



Achieving Net-Zero Flight with Hydrogen

Airbus is developing hydrogen propulsion systems with combustion engines and fuel cells. **BY JOHN KOSOWATZ**

In 2021, aviation accounted for over 2 percent of global energy-related carbon dioxide emissions, according to the International Energy Agency, reaching 720 million tons as the world emerged from COVID-19 lockdowns. The industry is working toward net-zero emissions by 2050, as startups and manufacturers develop versions of small electric aircraft for short flights. Long-haul electric flights are still constrained by battery size, and some manufacturers are looking to sustainable aviation fuels. Europe's Airbus is looking to hydrogen.

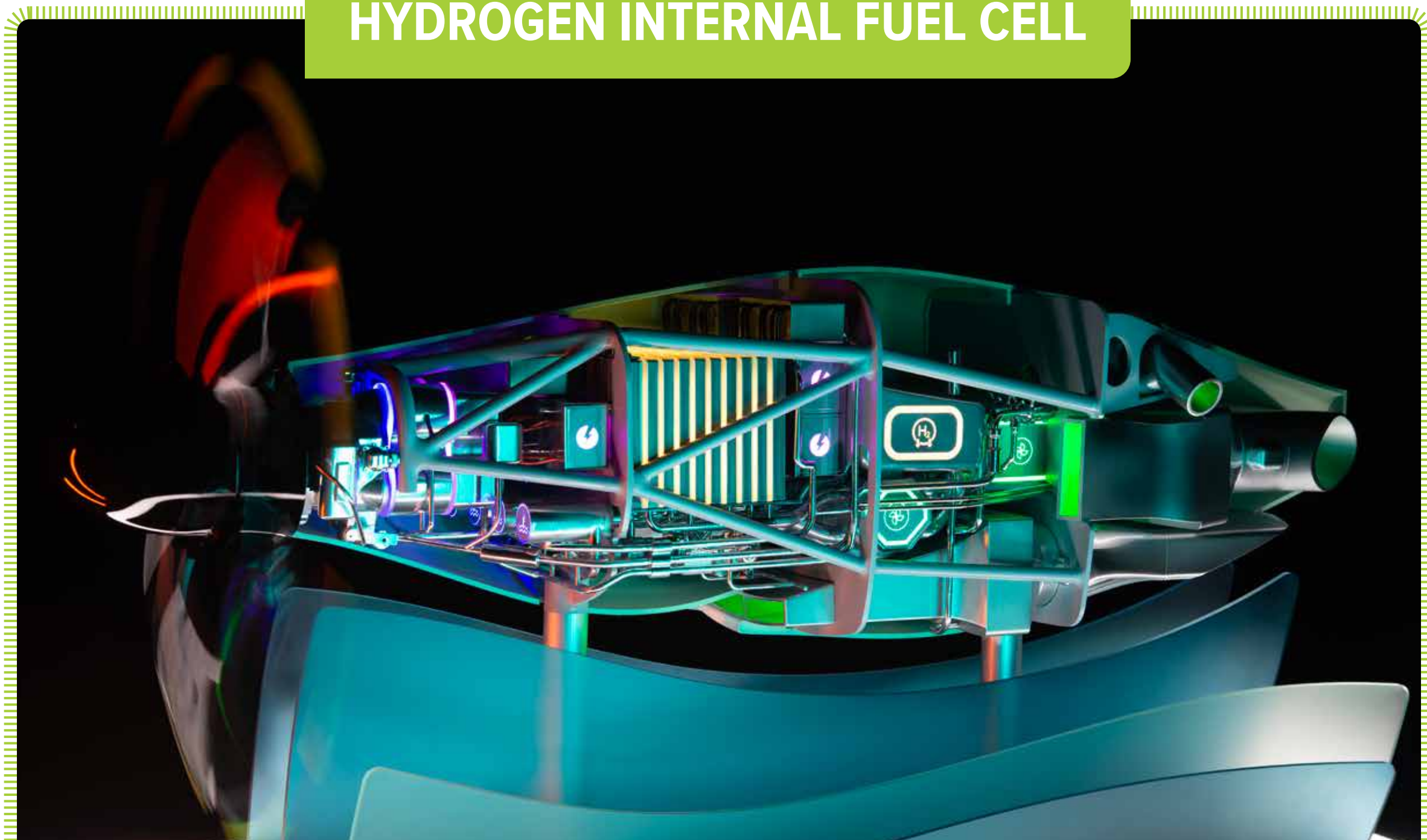
HYDROGEN INTERNAL COMBUSTION ENGINE



In 2021 it committed to flight test a direct combustion hydrogen engine in preparation for a zero-emission aircraft by 2035. Its ZEROe demonstrator is an A380 MSN1, the largest passenger aircraft now flying. It will be fitted with four cryogenic liquid hydrogen tanks near the tail of the aircraft and a hydrogen combustion engine mounted on the rear fuselage. A distribution system for liquid hydrogen will feed into a conditioning system to transform it into a gas for combustion.

The engine is being developed by CFM International, a joint venture of General Electric Aviation and Safran. Engineers will modify the combustor, fuel system, and control system of a GE Passport turbofan for hydrogen. The engine was chosen for its physical size, advanced turbo machinery, and fuel flow capacity.

HYDROGEN INTERNAL FUEL CELL



Airbus also is developing a hydrogen-powered fuel cell engine as a potential propulsion system for ZEROe aircraft. Company officials announced the effort in late 2022, noting that the technology's feasibility is still unproven. The test aircraft represents a high-wing 100-seat regional airliner with six eight-bladed propellers attached to engine pods. They resemble turboprop powerplants, but the pods will hold the hydrogen fuel cells that produce electricity.