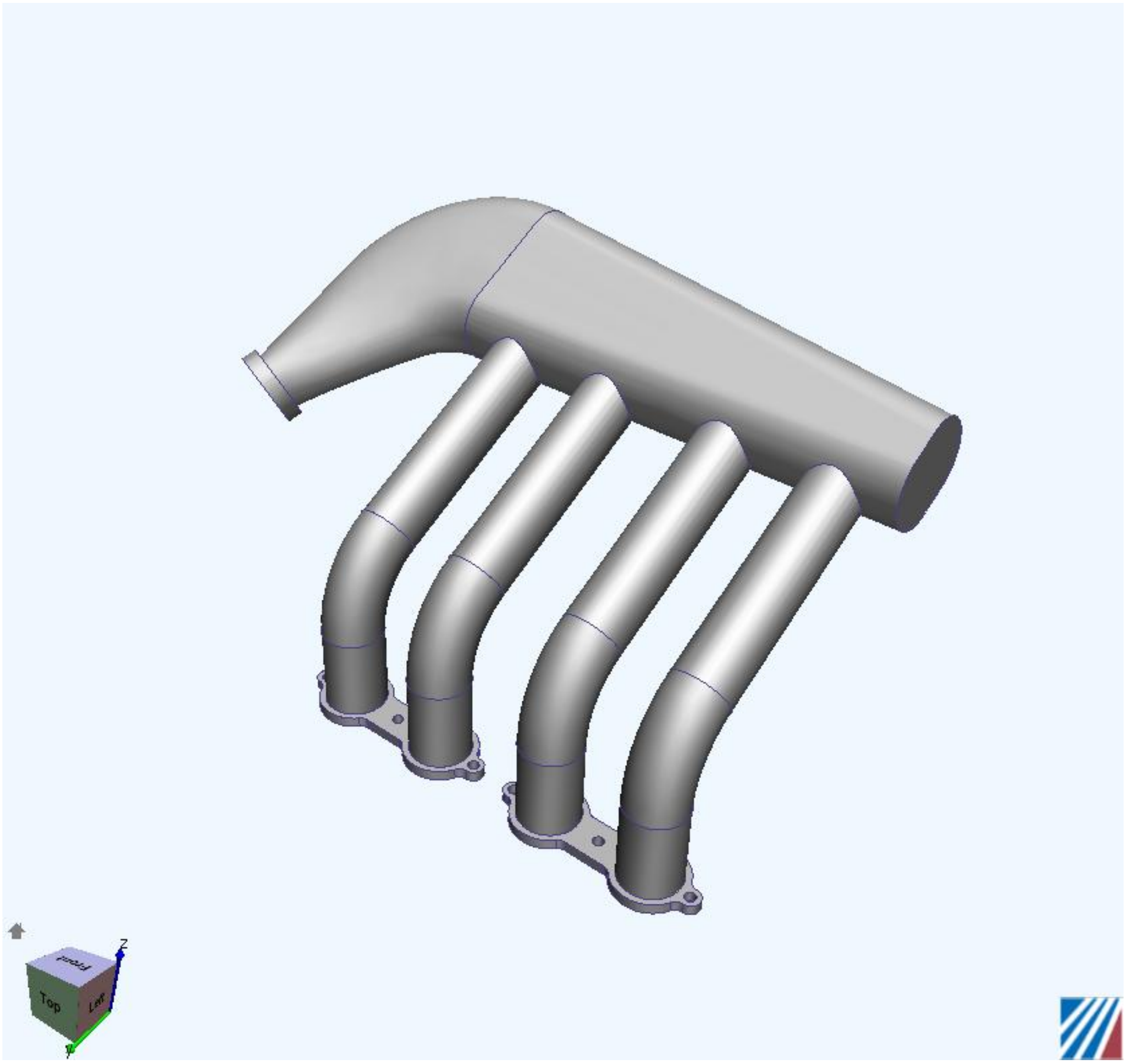
Design Approach:

Both the Helmholtz resonance and Induction Wave Ram Cylinder Charging Theories can be used to approximate where a torque peak should occur for any given intake geometry. A theoretical optimal length versus RPM curve can also be generated. However, since both of these theories are acting at the same time within the intake, perhaps with constructive or destructive affects on each other, it is best to use empirical data to set design parameters. Theoretically derived graphs, as well as historic dynamometer data was used to select a range of runner lengths from 6 inches to 12 inches to dynamically test.

