edexcel

Exemplar

Higher Project

Unit: P201

Topic: How Aerodynamics is used to make a car go faster

How aerodynamics are used to make a car go faster.

Project Proposal form

Section One: Title, objective, responsibilities	
Title or working title of project (in the form of a question) How aerodynamics are used to make a car go faster Project objectives (eg, what is the question you want to answer? What do you want to learn how to do? What do you want to find out?): I would like to investigate this as my project because I am fascinated by the effect of aerodynamics and how car manufactures use it to improve the performance of there products. I picked the subject of aerodynamics because this is a very good subject to study involved with cars. In later life I would like to be a mechanic and some day I would love to own one myself. When I leave school I would like to go to college to study mechanics. If it is a group project, what will your responsibilities be? N/A	
Section Two: Reasons for choosing this project	
Reasons for choosing the project (eg, links to other subjects you are studying, personal interest, future plans, knowledge/skills you want to improve, why the topic is important): chose this project pacifically because it fits perfectly into my diploma I do. Once I have finished my diploma I would like to go onto college and do a course in mechanics, after this I would like to go work in a garage at a main dealership fixing cars. I would really like to become the head mechanic at the Mercedes garage in York.	
Section Three: Activities and timescales	
Activities to be carried out during the project (eg, research, analysis, writing, preparing for the presentation, etc):	How long this will take:
• One my question has been accepted to fill in my project proposal form	2 hours
• Researching the internet	4 hours
• Write up my introduction	4 hours
• Write up my research methods	2 hours
• Write up my findings	4 hours
• Write a conclusion	2 hours
• Getting other people opinions	3 hours
	30 mins
Milestone one: Target date (set by tutor-assessor): Milestone two: Target date (set by tutor-assessor):	
Section Four: Resources	
What resources will you need for your research, write up and presentation (eg,	

libraries, books, journals, equipment): I had to use many different resources such as the school library, the computers with Microsoft word package so I can write up my work. What your areas of research will cover? My areas of research I will cover are how aerodynamics make a car go faster and what are the effect of aerodynamics
Comments and agreement from tutor-assessor
Is the learner taking this project as part of the Diploma? **Yes**/No If yes, which Diploma are they taking? Engineering Comments (optional): Is project derived from work which has been/wilt be submitted for another qualification? Yes/**No** Which qualification (title and unit)? Comments (optional): I confirm that the project is not work which has been or will be submitted for another qualification and is appropriate. Agreed: X
Comments and agreement from project proposal checker
Comments (optional): I confirm that the project is appropriate. Agreed: X

Title: How does aerodynamics make a car go faster

Introduction:

I chose this topic because I have an interest in cars and I like seeing how things work. Also chose this area of study because it is related in my engineering diploma. I think I have the confidence to speak to people about this subject because of my previous interviews in this area of work. I also hope to develop many skills and gain more knowledge about this area of research. I am hoping to find out how aerodynamics has changed the way cars are made and how it is used to make cars go faster.

What skills I hope to develop throughout my project

I hope to develop many different skills throughout the full project, firstly I hope to boost my knowledge on cars and how aerodynamics works. Secondly I hope you gain confidence and this will help me in later life such as interviews and other face to face conversation. I also would like to be able to hit deadlines and this project is perfect for this. I need to boost my organization skills and this is good for doing that. Through the project I will have to write many formal letters and organize many different interviews. I will try to develop theses skills by socializing with people and trying to work on certain sections. I also need to keep my project organized and up too date.

Barriers I will face during my project

I will face many different barriers during my project. Firstly I have the big barrier of finding the right information. Next I face the factor the people not having enough time for me. Being ill is a very common factor and this puts the project in hold minimizing time left. Not being able to find the right information is a huge disadvantage. Not being to find things on the internet is a huge set back because I am on a time deadline and not finding the right stuff is a waste of my precious time. I will over come my barriers by being as time effective possible and keep track of all my work.

