TRANSPORTATION

Flying

Problem Set Solutions

Problem 1: In flight Power Supply

Many airlines now provide electrical outlets to connect your laptop to in flight. Estimate how much more fuel a large airplane has to carry on a flight from Vancouver International Airport to London Heathrow Airport to accommodate for laptop use in flight. The fuel efficiency of jet engines is ~1/3.

Problem 2: Fuel Economy

How does the fuel economy of a Boeing 747 compare to that of a 2010 Toyota Prius (in L/100 km/passenger)?

Problem 3: Fuel Demands

How much fuel does a plane require to go from rest on the runway to the cruising speed at their typical altitude? Where does the rest of the fuel go into? How much fuel does it cost the plane to fly for the same amount of time at the cruising altitude and speed? Should planes fly at higher or lower altitudes?

Problem 4: Greenhouse Gas Emissions

Above 6,000 or 7,000 m, there is very little water vapour in the atmosphere. Airplanes are powered by burning jet fuel which is roughly given by $CH_2 + {}^3/_2O_2 \rightarrow CO_2 + H_2O$. How much water is produced in the longest flight a 747 will make and what effect does this water have on the atmosphere?

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