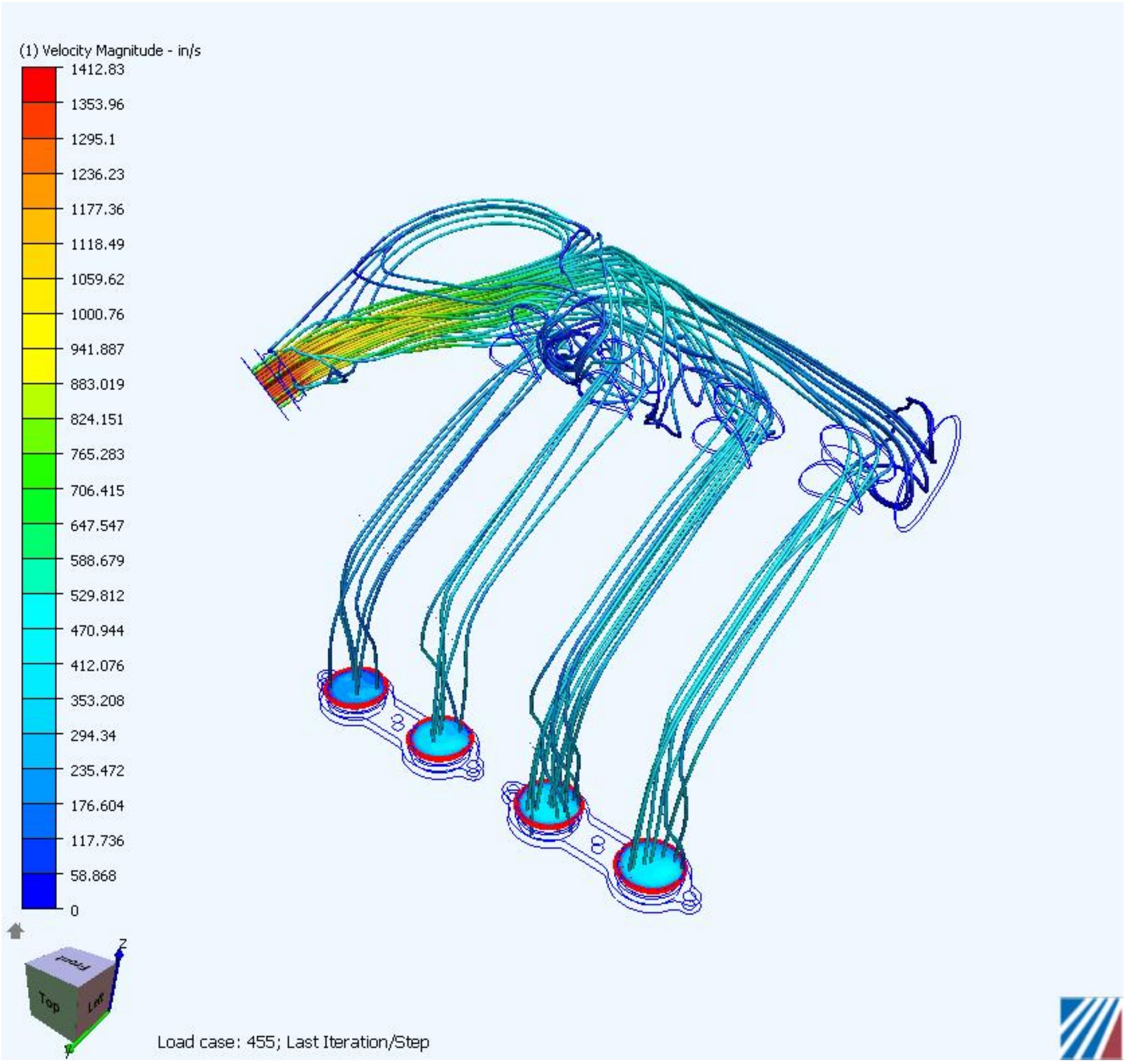
The intent of the variable runner length system is not to increase max torque or power, but rather to broaden the torque and power curves. Peak power gains may be found with the design of a less restrictive and more evenly flowing intake. CFD analysis has been employed on the last 2 competition intakes. The fluids problem that exists within the intake system is quite complex. A steady state flow does not exist, as the intake valves open and close. To simplify the analysis, the volumetric flow rate of air that a 600cc engine consumes at 10,000 rpm is applied to the inlet of the intake. The 4 exits are set as "unknown" conditions. This simplified analysis will solve much faster than a time dependent solution, but can only be used as a comparative analysis. Intake designs can be compared for overall pressure drop and equitable division of flow across the 4 runners.

Results show that the F17 intake did not have a favorable distribution of air, as cylinder #1 is shown to receive 17% of the total ingested air, where cylinder #4 receives 30%. Cylinder #3 and #4 both received approximately 26%.

F17 Model



F17 Flow Trace



CFD will be used to compare our design iterations and to select an optimized geometry.