Section 2: research ideas

The research methods I have used include internet, interviews and experimental methods which consist of many different forms of communication such as email, phone calls, interviews and one to one conversation. I tried to use as many different research methods as possible. I booked a interview from someone from the university of York and he backed out at the last minute and this resticted me on my research.

Internet research

I have used many different websites such as

www.wikipedia.com

www.qooqle.com/imghp

www.howstuffworks.com

I found these websites very useful because it had all the necessary information needed to complete my project. The three websites shown are the main used to gather my information for my project, www.wikipedia.com was the main website I used and I got most of my pictures from www.google.com/images. The main sours of knowledge and the most useful came from www.howstuffworks.com. I had to use many different websites and internet search engines to find the right information needed and this set me back a little because when found some decent information I had to read in detail to find any useful information. Most of the information I found was not that use was not that detailed so I had too use of the information too get a full over view of my findings. www.wikipedia.com is not reliable because you can change the content if you are a member but on the other hand www.howstuffworks.com is reliable because only the admin can change the information on the website and the information is scientifically proven. I used Google images to find all the pictures of the cars on my project evidence showing how car company's have changed the ways cars are shaped because of aerodynamics

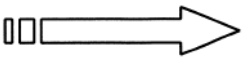
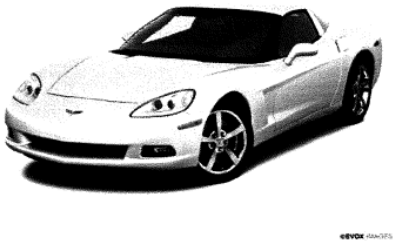
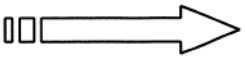
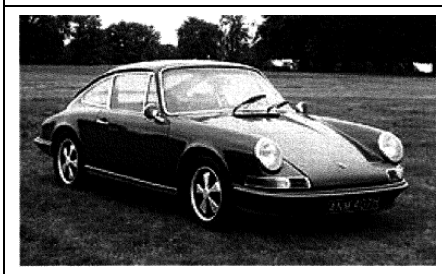
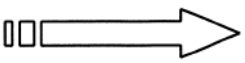
I was not able to carry out my interview because the people I originally arranged it with had a slight change of plan, this affected my project massively because I

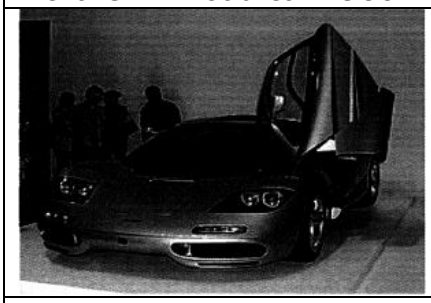
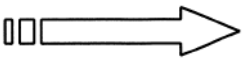
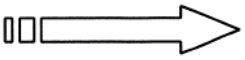
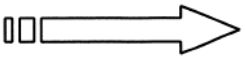
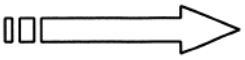
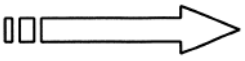
had to find other ways to gain information about aerodynamics. Instead of being able to interview people I had to be totally reliant on internet research and other secondary sources.

Section 3: what I found out

Over this section I am going to talk about how aerodynamics make a car go faster and how cars are based around the factor or aerodynamics. Firstly I found out that over the past 20 years aerodynamics have changed the ways cars are made. In the 1980's cars were based around the box shape, this gradually has been changed into the tear drop shape because of its outstanding aerodynamics. F1 cars have been engineered to pure perfection over the past couple of years, they have found out that a slight change to the body work can have a massive effect on the performance of the car.

