Problem 1 Vocabulary

Explain the following terms; making sure to use sufficient detail, including any math or helpful figures. In some cases, these terms are simple one sentence definitions, in others, you should include several paragraphs to explain them fully.

Wing Geometry Terms

- Wing Area
- Chord
  - Mean Geometric Chord
  - Mean Aerodynamic Chord
- Taper Ratio
- Span
- Aspect Ratio
- Sweep
- Dihedral
- Twist
- Washout

Forces and Moments

- Lift
- Drag
  - Induced Drag
  - Parasitic Drag
    - Skin Friction Drag
    - Pressure Drag
  - Compressibility Drag
- Pitching Moment
- Lift and Drag Polars
  - Angle of Attack
  - Zero Lift angle of attack
  - Lift Curve Slope
  - Stall

Non-dimensional Numbers

- Reynolds Number
- Mach Number
- Coefficients
  - Lift Coefficient
  - Drag Coefficient
  - Moment Coefficient

Airframe Analysis

- Vortex Lattice Method
- Strip Theory
- Critical Section Theory

Airframe Performance

- Lift Distribution
- Stall Speed

Stability

- Static Stability
  - Aerodyanmic Center
  - Center of Gravity
  - Static Margin
  - Stability Derivatives
  - Roll
  - Pitch
  - Yaw
  - Side Slip Angle
- Dynamic Stability
  - Stability Modes
  - Eigen Values
- Tails
  - Tail Volume Ratios

Optimization

- Design Variables
- Objective
- Constraints

Problem 2 Studies

Complete the following studies.

2.a Prerequisites

i. Install VortexLattice.jl and complete the Getting Started Guide as well as the Steady State Wing and Tail Example.

ii. Obtain, and become familiar with, the various tools auxiliary to VortexLattice.jl including:

- The airfoil analysis code
- The strip theory and far-field drag codes
- The critical section theory code
- The eigen value code
- The wing efficiency code

2.b Forces, Moments, and Polars

2.c Lift Distributions and Wing Efficiency

2.d Drag

2.e Static Stability

2.f Dynamic Stability