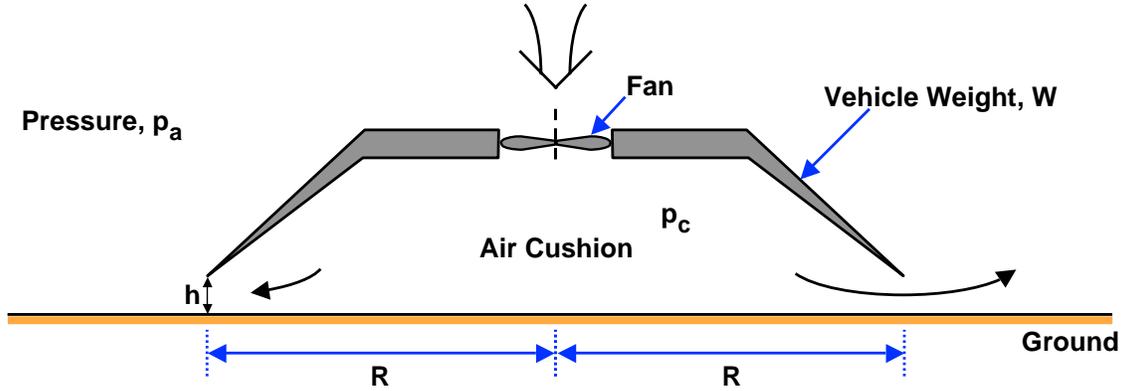


Problem 205C

A circular air-cushion vehicle of weight, W , uses a fan to pressurize the air cushion and thus elevate the vehicle:



For simplicity we assume that the air has a constant and uniform density, ρ . The fan characteristic is such that the pressure rise, $p_c - p_a$ (where p_c and p_a are the pressures in the cushion and the surrounding atmospheric pressure respectively) is related to the volume flow rate, Q , by

$$p_c - p_a = A - BQ$$

where A and B are known constants. The vehicle is elevated so that a gap, h , is created between the edge of the vehicle and the ground. Find h in terms of W , ρ , A , B and R , the radius of the base of the vehicle. Assume that the loss coefficient for the flow through the gap, h , is unity based on the velocity of the air flow through this orifice.