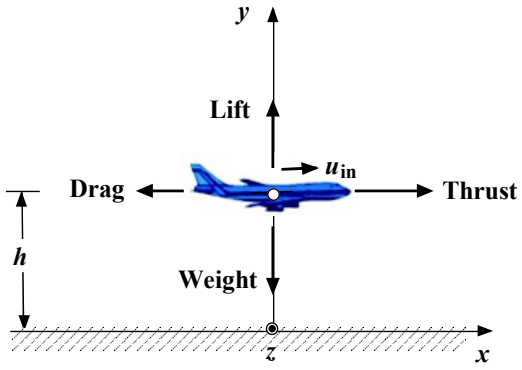
TEAM ASSIGNMENT NO. 1

A commercial aircraft is cruising at an altitude h with a speed $u = u_0$ and the thrust T_0. In order to increase the plane's velocity the pilot advances the trust to T_1. The inboard computer automatically increases the lift (by adjusting the appropriate aerodynamic surfaces) in order to match the aircraft's weight so that the plane maintains a level flight. According to Newton's second law, the equation that governs this dynamic maneuver is:

$$m\frac{du}{dt} = T_1 - \beta u$$

(m is the mass of the plane, u is its speed, βu is the drag, and β is a constant)



(a) Find velocity $u(t)$ as function of time.

(b) Find the limiting velocity u_1 $(t \to \infty)$.

(c) Find the position of the plane as a function of time. Note that at $t = 0$, $u = u_0$, and $x = 0$.