Avalanche Project

November 19, 2020

Abstract

In this article we want to observe the velocity of delivering package and want to check the possibility of controlling the touch down velocity

1 Free-Fall Study

At first , we consider a sphere that has free-falling in the present of of air resistance F_d and mass force mg the formulations are calculated as

$$\sum F = m\frac{\mathrm{d}v}{\mathrm{d}t} \tag{1}$$

$$F_d = \frac{1}{2}c\rho v^2 A \tag{2}$$

$$mg - F_d = m\frac{\mathrm{d}v}{\mathrm{d}t} \tag{3}$$

$$\frac{\mathrm{d}v}{\mathrm{d}t} + Bv^2 = g \tag{4}$$

$$B = \frac{c\rho A}{2m} \tag{5}$$

$$\int \frac{\mathrm{d}v}{g - Bv^2} = \int \mathrm{d}t \tag{6}$$

$$\frac{\tanh^{-1}(\frac{\sqrt{B}}{\sqrt{g}}v)}{\sqrt{B}\sqrt{g}} = t + c_1 \tag{7}$$

$$v(t) = \frac{\sqrt{g}\tanh(\sqrt{B}\sqrt{g}c_1 + \sqrt{B}\sqrt{g}t)}{\sqrt{B}} \tag{8}$$