CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Emin Abranians

Project Number
J0101

Project Title
Airplane Lift: Wing Curvature Generates Lift

Abstract

Objectives/Goals
Does the airplane wing curvature generate lift? I hypothesize that wings with more curvature will generate more lift.

Methods/Materials
Three methods were used to verify the objective; mathematically, computer simulation, and by wind tunnel experiment. Three wings with different curvature were built to test this hypothesis in a wind tunnel. Each wing was attached to a Styrofoam airplane model and each model was tested separately. The objective of this experiment was to keep all parameters constant except wing curvature.

Results
Drag and lift equations indicated increase in lift pressure as wing curvature was increased. Computer simulation and pressure plots from top and bottom of the airplane wing confirmed this hypothesis when wing camber and thickness was varied while keeping angle of attach constant.

It was determined by wind tunnel experiment that more curvature on the wing created more lift. For example, three wing models built for this experiment generated the following different pressures under constant weight, air velocity, air density, temperature, angle of attack, and wing surface area:

1. Flat wing - no curvature generated 15.88 gm pressure.
2. Medium wing curvature # 10cm`radius generated 106.50 gm pressure.
3. High wing curvature # 20cm radius generated 122.19 gm pressure.

Conclusions/Discussion
Mathematical equations, computer simulation, and measured data from wind tunnel experiment supported the hypothesis that more lift was generated by increasing the aircraft wing curvature.

Summary Statement
Airplane wing curvature generates lift.

Help Received
Uncle helped building airplane wind tunnel and provided engineering support.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Jagdeep S. Basi

Project Number
J0102

Project Title
How Much Does the Size of a Glider's Horizontal Stabilizer in Ratio to Its Fuselage Affect Its Flight Path?

Abstract

Objectives/Goals
To find what size of a glider horizontal stabilizer will increase a glider's flight distance the most. test each glider with the horizontal stabilizer as the variable. i believe that the 21 cm sized stabilizer will fly the farthest.

Methods/Materials
foam boards, blades, washers, u-shaped aluminum stake, measuring stick, tape, table/ graph.

cut glider pieces out, attach all pieces, measure the distance between the launcher and the glider, graph/ record each distance.

Results
21 cm size stabilizer flew the farthest. the 18 cm flew the second farthest, the 15 cm flew the second to worst, and the 12 cm flew the shortest distance.

Conclusions/Discussion
The larger the stabilizer, the better control and hang time. The larger lengths flew further because there was more stability. Many times, some of the gliders would crash or not fly as planned. his was either because of weather, unbalance of weight, or unstable launch. my hypothesis was right. i learned that without a large enough horizontal stabilizer, a plane or glider could easily loose control and fly as planned.

Summary Statement
the importance of a glider's horizontal stabilizer.

Help Received
father helped cutting stake; mother helped glue paper to board.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Hayden R. Bromberg

Project Number
J0103

Project Title
Blowin' in the Wind: The Answer to Renewable Energy

Abstract

Objectives/Goals
The purpose of my project was to test combinations of different blade quantities, angles, and shapes on a wind turbine to determine the one that produces the greatest amount of energy.

Methods/Materials
In the controlled environment of a sound stage, I used a studio fan to generate the wind to spin my non-yawing turbine. I tested three different blade shapes (constructed from balsa wood) in four quantities apiece, each at three different angles to the wind. I used a hand-held anemometer to measure the wind speed (at 10 and 15 mph) and a multimeter to record electrical output.

Results
The most productive configuration was six triangular blades angled at 22.5° to the 15 mph wind, but because many configurations failed to withstand the higher wind speed, I focused my analysis on the 10 mph results. In analyzing that raw data, I found that neither blade shape nor quantity seemed to have much effect on the output and that most of the difference came as a result of changing the blade angle.

Conclusions/Discussion
I believe my testing adds valuable insight into the field of harnessing the power of the wind for the benefit of mankind, despite some imperfections such as the thin blade material, imprecise angle measurement and insecure blade mounting. Taking into account the relative area of the three blades I tested, I conclude that my rectangular blade (i.e., the smallest one) is the most efficient in generating electrical power per unit of blade material.

Summary Statement
The purpose of my project is to contribute to the body of research on wind turbines to help ensure that our planet is green once again by generating as much energy as possible from renewable and environmentally friendly sources.

