v	Ascent Rate	m/s
F	Free Lift	N
F_g	Gross Lift	N
C_d	Drag Coefficient	
ρ_a	Air Density	kg/m^3
ρ_g	Gas Density	kg/m^3
r	Launch Radius	m
A	Launch Area	m^2
V_L	Launch Volume	m^3
m_p	Payload Mass	kg
m_b	Balloon Mass	kg
g	Gravitational Acceleration	m/s^2

$$v = \sqrt{\frac{F}{\frac{1}{2}C_d \rho_a A}} \tag{1}$$

$$A = \pi r^2 \tag{2}$$

$$F = F_g - (m_p + m_b)(g) \tag{3}$$

$$F_g = (\rho_a - \rho_g) \times V_L \tag{4}$$

$$V_L = \frac{4}{3}\pi r^3 \tag{5}$$

$$F_g = (\rho_a - \rho_g)(\frac{4}{3}\pi r^3) \tag{6}$$

$$F = (\rho_a - \rho_g)(\frac{4}{3}\pi r^3) - (m_p + m_b)(g) \tag{7}$$

$$v = \sqrt{\frac{(\rho_a - \rho_g)(\frac{4}{3}\pi r^3) - (m_p + m_b)(g)}{(\frac{1}{2}C_d \rho_a)(\pi r^2)}} \tag{8}$$

$$v^2(\frac{1}{2}C_d \rho_a \pi r^2) = ((\rho_a - \rho_g)\frac{4}{3}\pi r^3) - (m_p + m_b)(g) \tag{9}$$

$$[(\rho_a - \rho_g)\frac{4}{3}\pi]r^3 - [\frac{1}{2}v^2 C_d \rho_a \pi]r^2 - [(m_p + m_b)g] = 0 \tag{10}$$

yuck! a cubic!