|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time | Horizontal Velocity (Vx) | Vertical Velocity (Vy) | Velocity (V) | $$θ$$ | Horizontal Position (x) | Vertical Position (y) | $$\frac{dV\_{x}}{dt}$$ | $$\frac{dV\_{y}}{dt}$$ |
| 0.0 |  |  |  |  |  |  |  |  |
| 0.2 |  |  |  |  |  |  |  |  |
| 0.4 |  |  |  |  |  |  |  |  |
| 0.6 |  |  |  |  |  |  |  |  |
| 0.8 |  |  |  |  |  |  |  |  |
| 1.0 |  |  |  |  |  |  |  |  |
| 1.2 |  |  |  |  |  |  |  |  |
| 1.4 |  |  |  |  |  |  |  |  |
| 1.6 |  |  |  |  |  |  |  |  |
| 1.8 |  |  |  |  |  |  |  |  |
| 2.0 |  |  |  |  |  |  |  |  |
| 2.2 |  |  |  |  |  |  |  |  |
| 2.4 |  |  |  |  |  |  |  |  |
| 2.6 |  |  |  |  |  |  |  |  |
| 2.8 |  |  |  |  |  |  |  |  |
| 3.0 |  |  |  |  |  |  |  |  |
| 3.2 |  |  |  |  |  |  |  |  |
| 3.4 |  |  |  |  |  |  |  |  |
| 3.6 |  |  |  |  |  |  |  |  |
| 3.8 |  |  |  |  |  |  |  |  |
| Time | Horizontal Velocity | Vertical Velocity | Velocity (V) | $$θ$$ | Horizontal Position | Vertical Position | $$\frac{dV\_{y}}{dt}$$ | $$\frac{dV\_{x}}{dt}$$ |
| 4.0 |  |  |  |  |  |  |  |  |
| 4.2 |  |  |  |  |  |  |  |  |
| 4.4 |  |  |  |  |  |  |  |  |
| 4.6 |  |  |  |  |  |  |  |  |
| 4.8 |  |  |  |  |  |  |  |  |
| 5.0 |  |  |  |  |  |  |  |  |
| 5.2 |  |  |  |  |  |  |  |  |
| 5.4 |  |  |  |  |  |  |  |  |
| 5.6 |  |  |  |  |  |  |  |  |
| 5.8 |  |  |  |  |  |  |  |  |
| 6.0 |  |  |  |  |  |  |  |  |
| 6.2 |  |  |  |  |  |  |  |  |
| 6.4 |  |  |  |  |  |  |  |  |
| 6.6 |  |  |  |  |  |  |  |  |
| 6.8 |  |  |  |  |  |  |  |  |
| 7.0 |  |  |  |  |  |  |  |  |
| 7.2 |  |  |  |  |  |  |  |  |
| 7.4 |  |  |  |  |  |  |  |  |
| 7.6 |  |  |  |  |  |  |  |  |
| 7.8 |  |  |  |  |  |  |  |  |

What a Drag! Accommodating Assumptions

*Calculating Position with Drag*

 **Drag =** $\frac{1}{2}pV^{2}∙C\_{d}∙S$

Acceleration along the x-axis: $\frac{dV\_{x}}{dt}=-\frac{\left(\frac{1}{2}pV^{2}\cos(θ)∙C\_{d}S\right)}{m}$

Acceleration along the y-axis: $\frac{dV\_{y}}{dt}=-\frac{\left(\frac{1}{2}pV^{2}\sin(θ)∙C\_{d}S\right)}{m}-g$

$p=$ Atmospheric density = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ slugs/ft3

V=Velocity = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ft/sec

$θ=$Angle of attack = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ degrees

$C\_{d}=$ Drag coefficient = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

S = Cross sectional area = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ft2

W = Weight of object = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lbs

g = Gravitational constant = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ft/sec2

m = Mass of object = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ slugs

As the object moves through the air the angle of attack and the velocity will change due to drag and gravity. This makes it impossible to predict the outcome based solely on the input data. Instead changes in angle and velocity must be considered in very small segments of time.

Though we are given an initial velocity, we will need to understand the horizontal and vertical components of that velocity as they relate to the angle of attack ($θ$).