

# Hydrogen Aircraft Market: Current Analysis and Forecast (2025-2033)

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## Abstracts

The Hydrogen Aircraft Market is witnessing a robust growth rate of 30.03% within the forecast period (2025- 2033F). Hydrogen airplanes are extremely effective solutions for the aviation industry towards an emission-free future. Hydrogen is their energy source, the by-product being only water vapor vented into the biosphere, thus effectively replacing conventional fossil-fuel-powered aircraft completely with zero-emission fuels. The demand for hydrogen aircraft stems from the urgent push to decarbonize a very important segment of global greenhouse gas emission sources in aviation. Advancement in hydrogen fuel cell technology and propulsion, and hydrogen storage solutions enable the conceptualization of weight-viable hydrogen-power systems for the commercial passenger, military, and regional aircraft markets. For instance, in July of 2024, Joby Aviation completed a first-of-its-kind hydrogen-powered electric air taxi into the skies, traveling 523 miles, and as a by-product of that flight, nothing but water. Joby Aviation is a US-based company engaged solely in next-generation aviation. Moreover, Airbus is delving into hydrogen-powered aircraft in its "ZEROe" program, which defines its route to commercial hydrogen-powered airliners by 2035. Countries are gradually increasing their focus on sustainability, demanding that hydrogen become the leverage for impactful changes in the aviation sector. Thus, adopting hydrogen aircraft is thought to be necessary for the much-needed mitigation of environmental impacts in aviation. The market for hydrogen aircraft worldwide is growing fast due to the increasing pace of innovations in hydrogen technologies as well as the supportive government policies and investments.

Based on power sources, the hydrogen aircraft market is segmented into Hydrogen Combustion and Hydrogen Fuel Cell. In 2024, the hydrogen fuel cell market dominated the market and is expected to maintain its leading position throughout the forecast period. Hydrogen power cells provide high efficiency in

supporting reliable and sustainable power for aircraft, which emit only water vapor as a byproduct. This, therefore, meets the growing demand for environmentally friendly aviation solutions and decarbonization efforts in the industry. Increasing investments in fuel cell technologies, especially from companies such as ZeroAvia and Airbus, developing hydrogen fuel cell aircraft, indicate a growing trend towards sustainable aviation. These hydrogen fuel cell developments are further backed by government policies that incentivize zero-emission technologies, which push the advancement of hydrogen-powered aircraft.

Based on technology, the hydrogen aircraft market is segmented into Fully Hydrogen-Powered Aircraft and Hybrid Electric Aircraft. The Fully Hydrogen-Powered Aircraft market held the largest market share in 2024. The growing market for aircraft powered entirely by hydrogen fuel is based on their ecological advantage of operating without emitting any greenhouse gases. Hydrogen planes help realize the social requirements in terms of environmental protection. These planes use hydrogen as fuel, which is more efficient and significantly less polluting compared to conventional aircraft. Several companies, such as Airbus, ZeroAvia, Inc., and others, are investing heavily in developing fully hydrogen-powered aircraft. For example, Airbus, under its "ZEROe" program, is focused on the development of fully hydrogen-powered aircraft, thus marking the significant rewiring of aviation technologies. Due to advances in hydrogen fuel cells and regulatory enforcement of carbon emissions reductions, hydrogen-powered aviation technology is undergoing significant advancement. In September 2023, H2FLY, a German company that develops hydrogen-electric powertrain systems, announced the completion of the world's first piloted flight of an aircraft using liquid hydrogen. Further, with the increase in standards and demand for sustainable technology, hydrogen-powered aircraft are most likely to dominate the market.

