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# Design and Fabrication of Three Wheel Tilting Bike

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**ABSTRACT:**As we know that safety of the vehicle is the first and the foremost thing to be considered. In 2-wheelers the safety of the vehicle from accident was understated on two major factors, Directional stability and the Aerodynamic force both are correlated to each other. The tilting mechanism would dramatically increase the maximum speed in curves. The use of tilting mechanism in automobile would decrease the rate of accidents due to slippage. It will give better dynamic stability as well as directional stability to the vehicle, better road grip, better comfort to the passengers, and the most important load carrying capacity of vehicle increases. By this leaning, the centre of gravity balances the centrifugal force which is acting on the vehicle and makes it more stable during turning.

**KEYWORDS:**Tilting Mechanism, Slippage, Directional Stability

## I. INTRODUCTION

Today, the use of more efficient vehicles is being discussed to improve the energy performance and better utilize the space of existing roads in the cities. As we know that safety of the vehicle is the first and the foremost thing to be considered. In 2-wheelers the safety of the vehicle from accident was understated on two major factors, Directional stability and the Aerodynamic force both of which are correlated to each other. The tilting mechanism would dramatically increase the maximum speed in curves. The use of tilting mechanism in automobile would decrease the rate of accidents due to slippage. It will give better dynamic stability as well as directional stability to the vehicle, better road grip, better comfort to the passengers, and the most important load carrying capacity of vehicle increases. By this leaning, the centre of gravity balances the centrifugal force which is acting on the vehicle and makes it more stable during turning.

As engineers we have developed a revolutionary design to tackle varying terrain conditions and improve safety. We call it 'The Tilting Trike Bike'. A tilting bike has the advantages of both the types of vehicles that is cars and bikes. When the vehicle leans into a corner it virtually acts like a single-track vehicle, and even though having three wheels it can be driven like a motorcycle. The third extra wheel gives the extra traction required to tackle the corner. Generally, a tilting three-wheeler is a vehicle whose body and wheels tilt in the direction of the turn. We achieve this by adding an extra wheel to a two-wheeler chassis.

Generally, there are two types of configurations for a three wheeled vehicle. They are tadpole and delta. For our trike bike we are employing a tadpole configuration. This ensures that power is transmitted to only one wheel thus reducing transmission losses. Our vehicle can corner without roll over because the tipping movement caused by acceleration is balanced by the opposing centripetal acceleration Safety is one the major considerations in design. This has been keenly dealt with. Off-roading is also a trump card for this vehicle.



## II. LITERATURE REVIEW

- 1] Their invention Design and Fabrication of Elliptical Tricycle Using Tilting Mechanism Is a The load incurred on the suspension system of a vehicle is the maximum when it makes a turn or runs around a corner due to the centrifugal/centripetal forces acting on it. If the vehicle could lean by a certain angle when making a turn, it could retain its tire grip and stability as it was during a straight road run. It is very effective for a suspension system to offer maximum damping efficiency without compensating the vehicle’s stability and grip. Tilt suspension system is the most efficient design for a 3- wheeler suspension system and a vehicle has to lean if it is going to feel like a motorcycle. [1]
- 2] Generally a tilting three-wheeler is a vehicle whose body and wheels tilt in the direction of the turn. The tilting trike bike is designed to tackle rough terrain and also boasts of high safety features for the rider. It uses a A-arm to support the tilting mechanism. The main advantage of this mechanism is that it can tilt while turning By this leaning the centre of gravity balances the centrifugal force which is acting on the vehicle and makes it more stable during turning. It gives more traction when roads are slippery. The third wheel offers better braking as well as increases stability. It gives comfortable ride. It also ensures a lot of safety for the rider. [4]
- 3] Safety is the most important consideration for two-wheelers. The tilting mechanism increases the maximum speed in curves. The use of tilting mechanism in automobile would decrease the rate of accidents due to skidding. It will give better dynamic stability as well as directional stability to the vehicle, better road grip and better comfort to the passengers. The tilting trike uses a mechanism includes a parallelogram linkage which allows tilting of the vehicle similar to any other two wheelers. The tadpole configuration of the trike provides more stability compared to delta design. [5]

## III. PROBLEM STATEMENT

In this project, dynamics of a 3-wheel, tadpole vehicle is studied. The vehicle is an all-wheel drive and steer, equipped with an active camber control. Effect of camber angle on the yaw rate at different speeds will be studied and lateral stability of the vehicle will be investigated by analyzing its rollover and skidding at various situations. Furthermore, ride comfort of the three-wheeled vehicle will be investigated. The forces applied to the suspension joints will be also determined and analyzed. Both static and dynamic analysis will be carried out for the calculation of such forces Multibody Dynamics Adams software is used for the dynamic force calculations.

## IV. METHODOLOGY

The approach embraced to utilize standard and by and by utilized parts in structure as opposed to plan all segments from ground up. The advantage of this method is that, you do not have to spend ridiculous amount and time in testing the integrity of each part as they have already proved their worth.

