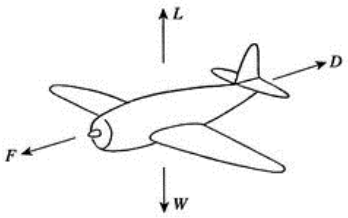
Name: _____ Section: _____ Exam1

Again: read this cover sheet fully (front and back), before starting anything.

Imagine this Gulfstream IV aircraft in a steady flight, leveled at a given altitude. The maximum velocity attainable in this straight and steady flight can be calculated through extensive math using: velocity of the aircraft (V_∞) in feet/second, altitude, aerodynamic shape, lift surface (S) in feet^2 and weight of the aircraft (W). However, it can easily be determined by reading graphically the intersection of two curves:



- the power required vs. the velocity, and
- the power available vs. the velocity.

ρ_∞ (greek letter pronounced "rho") is the air density at sea level: $\rho_\infty = 8.9068 * 10^{-4}$ slugs/ft^3

The equation for the power available as *a function of* velocity is:

$$P_{available}(V_\infty) = 15371 * V_\infty \text{ (in ft*lb/s)}$$

The equation for the power required as *a function of* velocity is:

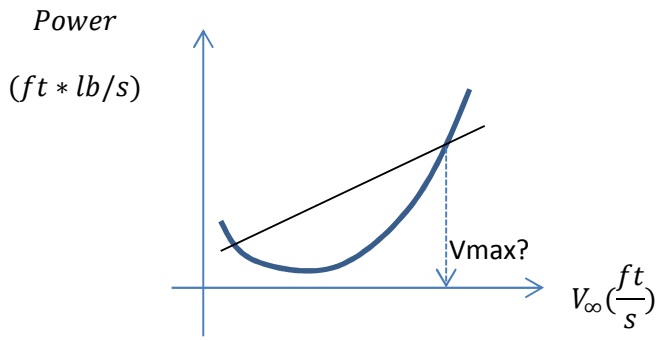
$$P_{required}(V_\infty) = 0.0075\,\rho_\infty * V_\infty^3 * S + 0.16 * \frac{W^2}{\rho_\infty * V_\infty * S} \text{ (in ft*lb/s)}$$

All units are consistent and you should not worry about any conversions.

Using the full 7 steps taught in this class, and **only** the material taught in this class at this time, develop a program that is easily reusable to solve the problem.

Step1**(5pts)**:

Step2:



Step3: (Equations given already)
Step4 **(3pts)**:

Step5: (solve graphically – hence no step5 needed)
Step6: not applicable
Step7a (comments) and 7b (place directly on the script file).

Requirements for the program itself:

- **(12pts)** prompt the user for the values of W and S. Tell the user that W should be between 70,000 and 74,000 lbs. Tell the user that S should be between 900 and 970 ft^2.
- **(15pts)** define all vectors that can plot power required and power available.
- **(10pts)** plot correctly, using colors, markers and line specifications AS SHOWN in the videos.
- **(15pts)** label the plot properly and fully

(4pts – other random errors!)

Within script:
name/section/description **(3pts)**
commands to clean up previous execution of MATLAB codes **(3pts)**
comments (which is considered the algorithm) **(5pts)**
spacing of code **(5pts)**
appropriate variable names (no single letters) **(5pts)**
semi-colon hiding intermediate calcuations **(5pts)**

Step7c **(5pts)**: For S = _____ and W = _____, the maximum velocity attainable read on the graph is _____ ft/s. Verify mathematically your solution seems accurate.