On the next page it shows how cars have changed over the past 20 years. The golf shown on the page shows that the 1981 golf is very block like and square but the 2011 golf is rounded and this lets the air flow around the car more easily and also makes the car look better. The Toyota mr2 in the 1970"s is all straight sides and block like very similar to the 1981 gold GTI, the new version is very curved so that the car lets air flow a lot better and

1980 Corvette		2010 corvette
		
Audi Quatro 1980		Audi Quatro 2010
		
Porshe 911 1963		Porshe 911 2010
		

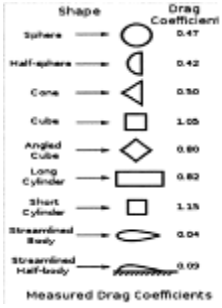
McLaren f1 road car 1980		McLaren f1 road car 2010
		
Golf GTI 1981		Golf GTI 2011
		
Toyota MR2 1970s		Toyota MR2 12007
		
Mazda MX-7 1970s		Mazda MX-7 2012 concept
		
BMW 6 series 1988		BMW 6 series 2010
		

gives the car more elegance and beauty. The third car which is a Mazda MX-7 from the 1970's has a abnormal shape for the age of the car, the shape is slightly curved but not like the cars of today. This car is very usual for the age because not many cars where designed like this, they was normally square and

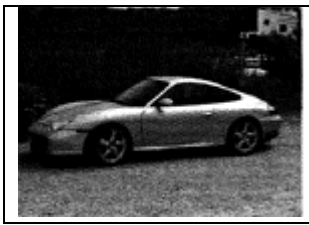
block like and its lack of aero dynamicity. The new MX-7 is a concept car and concept cars are to show how cars are or could look in the near future, this has a lot of aerodynamic features such as the wing mirrors and the head lights. The last one is a BMW 6 series from 1988, this is very block like and has a huge square front which would not cut through the air very good. On the other hand the 2010 model would be much quicker because of a more aerodynamic shape and more curved features.

Aerodynamics consist of science and math's to come up with a solution of making a car cut through air to solve speed problems and fuel efficiency problems Most of us don't think of air or wind as a wall. At low speeds and on days when it's not very windy outside, it's hard to notice the way air interacts with our vehicles. But at high speeds, and on exceptionally windy days, air resistance has a massive effect on the way a car accelerates handles and achieves fuel mileage. On a formula one car all the body work is designed to create as much down force as possible to make the car achieve the maximum performance possible. Think as it this way if you're running as fast as you can against a strong wind you will not achieve a greater speed then if you ran against no wind. This is because your body is not very aerodynamic so that the wind will push against your body and slow you down.

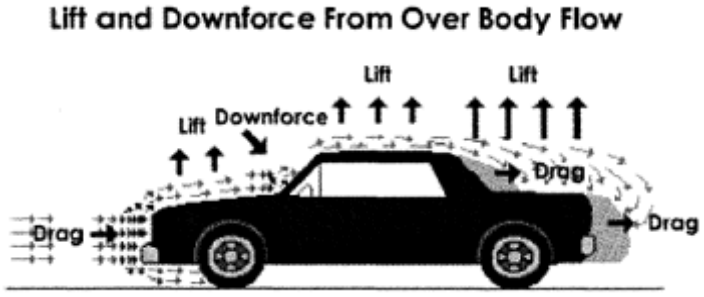
Co-efficient drag is where scientists measure how effectively aerodynamic the shape or object is. They measure co-efficient with water or powder by shooting a stream at certain parts of the object and see how the object reacts.



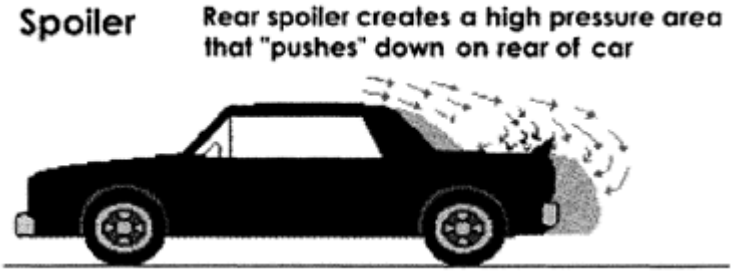
As shown from the diagram co-efficient drag is measured in numbers. As you can see the long cylinder on the diagram is a very inefficient shape, most cars around the 1970's to the 2000 were based around the square and block like, this is why most of the cars was slow and un-aerodynamic and also slow compared to the cars of today. The cars slowly progressed into the long cylinder, this was more aerodynamic than the short cylinder but still very un-efficient. Today's cars have been designed around the streamlined half body or in other words the half tear drop, this is an easy and effective shape to work with. Co-efficient drag helps car designers enhance the performance of there cars by testing the body work to see if it's the most effective product possible.