- 1.The Two wheels at front i.e. one on each side of the handlebar
2. Two shock absorbers associated with the adaptable or flexible rods
3. Adjustable connecting links
4. Fixed connecting links
5. Handle fork

Sr. no.	Particulars	Specifications
1	Vehicle Type	2 wheeler Bajaj Discover 150
2	Displacement	144.8 cc
3	Maximum Torque	12.7 Nm @ 5500 rpm
4	Maximum Power	12.8 HP @ 7500 rpm

## V. CONSTRUCTION

The construction of the working mode is starts with the frame/body pf the working model. Consider first a 4-Wheeler as seen from the rear, like here to the right. If the vehicle is in a curve towards the left, for example, we can



imagine that a centrifugal force is exerted on the center of gravity (black and yellow circle) of the vehicle occupants system, while the vehicle's weight exerts a downward gravitational force .

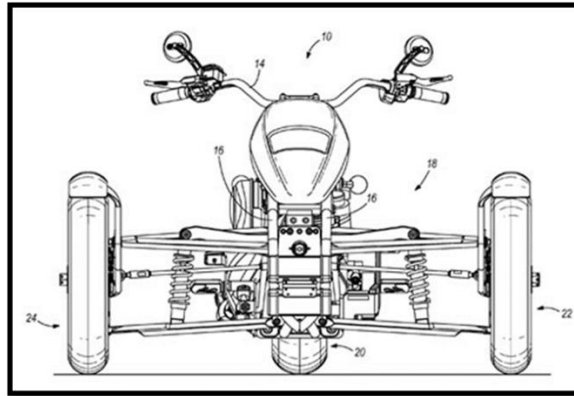


Fig 5.1 Machine Construction

Thus, the centrifugal force tends to roll the vehicle over towards the right, around an imaginary point under the right tires, while the gravitational force holds the vehicle back to avoid rollover. It's as though the centrifugal force and the gravitational force combined together into a resulting force exerted on the center of gravity to turn it around this imaginary point . We can easily understand that if the center of gravity height is greater than the half-track, the resulting force will be aligned over the imaginary point and will thus roll the vehicle over in a curve. The ratio of the center of gravity height to this half-track thus plays an important role in determining the stability against rollover of a 4-Wheeler vehicle. Ideally, this center of gravity height (red) should be low like for a sports car, in order to insure a safety margin against rollover. In the case of 'sport-utility' 4X4s, this height is relatively larger than for regular family cars. This explains why these vehicles have a higher rollover propensity. In the case of 3-Wheelers, another factor comes into play: As can be seen for a 4-Wheeler, the 4-Wheeler rolls over around a line corresponding to the imaginary point of the previous illustration

## VI. WORKING



Fig 6.1 Basic working Construction

A tilting bike has the advantages of both the type of vehicle that is cars and bikes. If the vehicles lean into corners it makes it a perfect, virtual single track vehicle and even though having three wheels it can be driven like a motorcycle, and the third extra wheel gives the vehicle more traction to make it safe even at high speeds But these vehicles are divided into two categories namely leaning reverse trikes and non-leaning reverse trike. On the one side when we consider the non-inclining vehicle, they are steady similar to a vehicle and are best at low speed and in rush hour

gridlock conditions however need to struggle with centrifugal force at high speed during cornering that is taking a large curve. On the other side if we consider a leaning reverse trike they are very good at high speeds and counteracts the centrifugal force by their leaning action but, this type of vehicles cannot be used under heavy traffic regions.

#### VII. ADVANTAGES

1. It will give better comfort to the passengers.
2. It reduces rate of accidents due to skidding.
3. The vehicle will be useful on highways as well as on off roads.
4. Good directional as well as dynamic stability.
5. Load carrying capacity increases.

#### VIII. DISADVANTAGES OF TILTING BIKE

1. Whole weight of the vehicle increases.
2. Stand of an automobile is of no use because an automobile stands easily on three wheels.
3. Weight shifting while turning is required.

#### IX. APPLICATIONS

1. Suitable for handicapped people.
2. It can be implemented in four wheelers also.
3. Mobility and exercise for the people who does not ride traditional bicycle.
4. The rider enables to ride the tilting motorized tricycle with confidence at all speeds.

#### X. FUTURE SCOPE



Fig 10.1 Assembling of parts

Three-wheeled motorcycle, also known as motorised tricycle or trike, is a vehicle based on technology similar to that of bicycle or motorcycle. It can be powered by an electric motor, scooter, car, or motorcycle engine. These motorcycles prove to be helpful for learners and beginners, as well as physically-disabled persons due to its enhanced support

#### XI. RESULTS AND CONCLUSION

On studying various vehicles and developing concept vehicle we concluded that leaning reverse bike has a great potential to bring new changes to the existing vehicle industries. It was found that the maximum leaning angle in each direction is 36 degree from the vertical. This allows the rider to take turns confidently without having the fear of falling or skidding. Due to leaning the centre of gravity of the vehicle is always balanced and the resultant forces and their reactions are lined up which increases the life of the mechanical components.

We were able to achieve leaning angle up to a certain degree. This universal tilting wheel mechanism can easily be utilised in vehicle having bracket fixed on chassis. By implementing this tilt mechanism on moped scooters, it can be



used by person with disability also. This tilting mechanism gave response as we desired. It reduces accidents which occur due to skidding. It also reduces the turning radius of the vehicle.

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