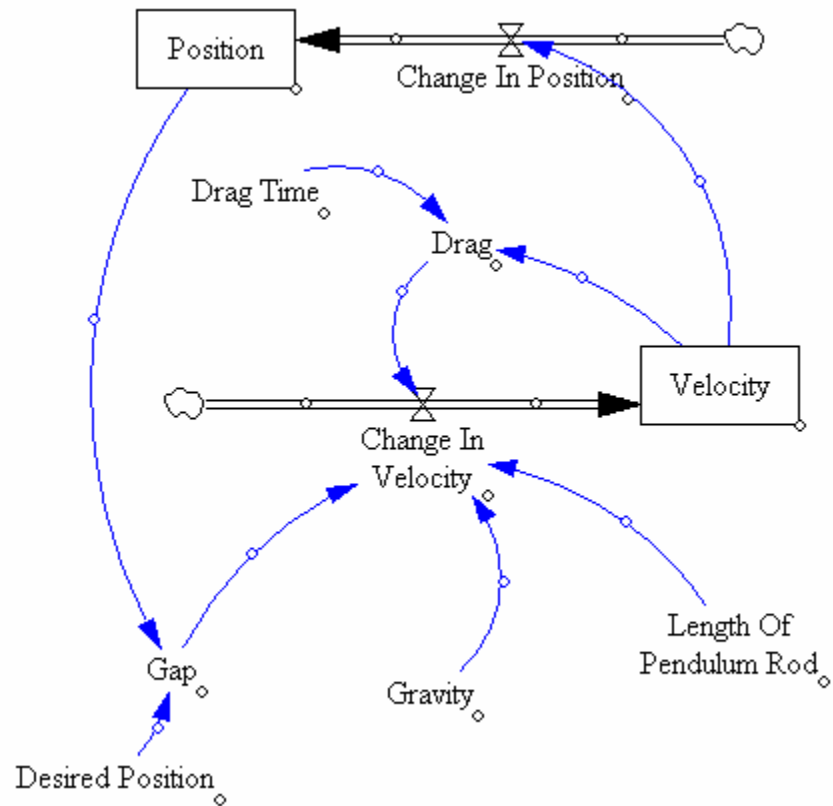
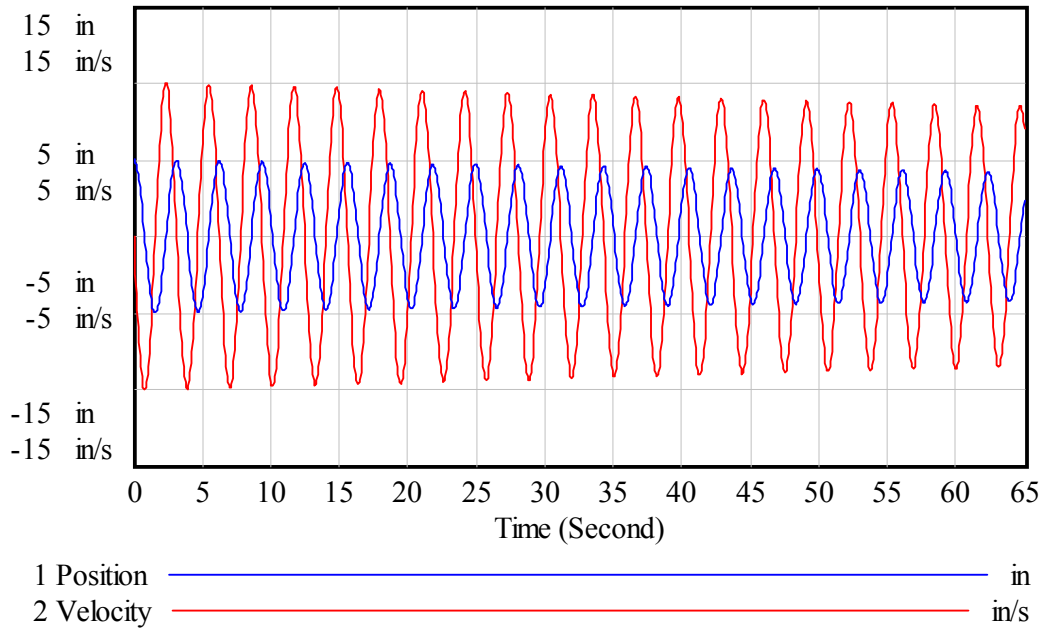


PENDULUM OBSERVATIONS & VENSIM SYSTEMS DYNAMIC MODEL

By: Dave Stancavish 3/27/2009



Narrow Swing Pendulum Test



3/26/09 Observations:

Test#1 Start Position = +5in at 0 sec || 20th Cycle End Position = +4.25in at 62.38 sec

Test#3 Start Position = +5in at 0 sec || 20th Cycle End Position = +4.25in at 62.47 sec

Vensim Model:

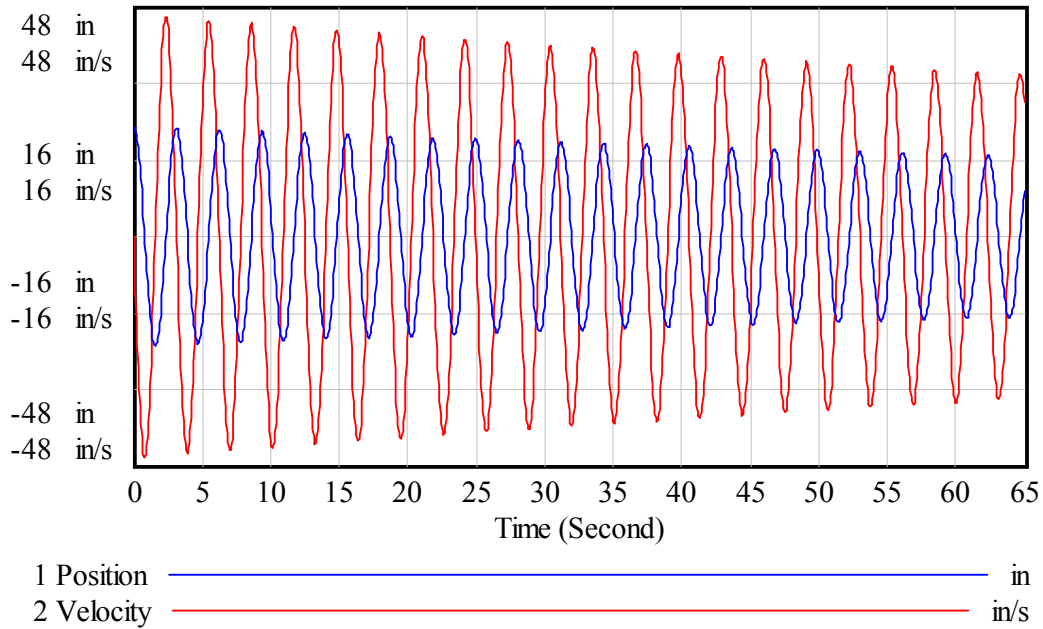
Start Position = +5in at 0 sec || 20th Cycle End Position = +4.25in at 62.38 sec

Velocity = 0in/sec at 0.00sec

Velocity = -10.04in/sec at 0.75sec

Velocity = +8.57in/sec at 61.56 sec

Wide Swing Pendulum Test



3/26/09 Observations:

Test#2 Start Position = +23in at 0 sec || 20th Cycle End Position = +17in at 62.44 sec

Test#4 Start Position = +23in at 0 sec || 20th Cycle End Position = +17in at 62.46 sec

Vensim Model:

Start Position = +23in at 0 sec || 20th Cycle End Position = +17.01in at 62.38 sec

Velocity= 0in/sec at 0.00sec

Velocity= -46.09in/sec at 0.75sec

Velocity = +34.38in/sec at 61.56 sec

Equations:

- (01) Change In Position=
Velocity
Units: in/s
- (02) Change In Velocity=
(Gravity*Gap/
Length Of Pendulum Rod)
-Drag
Units: in/(s*s)
- (03) Desired Position=
0
Units: in
- (04) Drag=
Velocity/Drag Time
Units: in/s
- (05) Drag Time=
103.5 for Wide Test
192.0 for Narrow Test
Units: s
- (06) FINAL TIME = 65
Units: Second
The final time for the simulation.
- (07) Gap=Desired Position-Position
Units: in
- (08) Gravity=
32.1423*12
Units: in/(s*s)
Gravity is 32.152231 ft/s² at sea level. IV altitude = 6425 ft, adjustment factor = .999695
- (09) INITIAL TIME = 0
Units: Second
The initial time for the simulation.
- (10) Length Of Pendulum Rod=
95
Units: in
- (11) Position=
INTEG (Change In Position,
23 for Wide Test, 5 for Narrow Test)
Units: in
- (12) SAVEPER =
TIME STEP
Units: Second [0,?]
The frequency with which output is stored.
- (13) TIME STEP = 0.0625
Units: Second [0,?]
The time step for the simulation.
- (14) Velocity=
INTEG (Change In Velocity,0)
Units: in/s
Starting Velocity