Reducing the Effects of a Mounting System

Marco Valadez, mvaladez22@damien-hs.edu
Profesor Uranga's Lab
Damien High School, Class of 2022
USC Viterbi Department of Aerospace Engineering, SHINE 2019

**Introduction**

The cylindrical shapes of the model mounting system are very intrusive on flows. Airfoil shapes are much less intrusive. This is why the airfoil shape is chosen for the shape of wings and shrouds. By covering the cylinders with a shroud with an airfoil shape, they will have less intrusion on the data results, leading the data to become more accurate.

**Method:** To accomplish this task, I created a shroud using a design program called SolidWorks. The shroud was required to cover the trunnion and the actuator. The chord length of the airfoil couldn’t be longer than 10 inches. Also, I had to make a hole for the horizontal arm to pass through. Several different sized airfoil were used to create the shroud seen below. The airfoils were acquired by using an airfoil database. The shroud was 3D printed in eight pieces due to the size capacity of the printer. To provide structure and strength to the shroud, I covered the existing shroud with fiberglass. To gather data, I used a smoke at a full and half height to see the streamlines.

**Time Frames:** At the beginning of SHINE, I practiced using Solidworks by looking at tutorials. Then, I began to make simple shrouds and wings to better understand how the shrouds are designed. The actual designing of the shroud took me around seven days to complete. Adding the fiberglass, bondo, and sanding took me a total of three days. I spent a day gathering results in the wind tunnel.

**Research Process**

**Results**

- This data shows two lines which are the tall and half heights.
- The area where the model is typically placed was positively affected by the shroud. The models are typically placed in the 55 to 65 centimeter area on the x-axis.
- In the other areas, the shroud did not provide much improvements due to its size.

![Effectiveness of Shroud](image)

**Advice for Future SHINE Students**

For future SHINE students, I recommend using this program to open up your knowledge to things that you have never seen or learned about before. Also, don’t be afraid to ask questions about a topic you are unfamiliar with. When you make a mistake, you should not be discouraged because it is part of the program. The PHD mentors will always help you, and they have the best intentions for you because they want to see you succeed. Lastly, make the most of this program because you are only in the SHINE program for a short amount of time.

**Skills Learned**

- Basics of aerodynamics
- Solidworks
- Basics of MATLAB
- Learned how to import airfoil coordinates into Solidworks
- Learned how to apply fiber glass on a 3D printed model

**Acknowledgements**

Thank you to all of the people who helped put the SHINE program together. A special thank you to James, my PhD mentor, for guiding and helping throughout my weeks while attending SHINE. Yohana, Thank you for reviewing my poster. Also, thank you to Dr. Mills and Dr. Herrold for making the SHINE experience more enjoyable for all of the SHINE students. Lastly, thank you to Profesor Uranga for allowing me to work in her lab.