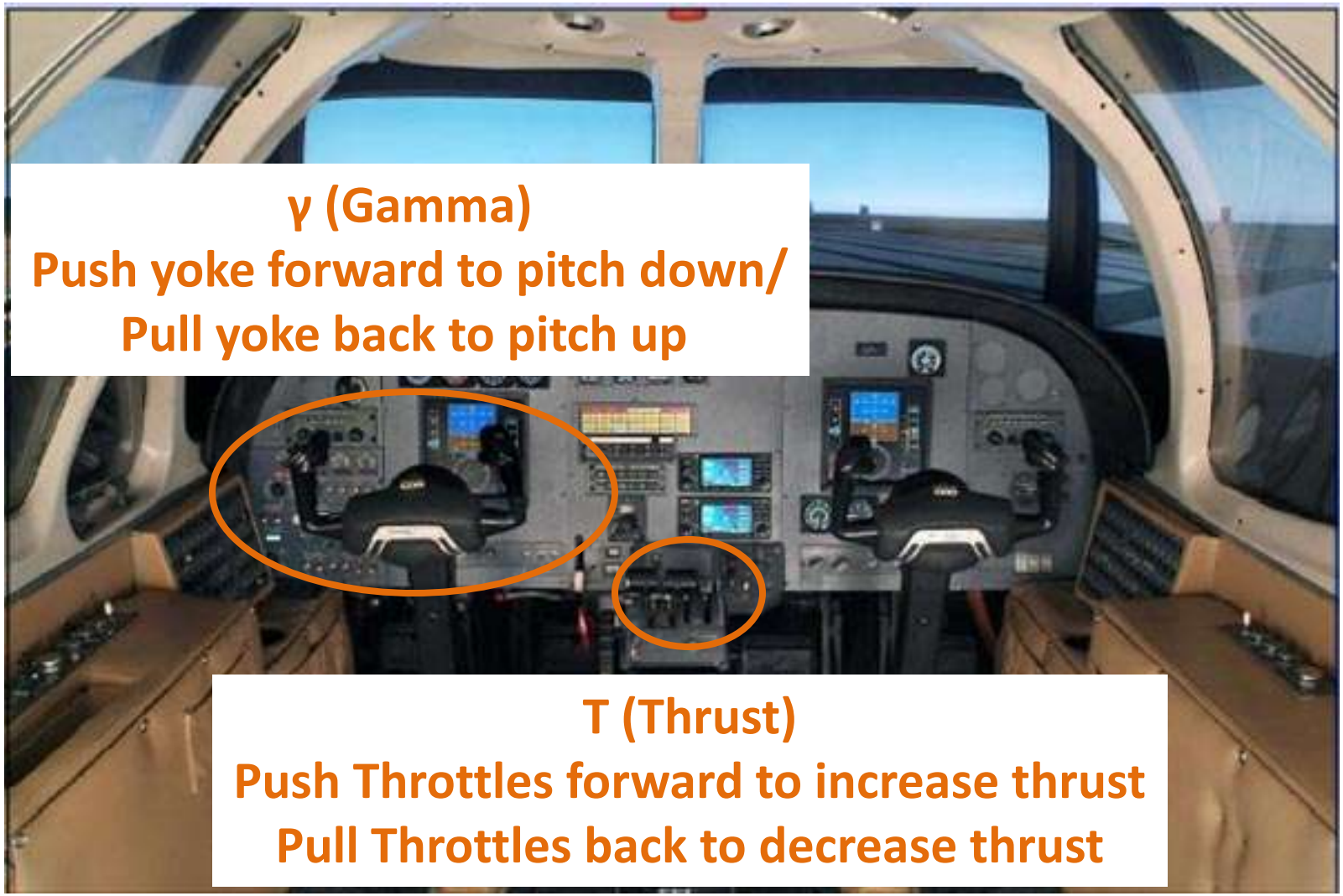
# Aerodynamics Homework

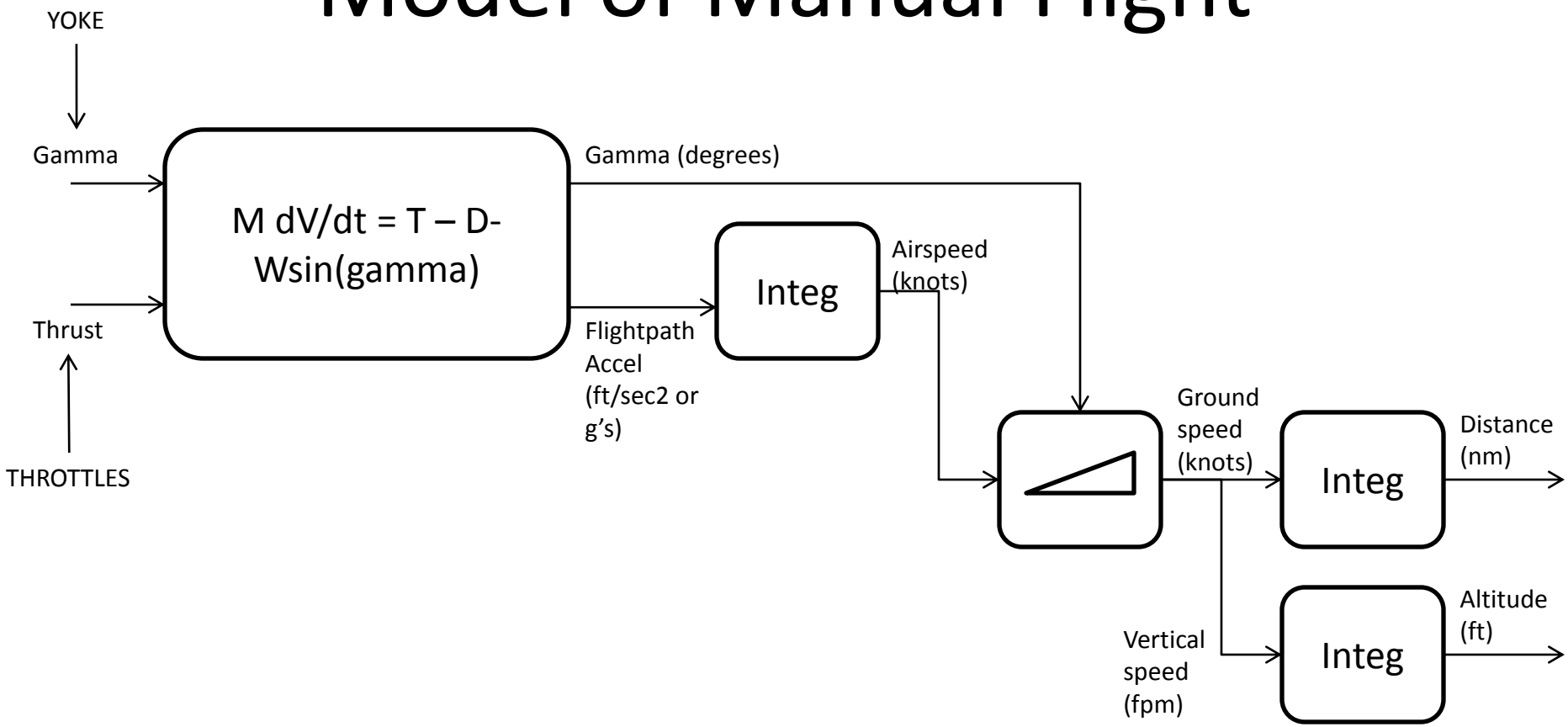
SYST 560/460

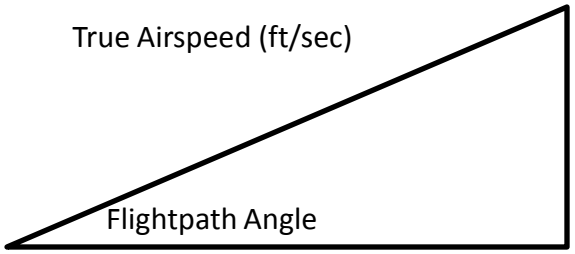
Lance Sherry

# Model of Manual Flight



# Model of Manual Flight




Altitude Rate = Vertical Speed (ft/sec)

$$\text{Sin (Flightpath Angle)} = \frac{\text{Vertical Speed (ft/sec)}}{\text{True Airspeed (ft/sec)}}$$

# Model of Manual Flight

| Time (secs) | T | FlightpathAngle | sin (FPA) | Weight | Drag |
|---|---|---|---|---|---|
| 0 | 22461 | 17 | | | |
| =A2+1 | =25000-B2 | =(C2*0.5)-10 | =SIN(C3*57.3) | 100000 | =0.5*0.0212*0.0017*1000*(L2)*(L2) |

| T-D/M | Inertia | FlightpathAccel (ft/sec 2) | FlightpathAcel (g's) | Excess Thrust for Constant Speed | Airspeed (ft/sec) | Airspeed (knots) |
|---|---|---|---|---|---|---|
| | | | | | =M2*6076/3600 | 140 |
| =(B3-F3)/(E3/32.2) | =-(E3*SIN(C3*57.3))/(E3/32.2) | =(B3-F3-(E3*SIN(C3*57.3)))/(E3/32.2) | =I3/32.2 | =B3-F3 | =L2+I3 | =L3*(3600/6076) |

