonnes of $CO_2$ emissions per year. However, electrolysers, powered by electricity generated from renewables, offer a low-emission alternative. This process, resulting in "green hydrogen," involves water electrolysis to extract hydrogen.

Airbus is targeting the use of green hydrogen to fuel its future zero-emission aircraft and declining costs for renewable energy and the scaling up of hydrogen production could make green hydrogen increasingly cost-competitive with existing options, such as jet fuel and sustainable aviation fuels.

**How Government can Support**

In order to reach these ambitious aims, support is needed now to enable a stepchange in the technology and solutions available. Government should consider contributing to this by:

- Doubling Aerospace Technology Institute funding to £330m per year. The industry has a strong record of delivery and the ATI is a successful model which stimulates aerospace investment. The ATI's current £150m per year grant funding budget should be doubled to £330m per year (inflation adjusted) through to 2040.
- Launching the Brunel Challenge slingshot proposal relating to High Value Design (HVD) to ensure the aerospace industry can compete in the future. This work will be vital for producing the next generation of aircraft, including any net zero aircraft. This is a cross sector initiative alongside automotive, defence, maritime and nuclear. The slingshot to get it started would be £60.1m (£19.9m from industry).
- Develop a UK wide Hydrogen strategy that recognises all the areas required for Hydrogen development including at ports, airports, domestic heating and road transport.
- Invest in the development of the UK wide infrastructure to realise this strategy.
- Consider the role that the Jet Zero Council has to support discussion and coordination of hydrogen use for aviation in the UK.

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