Based on range, the hydrogen aircraft market is segmented into up to 1000 km, 1000 km to 2000 km, and over 2000 km. The up to 1000 km category held the largest market share in 2024. The growth of this segment is expected to benefit greatly from the increasing demand for short-range, zero-emission aircraft in commercial and regional aviation. Hydrogen-fueled aircraft offer substantial benefits to airlines and operators about sustainability, as compared to conventional aircraft's greenhouse gas emissions reduction. Leading companies, such as ZeroAvia, Airbus, and H2FLY, are working on developing hydrogen-powered aircraft mainly for regional and short-haul flights. These

aircraft will operate very much like their fossil fuel counterparts; however, they will also enable a contribution to an environmentally friendly footprint regarding air travel for distances up to 1000 km, thus moving towards decarbonizing the aviation industry. This includes advances in hydrogen fuel cell technology and the collaboration of many stakeholders, like regulatory bodies, to speed up this development. For example, Fokker Next Gen has scheduled the manufacture of a twin-engine hydrogen aircraft for entry into service by 2035, per the program initiated for the Airbus ZEROe hydrogen aircraft. The Dutch company aims for a first flight in 2028 of a Fokker 100 twinjet converted into a hydrogen testbed aircraft. The new Fokker Next Gen jet is designed to carry from 120 to 150 passengers for a distance of 2,500 kilometers and be powered either by liquid hydrogen or sustainable aviation fuel, and thus able to operate on either fuel depending on availability at destinations.

Based on applications, the hydrogen aircraft market is segmented into Commercial and Military & Defense. The commercial category held the largest market share in 2024. The major factors for market growth in this segment are the increasing demand for aircraft that are environmentally friendly and fuel-efficient to comply with stringent emission regulations in the aviation sector. With sustainability goals in mind, commercial airlines are increasingly investing in hydrogen aircraft to decrease their carbon footprint. Major airlines like Lufthansa and Air France are already considering looking into hydrogen aircraft to decarbonize short-haul flight operations, which is expected to drive demand. The improvements in hydrogen storage and fuel cell technology render the commercial feasibility of these aircraft on long-range more desirable. For instance, in January 2023, ZeroAvia clocked the first flight of the largest hydrogen-electric aircraft in the world, a 19-seater Dornier 228. This flight, which happened under the auspices of the HyFlyer II project, takes ZeroAvia closer to its goal of commercial hydrogen-powered flight by 2025. The test flight proved that a 600kW engine could power a small hydrogen-electric aircraft on scale. As the commercial aviation sector continues to search for the most sustainable viable options, demand for hydrogen aircraft would also be expected to rise, driven by the need for greener air travel options alongside regulatory support.

For a better understanding of the market of the hydrogen aircraft market, the market is analyzed based on its worldwide presence in countries such as North America (The US, Canada, and Rest of North America), Europe (Germany, The UK, France, Italy, Spain, Rest of Europe), Asia-Pacific (China, Japan, India, Rest of Asia-Pacific), Rest of World. The Europe hydrogen aircraft market

dominated the global hydrogen aircraft market and is expected to behave in the same fashion in the forecast period. There is booming European market growth due to the robust government support for green aviation technologies, such as hydrogen-powered aircraft. Europe has become a center for hydrogen aircraft innovation, with the likes of Airbus and H2FLY spearheading initiatives into hydrogen-powered aircraft technologies. The ambitious emissions reduction targets set by the European Union, complemented with investment in sustainable aviation, put the union in a strong player posture in the hydrogen aircraft industry. The strong aerospace presence in Europe, in combination with regulatory frameworks that stimulate green aviation solutions, positions Europe as a market leader. Additionally, the increasing emphasis on emissions reduction from aircraft engines, especially for short-haul trips, is another factor through which demand for hydrogen-powered aircraft rises in Europe. This region is expected to develop as hydrogen fuel cell technologies develop and as joint ventures between aerospace companies and governmental bodies are formed. Therefore, Europe is an important region for advances in hydrogen aviation, which leads the hydrogen aircraft industry.

Some of the major players operating in the market include Airbus, Boeing, Embraer, Urban Aeronautics Ltd, GKN Aerospace, PIPISTREL, ZeroAvia, Inc., AeroDelft, H2FLY GmbH, and APUS Zero Emission GmbH.

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