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POLLUTION

BY AVIATION INDUSTRY

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Aircraft engines emit heat, noise, particulates and gases which contribute to climate change and global warming. Airplanes emit particles and gases such as carbon dioxide (CO_2), water vapor, hydrocarbons, carbon monoxide, nitrogen oxides, sulfur oxides, lead, and black carbon which interact among themselves and with the atmosphere.

Despite emission reductions from automobiles and more fuel-efficient and less polluting turbofan and turboprop engines, the rapid growth of air travel in the past years contributes to an increase in total pollution attributable to aviation. From 1992 to 2005, passenger kilometers increased 5.2 percent per year. In the European Union, greenhouse gas emissions from aviation increased by 87 percent between 1990 and 2006.

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There are about 39,000 planes in the world – including all commercial and military planes. Over the course of history, there have been 150,000 planes. In the past year there were an average of 9,728 planes — carrying 1,270,406 people — in the sky at any given time.

Due to low or non-existent taxes on aviation fuel, air travel enjoys a competitive advantage over other transportation modes due to lower fares, (US$ 3.85 per Gallon). The world has to consider it seriously, if climate change is to be held to a temperature increase of 2 °C or less. It is also a fact that about 60 percent of aviation emissions arise from international flights.

Burning jet fuel releases greenhouse gases such as carbon dioxide into Earth's atmosphere and oceans. Greenhouse gases block heat from escaping from the atmosphere, causing temperatures to rise just like in a greenhouse.

While the principal greenhouse gas emission from powered aircraft in flight is CO_2, other emissions may include nitric oxide and nitrogen dioxide (together termed oxides of nitrogen or NO_x), water vapour and particulates (soot and sulfate particles), sulfur oxides, carbon monoxide (which bonds with oxygen to become CO_2 immediately upon release), incompletely burned hydrocarbons.

CO_2 emissions from aircraft-in-flight are the most significant.

The level and effects of CO_2 have the same atmospheric effects as ground-based emissions. On average, a plane produces a little over 15 kg of carbon dioxide (CO_2) per km. A car emits more CO2 than average planes because they consume more energy to transport the same amount of passengers. As well, according to the International Council on Clean Transportation (ICCT), on average, on a long journey, a car with 2 people emits few more CO_2 than if these two people had flown.

Lets take the example of Boeing 747. It has more than 60,000 gallons of fuel capacity. Just from taxi to reach to run way (take off position), it consumes 1 ton of fuel. From take-off position till achieving cruising height, it consumes 15 tons of juel. For 6400 km flight, it consumes 20,000 gallons of fuel. According to Boeing's web site, the 747 burns approximately 12 liters per kilometer. Even though, by-air travel per person is efficient than travelling in Honda Civic, the total contribution of pollution by aviation industry is still enormous. According to Flights tats (an online air travel stat source), an average of 90,000 flights take off every day. Airplanes consume 740 million gallons of fuel per day. (Automobiles consume one billion gallons of fuel per day)

About 60 percent of aviation emissions arise from international flights. According to the Guardian‘s “Travel Blog”, air travel may not be a big contributor to carbon emissions, but it’s been among the fastest-growing causes of global warming for years,

with the industry expanding at 5 percent annually. And with the world's most populous country now becoming among the wealthiest, hundreds of millions of Chinese citizens may soon enter the ranks of the frequent flier, as predicted by Boeing, which expects its passenger traffic to triple by 2030.

China emits almost twice the amount of greenhouse gases as the US, which it surpassed in 2006 as the world's top contributor to atmospheric carbon dioxide. Today, the country accounts for approximately 23 percent of all global CO_2 emissions.

Oxides of nitrogen (NOx) are the second most prominent factor generated by aviation industry. Emissions of NO_x are particularly effective in forming ozone (O_3) in the upper troposphere. High altitude (8–13 km) NO_x emissions result in greater concentrations of O_3 than surface NO_x emissions, and these in turn have a greater global warming effect. The effect of O_3 surface concentrations are regional and local, but it becomes well mixed globally at mid and upper tropospheric levels. NO_x emissions also reduce ambient levels of methane, another greenhouse gas, resulting in a climate cooling effect.

Water vapor (H2O), and contrails are the third most important factor, needing attention of scientists. Water vapour produced by aircraft engines at high altitude, under certain atmospheric conditions, condenses into droplets to form condensation trails, or "contrails". Contrails are visible line clouds that form

in cold, humid atmospheres and are thought to have a global warming effect. Contrails are uncommon (though by no means rare) from lower-altitude aircraft, or from propeller-driven aircraft or rotorcraft.

Contrails

Cirrus clouds

Cirrus clouds have been observed to develop after the persistent formation of contrails and have been found to have a global warming effect over-and-above that of contrail formation alone. A 2015 study found that artificial cloudiness caused by contrail "outbreaks" reduces the difference between daytime and nighttime temperatures.

Particulates are of least significant which, on a mass basis, are the release of soot and sulfate particles. Soot absorbs heat and has a warming effect. Sulfate particles reflect radiation and have a small cooling effect.

Aircraft manufacturers are striving for reductions in both CO2 and NOx emissions with each new generation of design of aircraft and engine. Engines that run hotter and cleaner reduce

emissions and burn half the amount of fuel used today. Unfortunately, these higher temperatures increase the NOx emissions that harm the ozone. Today, turboprop aircraft – probably in part because of their lower cruising speeds and altitudes play an obvious role in the overall fuel efficiency of major airlines.

Another proposed change is the integrating of an Electromagnetic Aircraft Launch System (EMALS) to the airstrips of airports. Some companies such as Airbus are currently researching this possibility. The adding of EMALS would allow the civilian aircraft to use considerably less fuel (as a lot of fuel is used during take-off, in comparison to cruising, when calculated per km flown). The idea is to have the aircraft take off at regular aircraft speed, and only use the catapult for take-off, not for landing.