

## A Study of Cross Wind Effect on Bike's Aerodynamic

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**Abstract** - This paper presents a review of recent research that has been carried out on the cross-wind effects on a bike. Air resistance plays important role in a bike. And its performance can change according to its different shapes. Bike aerodynamic drag has been extensively studied with the primary purpose of reducing drag and improving performance. Aerodynamic play a key role in bike design for stability when it is in motion. Here, we use computer model analysis and simulation to investigate the effects of crosswinds on bike's aerodynamics. Using two different bikes for analysis of cross wind effect analysis and simulation shows the effect of cross wind in bikes aerodynamic and how it will affect its safety issues

**Key Words:** Aerodynamic, Air resistance, cross wind effect, stability

### 1. INTRODUCTION

Aerodynamics is the branch of study where the gas fluids interacting around moving bodies.

Aerodynamics is the branch of study where the gas fluids interacting around moving bodies. Aerodynamic is primarily concerned with the forces of drag and lift which are air is passing around the body. The most important aerodynamic force that applies to nearly every objects that moves through the air is a drag. Drag is the force that opposes a bike's motion through the air. Drag is generated in the direction the air is moving when it encounters any solid object. In most instances, such as in automobiles drag is undesirable because it take power to overcome it. Strong crosswinds have a great instigate on the safety of road vehicles. Different vehicle types may have different behavior under strong crosswinds, thereby leading to different dominant accident modes and accident risks. To compare the crosswind stability of road vehicles.

Strong crosswind can reduce motorcycle safety when crossing a wind-exposed structure such as a bridge. As the number of long-span bridges increases throughout the world, the amount of accidents increases. This side force affects the original aerodynamic of a bike. To reduce these accidents we have to reduce yaw sensitivity and side force which is acting on a bike. Therefore have to some changes in the design of the bike like the installation of a windshield etc. this protecting motorcycle from a high windy area.

Side force influences the behavior of motorcycles in windy conditions. It increases approximately linearly with yaw

angle over a significant range of yaw for almost all motorcycles and the side force derivative, the gradient of side force coefficient with yaw angle, is similar for the motorcycle of a given category and size. The shape factors and components which affect side force for different motorcycle types are discussed.

### 2. PROBLEM STATEMENT

Riding the bike is a very dangerous situation because of its stability and balance. That situation affects the technical condition of bikes in different weather conditions. This can impact the bike's aerodynamic. Crosswind interaction affects both the frontal aerodynamic drag, as well as lateral drag and the aerodynamic lift force. The influence of crosswind on the bike motion can have a significant impact in case of a bike riding in a high windy area. e.g. the bike riding on bridge.

When a motorbike is riding on the bridge or high windy area the bike can faces extra drag on side of the bike is called side drag or side wind force. Crosswind has a dramatic effect on riding as it can easily push the bike off the road or into another lane of traffic with a strong gust. The frontal area can make difference in how much the wind can push the bike. The larger area of wind is in contact the more rider feels the effect. strong crosswind hits the bike from side, it tries to topple the bike over this tendency is a lot worse with fully faired bikes as there is no space for the wind to take on another side as it would be without faring is place. The faring has reduced the drag by streamlining the bike in the front-rear direction. Because this is the direction where the wind is expected to hit most of the time.

To respond to the wind force the bike to start tilting in the direction of the wind. All you need to allow it to do without stiffening up, grabbing the handlebar tight, and resistive the corrective force.

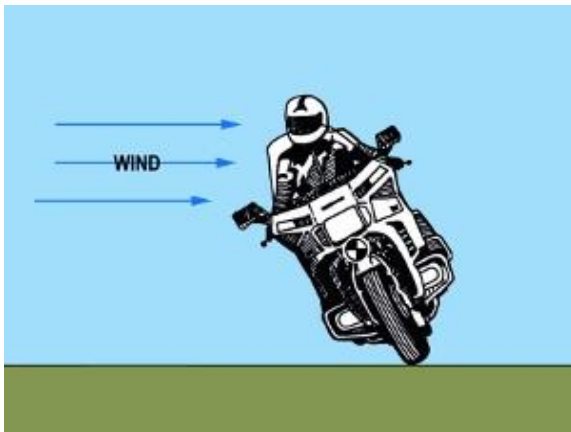


Fig -1: Cross wind



Fig -3: Wind vector

### 3. OVERVIEW OF SOME FORCES ACTING ON BIKE

#### 3.1. LIFT FORCE

Lift force is directly appose to the weight of motorbike and lift up the bike from front. The air around the bike exerted on the surface .this force is perpendicular to oncoming flow direction. While the common meaning of the term "lift" suggests an "upwards" action, lift can be in any direction. For instance, for a sail the lift is horizontal, and for the wing on a race car the lift is down.

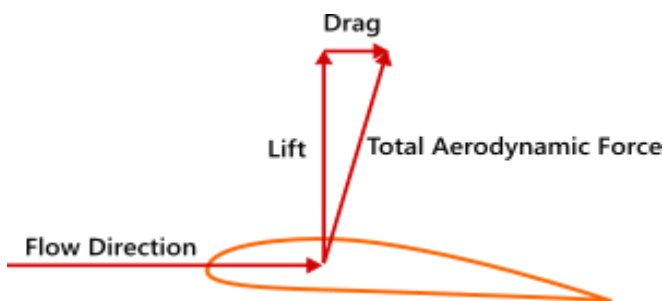


Fig -2: Lift force

#### 3.2. WIND VECTOR

Wind vector represent movement of mass of air on the motorbike. When air flows near ground, the speed of that wind and direction of vector is opposite of direction of air.

### 4. RIDING TECHNICQUES IN HIGH WINDY AREA

Riding a motorbike in windy conditions is challenges your safety and constant effort to keep the motorcycle in the lane some general tactics can be useful when riding in high windy conditions

- Steering controls lean. When a wind gust slams into the bike, it is necessary to get the bike leaned upwind quickly. Immediately press both grips upwind. That is, if the wind from the left pushes the bike towards the right, push-steer on the left handlebar. In many cases, you might need to apply constant pressure on the left bar to battle the effects of a crosswind from the left.
- Protect your eyes from windblown grit and debris. Earing a full-coverage helmet with a face shield, keep it closed. It is essential to wear tight-fitting goggles to keep the grit out of your eyes. With the added windy effects your eyes will also become quite dry. Try to lubricate with artificial tears during one of your breaks.
- Wind can come in any direction while riding. Make yourself small by tucking behind your windscreen or front fairing to allow the air to travel around you as best you can. Crosswinds can push you from side to side and you can counteract that by extending a knee into the crosswind to make a sail. That will direct you into the crosswind and help to negate its effect.
- Learn to read the wind. Clouds, flags, trees, and grasses are all good indications of which way the wind's blowing. Except when you're riding amidst or around large trucks that you'll experience a push a "bow wave" of air, and a

gust will push turbulent air around the front and downwind.

## 5. CONCLUSION

Performance of motorbike improved by the reduces side force resistance act on aerodynamic of bike or change in some design of bike. Reducing crosswind effect improves the stability of motorbike and it will be fun to ride.

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