

# *AERO 101*

Greetings! This is the ninth segment of Aero 101. Today's discussion is about vortex generators. Vortex generators were used on aircraft for many years before cars. Their purpose is to energize the boundary layer to avoid flow separation. As stated before, if you have any questions, don't forget to ask!

Vortex generators (VG's, as we will reference here) can range from small to large. The size of the VG will determine which boundary layers it can affect. VG's can come in many shapes and forms. Most commonly on open wheel race cars is the airfoil VG. Alternatively, flat plates form tip vortices similar to slender wings or strakes. When placed underneath a car, these trailing vortices snake around and, due to the high speed around the vortex core, low pressure will surround them and increase downforce. However, this increases induced drag as well. In general, reducing the ground clearance increases downforce and drag by strengthening the vortex, untangling vortices, and bringing them closer to the underbody.

So why do vortices form? Take for example a plate or vane that is at an angle to the airflow. There is a static pressure differential between the windward and leeward sides. This causes the air to spill over the edges, moving from high to low pressure regions. As the air makes the turn over the plate, it cannot remain attached due to the sharpness. The change in momentum starts a circular motion that dissipates as distance increases. Vortices are useful in shielding unwanted air from entering pressure sensitive areas. They can also be used to affect airflow farther back on the body. On F1 cars, VG's are used to keep tire squirt from entering the radiator ducts and also to keep flow attached over the sidepod.



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