

Design and Analysis of a Car Rear Spoiler for Drag Reduction

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ABSTRACT:

Aerodynamic characteristics of a Honda civic car 2009 are of significant interest in reducing car-racing accidents due to wind loading and in reducing the fuel consumption. Even though these vehicles typically have a more rigid chassis and a stiffer suspension to aid in high speed maneuverability, a spoiler can still be beneficial. One of the design goals of a spoiler is to reduce drag and increase fuel efficiency. Many vehicles have a fairly steep downward angle going from the rear edge of the roof down to the trunk or tail of the car. Reducing flow separation decreases drag, which increases fuel economy; it also helps keep the rear window clear because the air flows smoothly through the rear window. In this thesis will focus on CFD-based lift and drag prediction on the car body after the spoiler is mounted at the rear edge of the vehicle, a car rear spoiler is designed and modeled in 3D modeled software CREO by different models of spoilers (NACA 4412 & NACA 6409) and analysis done by ANSYS software at different speeds (70, 90 & 110km/hr). In this thesis the CFD analysis to determine the lift force, drag force, mass flow rate, and pressure drop. 3D modeled in parametric software CREO and analysis done in ANSYS.

1.INTRODUCTION:

A spoiler is a component of a disseminated outline or description of any piece of fiction that reveals any plot parts that threaten to provide away vital details. Typically, the main points of the conclusion of the plot, together with the climax and ending, area

unit particularly considered spoiler material. It can even be wont to confer with any piece of knowledge concerning any a part of a given media that a possible shopper wouldn't wish to understand beforehand. as a result of enjoyment of fiction depends an excellent deal upon the suspense of

unveiling plot details through normal narrative progression, the previous revelation of however things can end up will "spoil" the enjoyment that some customers of the narrative would otherwise have practiced. Spoilers will be found in message boards, articles, reviews, commercials, and picture show trailers The term spoiler was introduced within the period of the net, and came to prominence in newsgroup conversations. it's still common in web articles and social media discussions. Early rules of netiquette insisted that spoilers may and will be commonly avoided, however if the posting of "spoiling" info was ineluctable, or not it's preceded by a warning like "SPOILER ALERT", or the spoiler itself must be cloaked in order that it can't be visible to any however those keen for details and not bothered at the thought of such probably plot-revealing info.

REAR SPOILER

Sometimes, these warnings area unit omitted, accidentally or deliberately and a few unwitting readers have had literature, films, tv programmes and different works that they were trying forward to experiencing "spoiled". there's a typical demand, particularly among web users, to

own protection against accidentally seeing material thought of to incorporate "spoiler" info, even within the web version of settings wherever such material has conventionally and traditionally appeared, like discussion teams or literary reviews. As a results of this level of objection to spoilers, trolls could post them strictly for his or her own pleasure, finding amusement in basic cognitive process they're fully destruction a narrative expertise for others. On honorable websites, these will be according to moderators and such posts taken down, the posters blacklisted, however solely once the actual fact. Most such websites give a way of tagging bound threads as containing spoilers for those that want to debate a fictional add depth, together with the outcomes of events and also the handling of the narrative resolution. Some have felt compelled to avoid taking part on public websites altogether, came upon "closed" websites to exclude those that area unit sensitive regarding spoilers, or determined that they had to unilaterally web log at the expense of public exchange

2.LITERATURE REVIEW:

Investigation of Drag and Lift Forces over the Profile of Car with Rearspoiler Using CFD

Now a days demand of a high speed car is increasing in which vehicle stability is of major concern. Forces like drag & lift, weight, side forces and thrust acts on a vehicle when moving on road which significantly effect the fuel consumption. The drag force is produced by relative motion between air and vehicle and about 60% of total drag is produced at the rear end. Reduction of drag force at the rear end improves the fuel utilization. This work aims to reduce the drag force which improves fuel utilization and protects environment as well. In the stage of work a sedan car with different types of spoilers are used to reduce the aerodynamic drag force. The design of sedan car has been done on CATIA-2010 and the same is used for analysis in ANSYS-(fluent). The analysis is done for finding out drag and lift forces at different velocities, and spoilers. This study proposes an effective numerical model based on the computational fluid dynamics (CFD) approach to obtain the flow structure around a passenger car with a rear spoiler.