| Groundspeed (ft/sec) | Groundspeed (knots) | Distance (ft) | Distance (nm) |
|---|---|---|---|
| | | -36456 | =P2/6076 |
| =L3*COS(C3/57.3) | =N3*(3600/6076) | =P2+N3 | =P3/6076 |

| VerticalSpeed (ft/s) | Vertical Speed (fpm) | Altitude | Alt for 3 Deg Glideslope at 140 knots | Vertical Deviation (+ High) |
|---|---|---|---|---|
| | | 2500 | =2000 | =T2-U2 |
| =L3*SIN(C3/57.3) | =R3*60 | =T2+R3 | =U2-16.66667 | =T3-U3 |

# Homework

- Build Aircraft simulation model using equations for Flightpath Axis
  - Plot:
    - T on x axis, Airspeed and Ground Speed (primary y axis), FP Accel (secondary y)
    - T on x axis, Altitude (primary y axis), Vertical speed (secondary y)
    - T on x axis, Airspeed and Ground Speed (primary y axis), Thrust (secondary y)

1. Initialize to 5000 ft at 250 knots. Fly for 60 seconds then climb at 2000 fpm, to 7000'. Increase speed to 260 knots. (Adjust FPAng and Thrust)
2. Fly a glideslope of -3º from -6nm from 2000' at 160 knots. (Adjust FPAng and Thrust)