The Physics of Baumgartner Skydiving

Formulas and Constant

Definitions

m: The mass of Baumgartner and his equipment.
A: The projected area of the Baumgartner.
C: The drag coefficient of Baumgartner.
g: The acceleration due to gravity.
ρ: the density of the atmosphere around Baumgartner.
v: The velocity of Baumgartner.
t: The time pass after Baumgartner began falling.
h: The distance between ground and Baumgartner.
T: The temperature of atmosphere around Baumgartner.
p: The pressure of atmosphere around Baumgartner.
dt: A very short time.

$m = 110\text{kg}$
$AC = 0.8395\text{m}^2$
$g = -9.8\text{m/s}^2$
$dt = 0.001\text{s}$

Figure 1: Baumgartner and his equipment

Calculation of Constant

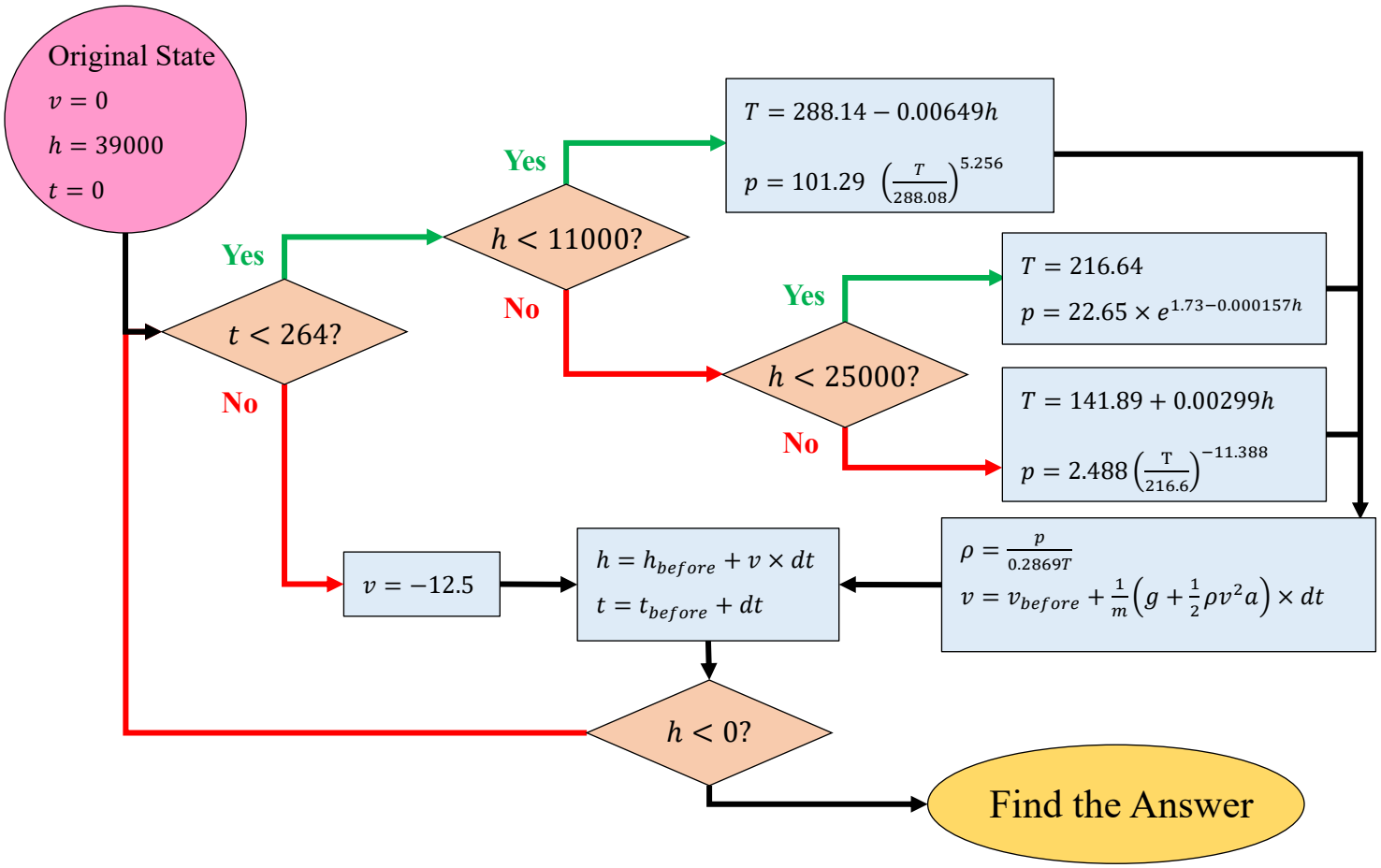
About 50 seconds after Baumgartner began falling, he reached the terminal velocity(1173km/hr ≒ 326m/s) at a height of about 28000 meters.

We hypothesized that $A, C, m, g,$ is constant. We found out m is about 110 kilogram and set $g = -9.8\text{m/s}^2$. Reaching the terminal velocity signified that the resistance equals gravity, so we got $mg = \frac{1}{2}\rho v^2 CA$.

We substituted $h = 28000$ meters into the function of density and got ρ. Then find $AC \fallingdotseq 0.8395$ by $mg = \frac{1}{2}\rho v^2 CA$.

Simulation by Computer Program

Flow Path



Program (made by phthon)

Result and Discussion

References

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