

F5. An certain aircraft normally operates at 8km altitude, where the air properties compare to the sea level values as follows:

$$\rho = 0.50 \rho_{\text{SL}}$$

$$a = 0.95 a_{\text{SL}}$$

$$\mu = 0.95 \mu_{\text{SL}}$$

a) A 1/4 scale model of an aircraft is to be tested in an wind tunnel at sea level conditions. Is it possible to match both the Reynolds number and Mach number to those of the actual aircraft at altitude? Explain why or why not.

b) The Wright Brothers Wind Tunnel was designed to be pressurized during operation, as a means of increasing the air density ρ . The air temperature in the tunnel is still maintained at a normal $300K$, so that the speed of sound a and air viscosity μ inside the tunnel are unaffected by the pressurization, and are equal to their normal sea level values. Determine the pressure (in atmospheres) at which the tunnel must be operated to match the flight Reynolds and Mach numbers.