January 20, 2005
Version 1.0

Test and Verification Protocol

Objective Function: $F = L - 3D - 5W$

Collect all force data (except weight) through the Lab View program in the Wind Tunnel and export that data to an excel spreadsheet. E-mail this spreadsheet to yourselves from the control room.

1. Start lab view with only the rest rig (not your airfoil and endplates), and zero the readouts.

2. Once your apparatus is secured to the test rig, take data at zero speed conditions for at least a minute to benchmark the load cell voltage outputs.

3. Gradually ramp up the wind tunnel speed from 0 to 60 mph in 5 mph increments. Be sure to allow the readouts to stabilize at each speed so you have consistent voltage readings.

4. Once you have reached the operating speed (60 mph), take several minutes of data.

5. If time allows, back the speed down in 5 mph increments to verify your accuracy.

Data Analysis
Once you have the spreadsheet, you will want to "zero" your data based on the benchmark data collected at 0 mph. Once the data has been corrected, you will need to convert the voltage outputs to forces and moments with the following conversions.

> **Voltage to English Conversions:**
> Lift: 17.19   mv/pound
> Drag: 112.00 mv/pound
> Side Force: 50.50   mv/pound
> Roll: 51.00   mv/foot-pound
> Pitch: 56.40   mv/foot-pound
> Yaw: 49.85   mv/foot-pound
>
> **English to Metric Conversions[1]:**
> 1 pound-force = 4.4482216 newton
> 1 foot pound-force = 1.355818 Newton meter

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[1] Note that other conversions can be found online at http://www.onlineconversion.com/

Summary of Test Results:

Team #: _____   Date: _____

Team Name: _____   Time: _____

Team Members: _____

_____

_____

On this sheet, record the components of the optimization function to arrive at your overall score. Use a large continuous section of your sample to determine the function components and take the average. Make sure all measurements are in appropriate units.

Down-Force Produced: $L =$ _____ Newtons

Drag Produced: $D =$ _____ Newtons

Weight Added: $W =$ _____ Newtons

Objective Function: $$F = L - 3D - 5W$$

Final Result: $F =$ _____ Newtons