

Project #1**MEAM 5460 - Spring 2023****Assigned: 03/16/2023, Due: 03/31/2023**

For a new VTOL related program in the company and your technical lead engineer wants you to work with a colleague to continue developing the group's analysis tool to predict the variation of thrust and power of a rotor in hover (the current tool is classical Blade Element Momentum Theory). For this development sprint she wants you to add Prandtl Tip loss function to the model and the capability to model linear twist and taper variation. Furthermore, she wants the ability to have different airfoils (albeit still linear) along the blade span (with linear interpolation between stations).

The baseline blade configuration you and your colleague are using to test the model is to have a Radius of 30 ft, Linear twist of -8 deg (from root to tip) and a Tip speed of 780 ft/sec. In order to ascertain whether the tool is giving you expected results you are considering analysis of the following:

- 1.) Constant chord of 2ft with Constant airfoil (lift curve slope of 2π)
- 2.) Constant chord of 2ft with varying airfoils (linear variation, lift curve slope of 2π at root and 6.0 at tip)
- 3.) 2:1 taper ratio (2 ft chord at 0.75%R) with Constant airfoil (lift curve slope of 2π)
- 4.) 2:1 taper ratio (2 ft chord at 0.75%R) with varying airfoils (linear variation, lift curve slope of 2π at root and 6.0 at tip)

The end goal is to provide a report with your analysis and assessment of the results. To confirm that you and your colleague have implemented everything correctly you may choose to review the impact of the Prandtl tip loss function model feature on the model results.