Design and analysis of a new rear spoiler for SU vehicle mahindra bolero using CFD

Environmental issues and increased fuel are driving forces for the automotive manufactures to develop more fuel efficient

vehicles with lower emissions. The need for fuel efficiency is a rapidly increasing trend in automotive industries in the recent years. Therefore, extensive research is undergoing for development of aerodynamically optimized vehicle designs. One of the design goals of the spoiler is to reduce drag and increase fuel efficiency. The drag coefficient is an important factor that determines the fuel efficiency of a vehicle in close proximity to the ground. The primary objective of the project is to study the effects of fluid flow and the effective drag of the vehicle over a 3D standard car (BOLERO) with attached Rear Spoiler by using Computational Fluid Dynamics (CFD) simulation. A 1:1 scale model of the actual vehicle was designed in CAD package SOLIDWORKS and CATIA V5 R20. CFD analysis was done over the scaled model keeping conditions as close as possible to the actual road conditions. For evaluation, optimization, the Reynolds-Averaged NavierStokes (RANS) equations with Reliable k- ϵ turbulence model was used over commercial package ANSYS 14, FLUENT CFD Solver. The effect of aerodynamic drag is significant only at higher velocities. Therefore, the simulation was done for vehicle speed at 80kmph and the results were compared with scaled base vehicle.

Various velocity, pressure, streamline contours and velocity plots were examined and analyzed at rear part of the vehicle. It was concluded that, the Co-efficient of drag (Cd) of the vehicle with attached Rear Spoiler went down by 4.8%.

Design and analysis a new spoiler for ump rev using CFD

This thesis presents the design and develops new rear spoilers to overcome a drag force that is created because of low pressure zone at the rear hack. With the new design of rear spoiler for the Proton iswara Hybrid Electrical Vehicle (BV) UMP, the performance of the car had increased from the aspect of acceleration and also from the aspect of handling of the car, the controlled speed of this research is from 80 km/hr to 110 km/hr. The design of rear spoiler is based on the type of the car used, therefore aerodynamic shape of the body and the point of the rear spoiler is important in this research. In this research 2 spoilers have been choosing that are squareback and fastback rear spoilers. According to that reason, low pressure zone will be annihilated slowly if one of the rear spoilers is put at the rear back of the car. Refer to data testing obtained, using squareback spoiler will reduce more low pressure zone

than using fastback spoiler. Based on the analysis, the suitable place to mount the rear spoiler is at the point where squareback spoiler is mounted and it synchronized with the shape of the Proton Iswara HEy. It will give additional information to the performance car researcher to continue on this research thoroughly about the effect of spoiler on any HEY car and eventually to Malaysia's first HEV race car. In the future, this factor will give benefit to the Malaysia car developer especially HEY car developer.

Analysis of Effects of Rear Spoiler in Automobile Using ANSYS

Aerodynamic characteristics of a Honda civic car 2009 are of significant interest in reducing car-racing accidents due to wind loading and in reducing the fuel consumption. Even though these vehicles typically have a more rigid chassis and a stiffer suspension to aid in high speed maneuverability, a spoiler can still be beneficial. One of the design goals of a spoiler is to reduce drag and increase fuel efficiency. Many vehicles have a fairly steep downward angle going from the rear edge of the roof down to the trunk or tail of the car. Reducing flow separation decreases drag, which increases fuel economy; it also

helps keep the rear window clear because the air flows smoothly through the rear window. This thesis will present a numerical simulation of flow around racing car with spoiler positioned at the rear end using commercial Autodesk flow design software. The thesis will focus on CFD-based lift and drag prediction on the car body after the spoiler is mounted at the rear edge of the vehicle. A 3D computer model of 4-door sedan car (which will be designed with commercial software SolidWorks) will be used as the base model. Different spoilers, in different locations will be positioned at the rear end of vehicle and the simulation will be run in order to determine the aerodynamic effects of spoiler.

CONCLUSION:

A spoiler is an aerodynamic device that is attached to an automobile to increase the down force or in other words to improve the road holding. Spoilers generally work by disrupting the air flow over a car. Earlier cars were sickly designed with heavy engines, protruding parts and rectangular Shapes due to which they consumed large quantities of fuel and became unaffordable all these factors lead to the development and need of aerodynamics in the design of cars now it would be fair to say that all

most all cars are tested for getting the optimum aerodynamic configuration using spoilers thereby increasing the efficiency as well as the stability of the vehicle. In this project, a car rear spoiler is designed and modeled in 3D modeled software CREO by different models of spoilers (NACA 4412 & NACA 6409) and analysis done by ANSYS software at different speeds (70, 90 & 110km/hr). By observing the CFD analysis results the pressure drop and velocity, drag force, lift force and mass flow rate will be increases by increasing the speeds. The drag forces decreases at modified model by the speed 70 km/hr. lift force will increases at modified model by the speed 110 km/hr. So it can be concluded the lift force more for modified model by the speed at 110 km/hr so modified model of spoiler is better model

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