	Co-efficient drag: 0.30 - Porsche 996, 1997

	0.48 - Volkswagen Beetle Due to vertical headlights, Wider tires and mudguard
	0.372 - Ferrari F50, 1 996 high drag due to aerodynamic aids



Spoilers on cars are there to disrupt the air flow going over the car to produce down force, this can be described by imagining it as a upside down aeroplane wing, but instead of creating uplift its is creating down force to keep the car as low as possible to the ground.



Spoilers on the front of the car (also called air dams) are there do direct the air from underneath the car, this is because when car is at high speeds the air travels underneath the cars and produces uplift and this can slow the car down by lowering its effectiveness and its overall performance. Side skirts are there to make the air under the car go faster so that the car produces air force and helps the cornering aspect of the vehicle. The rounded and tapered shape of the top of a car is designed to slice through the air and minimize wind resistance. Detailed pieces of bodywork on top of the car can be added to allow a smooth flow of air to reach the down force-creating elements (i.e., wings or spoilers, and under body tunnels). The underside of the body is similar in shape to an inverted wing and creates an area of low pressure between the car and the track, pressing the car to the road. This is sometimes called a ground effect. Vehicles with steep

windshields can benefit from a hood fairing to help smooth the transition of air between the hood and windshield.

CONCLUSION

SUMMARY OF MY FINDINGS:

I found out overall that aerodynamics plays a massive role in improving the speed of a car. Firstly I found out that aerodynamics is very important in the way cars are made. Cars have changed massively over the past 20 years in the shape, size and looks. In the 1980's cars shape was based around the box look but compared to the

Cars 2010 which are based around the tear drop shape because it is very aerodynamic. I also have found out that aerodynamics have changed the way motorsports works. Fl cars are very aerodynamic that is why they are very fast and supposedly can drive up side down because the aerodynamics produce enough down force.

Skills I developed

I developed many different skills such as I improved my photography by taking lots of pictures. I have developed my basic thinking skills and face to face communication skills just by having interviews; I have massively improved my confidence to talk to strangers and other people. I have really improved my knowledge on aerodynamics; I also learned how to write formal letters properly and also how to interview people with confidence. Thought my project I have had to meet deadline and I have done this with much confidence finishing all work before deadlines.

Any problems I have encountered

I have encountered some problems but not a lot, firstly I had the trouble of finding information on the internet but I overcome on this problem by making my search less accurate. Secondly I had the trouble of when sending a letter of the university they did not send back but I over come this by getting information from asking people who I know.

What I did well and what I liked doing

i think personally that I was good at the researching my project. I enjoyed looking on the internet for information and I also like the fact that I were self dependent and we had the free will to do what ever project we liked. I the best thing about this project was I got to do something I enjoyed and this included cars and basic engineering.

What i did not like doing

I did not like doing the write up of our project because of its word quantity. I thought that the write of my project was the hardest because I had to make a summary of all my finding.

How other people thought I worked

Other people thought I worked to a satisfactory standard but although struggling at times but In the end i got it done. Other people thought I worked a little bit slow because of my poor time keeping, also people thought that I had poor concentration throughout half of my project, toward the end people thought an attitude changed and I started to work harder.

Changes and improvements

If I had to do my project over again I would pick a less complicated subject and I would try a lot harder and make sure that I could do primary research to make sure I can achieve the best grade possible because it is much harder and less effective to just rely on information for the internet Because it is not always reliable and if you actually do it for yourself you understand the full aspect of the subject.