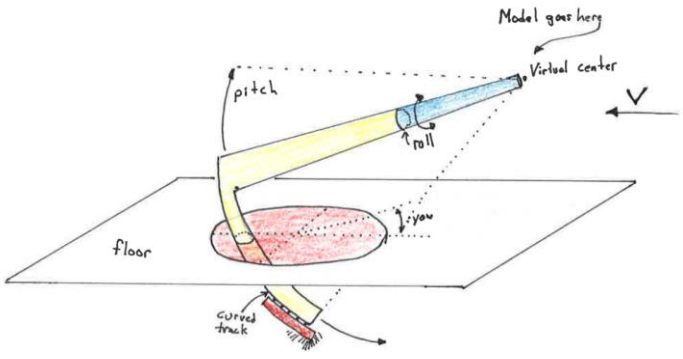
AEM 313 Problem Set #1

Due: 30th August 2016 by 11:00am

Prepare solutions to the following 6 problems. Write on engineering or regular 8.5x11 paper and staple on the top left corner. Write out problem statement and assumptions. Provide calculations. Write a 1-2 sentence summary of what you learned. No more than one problem per page. Box your final answers.

1. Plot an NACA 2416 airfoil exactly to scale with a chord of 7 inches. Show the mean chord line, the locations of maximum thickness and camber.
2. Compute the density of wet air in English units given 90% relative humidly and 90 degrees Fahrenheit. Include your Arden-Buck calculations or ASHRAE Psychrometric chart.
3. Problem 1.18
4. Draw to scale the planform of a linearly tapered wing with the following properties:
   - b = 10 inch
   - $\Lambda_{c/4} = 30^{\circ}$
   - AR = 5
   - S = 20 sq-in

   Cr=2.5 in
5. For the linearly tapered wing in problem #4, derive equations for the following and compute:
   - Average chord (e.g. $\bar{c} = S / b$)
   - Tip chord
   - Root chord
   - Taper ratio
   - Leading edge sweep angle
   - Trailing edge angle
   - MAC
   - Port LE wing tip location (assuming FS0.0 BL0.0 is the root LE)
6. A wind-tunnel model is connected to the following sting in a level attitude. The sting is initially pointed directly into the freestream velocity vector. The sting's roll mount is rotated right to φ=90˚. The sting's pitch mount is rotated up to θ=20˚. Then the sting's yaw mount is rotated left to ψ=-45˚ (note the minus). Determine α and β of the model with respect to the freestream.



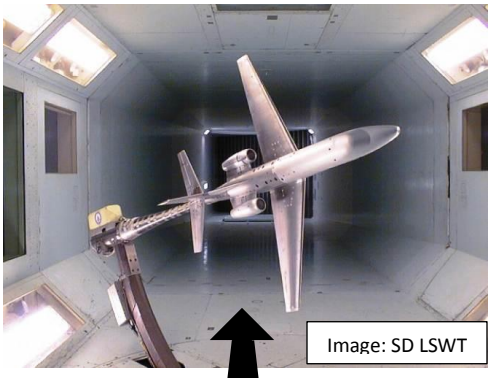


Image: SD LSWT

Flow direction