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Solutions for Aviation

There are almost 23,000 commercial aircraft, and they all burn kerosene, producing 750 million tonnes of CO₂ in 2007, or 2% of the world's CO₂ emissions.¹ CO₂ causes 44% of global warming (see 10), but flying also produces nitrogen oxides that contribute to tropospheric ozone formation and water vapor that causes condensation trails and cirrus clouds; so the IPCC recommends that we multiply the impact by 2.7%, increasing aviation's responsibility for climate change to 2.4%.² Eighty percent of the impact comes from long-haul trips, though short-haul flights up to 500 km produce proportionally more CO₂ per kilometer because more fuel is used during take-off.

In 2007, 2.2 billion people flew, one in four for business, the rest for personal reasons. 40% of the world's air travel happens in North America. The airlines also ship 44 million tonnes of freight a year, and are projecting rapid growth for the

Sooner or later, aviation will have to shoulder the burden it imposes on the planet.

— *The Economist*, June 2006

future. Aviation enjoys freedom from fuel taxation and benefits from many loans and subsidies.

The International Air Transport Association, representing 230 airlines, published *Building a Greener Future* in 2008, in which it set goals to reduce aviation's emissions by 18% by improving infrastructure and flight operations; to meet 10% of airline fuel needs with biofuels by 2017; and to build a zero-carbon emissions aircraft within 50 years.

Boeing has pledged to reduce its CO₂ emissions by 15% with each new generation of aircraft and by 25% for its worldwide fleet by 2025, and to work with its customers to reduce their emissions by 25% by 2023. Air Canada's goal is to improve its fuel efficiency by 25% by 2020. Virgin Atlantic's goal is a 30% improvement by 2020. How can these goals be achieved?

- **Buy lightweight airplanes.** Europe's Airbus A380 uses 12% less fuel than its competitors; the Boeing Dreamliner will use 20% less. Friction drag can potentially be reduced ten-fold by covering a plane's surface with tiny pill-like discs, which reduce turbulence.³
- **Reschedule night flights.** Night flights are 25% of total air traffic, but their contrails cause 60–80% of aviation's climate effect, due to the colder night atmosphere.⁴ Slowing down from a cruising speed of 800 to 775 km/hr also saves fuel.
- **Operate with full flights.** In 2007 British Airlines flew 80 billion empty seat kilometers. Reducing the number of business and first class seats would improve efficiency; so would charging for luggage by weight.



Flying over Alaska's mountains and glaciers.

- **Improve air-traffic management.** The industry says it could reduce emissions by up to 12% with optimized traffic-control procedures. Each minute of flying time saved reduces fuel consumption by 62 liters and CO₂ emissions by 160 kg.⁵
- **Stop ground idling:** Delta's reduction of engine idling has cut its ground emissions by up to 40%. Virgin estimates it can save up to two tonnes of fuel per flight (five tonnes of CO₂) by using electric tractors to tow planes to and from the runway.
- **Become carbon neutral.** Include the price of offsets in all tickets on a voluntary basis, prior to making it mandatory. In 2009 Harbour Air and Helijet in British Columbia and NatureAir in Costa Rica offset all their emissions.
- **Support plans to include aviation in carbon trading.** When carbon pricing becomes mandatory, this will help airline initiatives to reduce their emissions.⁶

Biofueled Flying

The airlines are placing their hopes in second- and third-generation biofuels, testing biofuel mixes made from the jatropha plant, coconut and babassu nut oil, camelina oilseed and algae. *New Scientist* magazine has calculated that if all of the world's aviation fuel (five million barrels of oil a day in 2007) came from jatropha nuts, growing them would require 1.4 million square kilometers — twice the size of Texas. If the biofuel were grown from algae, however, it could be done on 66,000 sq km, about the size West Virginia or

- AeroNet: aero-net.org
- Aeroscraft: aerosml.com/ml866
- Air Cargo World: aircargoworld.com
- Air Transport Action Group: atag.org
- Algae Jet Fuel: algaelink.com/jet-fuel.htm
- Algal Biomass Organization: algalbiomass.org
- Aviation and the Global Atmosphere (IPCC): grida.no/climate/ipcc/aviation
- Aviation Environment Federation (UK): aef.org.uk
- Aviation Global Deal Group: agdggroup.org
- Boeing and the Environment: boeing.com/environment
- Clearer Vision, Cleaner Skies: enviro.aero
- *Climate Change and Aviation: Issues, Challenges and Solutions*, by Stefan Gossling and Paul Upham, Earthscan, 2009.
- Green Flight International: greenflightinternational.com
- International Air Transport Association: iata.org
- International Civil Aviation Organization: icao.org
- Solar Impulse: solarimpulse.com
- Virgin Atlantic's Eco Flight Plan: (tinyurl.com/5wgp6x)

Ireland, which is just 0.13% of the world's 50 million square km of farm and pastureland.⁷

What else is possible?

The solar-powered Solar Impulse has flown for 25 hours, but carrying only one person at 27 mph. A French test pilot managed a 50-km electric flight around the Alps in a single-person plane. Boeing is testing a small slow-speed hydrogen airplane, but hydrogen's water emissions form more contrails and cirrus cloud. Looking into the future, Richard Branson dreams about making a larger version of his Virgin Galactic spaceship that could lift passengers out of the atmosphere and convey them from New York to Sydney in 2.5 hours. Or maybe we just need to stop flying so much.