



Ways to Cut AVIATION EMISSIONS

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People love to fly to distant locales, but those flights create a carbon conundrum. A single passenger on a single flight from New York to San Francisco is responsible for nearly as much carbon emissions as a typical car produces all year—1.2 tons compared to 1.7. Overall, aviation accounts for 10 percent of transportation emissions.

Engineers in the aviation industry are working to reduce that impact. They are developing new fuels or propulsion systems that reduce or eliminate carbon emissions. While some of these new technologies are in the demonstration phase, it may be some time before we can say we're flying the carbon-friendly skies.

BIOFUELS



Sustainable Aviation Fuel, or SAFs, are made from a variety of sources, such as agricultural waste, sewage, or cooking oil. Because these fuels started out as organic matter, they don't contribute carbon to the atmosphere over their full lifecycle.

Because these fuels are processed to behave like conventional jet fuel, they can be used in existing jets. Already dozens of airlines have used a mix of 50 percent SAF and 50 percent jet fuel to power some 370,000 flights. Unfortunately, moving to 100 percent SAF will require retrofitting fuel seals that are incompatible with biofuels.

HYDROGEN



Hydrogen fuel can also be made from renewable sources, and when it is burned it produces zero carbon emissions. The fuel can be burned in jet engines that have been modified to accept the gas. Airbus has introduced three different “ZEROe” concepts in 2020, including a turbofan design that could carry 200 passengers. Another company, Universal Hydrogen, is developing a plane powered by a hydrogen fuel cell.

The biggest barriers to hydrogen fuel are infrastructure—the gas is difficult to handle—and energy density. Even when compressed, hydrogen has much less energy than a similar volume of jet fuel. That puts a range limit on hydrogen-fueled aircraft.

ELECTRICITY



Battery-powered planes would burn no fuel in flight and could be recharged using renewable electricity. Many companies are working to develop electric aircraft. California start-up Wright Electric says they'll have a 100-seat plane in the air by 2026, and United Airlines is buying 100 electric 19-seater planes and plans to have them flying within the next five years.

While batteries are heavy compared to jet fuel, some electric aircraft can provide good performance. In November 2021, Rolls-Royce's Spirit of Innovation became the world's fastest electric vehicle by flying at 345 mph. But like hydrogen, the range of electric aircraft may be a limit. Electric airplanes would be unable to fly cross-country or across oceans, and those flights are the ones that produce the most carbon emissions per passenger.