Help Received
My mom helped me shop for the necessary materials. My dad helped me build the turbine and conduct the experiment. I used a sound stage and wind machine at Hollywood Center Studios.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Chase Campion

Project Number
J0104

Project Title
The Effects of Tail Assemblies on Gliders

Abstract

Objectives/Goals
My objective was to find out the effect of different tail assemblies on gliders. I believe that the T-tail assembly will have the farthest flight distance because the horizontal stabilizer on the T-tail is mounted farther back than any other tail assembly; therefore the T-tail would have more leverage when the glider pitches up.

Methods/Materials
Four identical gliders, with different tail assemblies were constructed out of basswood and balsawood. The different tail assemblies were: a right-angle tail, a V-tail, a twin tail, a T-tail. The gliders were then launched the same way for 9 trials, for each glider, in a no wind condition.

Results
The T-tail assembly glided the farthest out of all the gliders at an average of 97.72 feet, followed by the twin tail at 86.28 feet, followed by the V-tail at 73.61 feet, and lastly the right-angle tail at 56 feet.

Conclusions/Discussion
The conclusion is that the T-tail is the best design for an un-powered airplane, a glider, based on the flight distance. Other tail assemblies may be better for powered airplanes, but still the best design for a glider is the T-tail assembly.

Summary Statement
My project is about how different tail assemblies effect the flight distance of gliders.

Help Received
Mother and older brother helped with launching the gliders

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)

Jonathan J. Crowther

Project Number

J0105

Project Title

Out of Thin Air: Harnessing Wind Energy with an Efficient Blade Design

Abstract

Objectives/Goals

The purpose of my project was to test different blade designs in order to find the most efficient design. I wanted to learn if blade shape, size, angle, and number influence a turbine#s efficiency. My hypothesis is that if three long and narrow blades are used on a wind turbine, resembling current commercial designs, then more energy will be produced.

Methods/Materials

I made a testing apparatus from a piece of plywood, PVC pipe and fittings, a household fan, and assorted hardware. I bought a small hub and generator off the Internet. Blades were made from light card stock, small dowels, tape, and cyanoacrylate glue. I used a kit with small gears and shafts in it to make a small gearbox to multiply the rotating speed of the generator by 7-fold. I tested for the design that could do the most work, measured as maximum sustained milliamps output under load, an indicator of highest torque. I also tested aerodynamic performance, measured as maximum sustained no-load voltage, an indicator of the fastest spin rate and therefore the lowest aerodynamic drag. I made and tested a total of eight blade designs (all but one using a horizontal-shaft design). Each design was tested using different blade angles and number of blades, in order to find the combinations that made the most power, in milliamps, indicating, as well as the highest Voltage, indicating the fastest rotation.

Results

My hypothesis was proven wrong. The miniaturized commercial design using long, narrow blades was a total failure in my testing system. The best blade design had large surface area, and three blades were optimal for a balance of aerodynamic performance and torque production.

Conclusions/Discussion

I have learned that, at least for small turbines, the larger the surface area of the blade, the more power made. Also, it looks like three blades work best, because they can catch enough wind without creating too much drag. Further, shifting more of the surface area away from the hub creates more torque when the total surface area and swept area are held constant. The best blade angle depends on the design, but should be between 30° and 45°. Finally, I think that my experiment shows that more useful data can be acquired by including an apparatus that stresses the system, such as my stepped-up gearbox.

Summary Statement

My project is a search for a small scale blade design, number of blades, and blade angle that extracts the most energy from wind and coverts it into usable torque.

Help Received

My Dad helped me obtain materials, provided guidance throughout the project, taught me to use the tools needed. He performed step he considered dangerous, like drilling through steel with a 2mm bit in a hand drill. He turned the fan on/off, discussed my observations with me and took pictures.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Natalie Dean; Zoe-Marlene Frei

Project Number
J0106

Project Title
High Winds and Low Roofs

Abstract

Objectives/Goals

Introduction

In a hurricane or in high winds, a roof of a house is prone to detaching from its walls. The problem of roof disengagement from homes is often approached with large metal bolts and special attachments that fasten the roof to the walls. However, this is both expensive and wasteful. It would be very useful if there was a way for roofs to not part with the rest of the house as easily. We want to find out how variables such as the shape and angle of a roof affect the house's lift in high winds.

Lift is the force that raises an object if air is flowing over the object faster than the air flowing under it. Because of the higher pressure below it and the lower pressure above it, the object rises toward the more desirable low pressure air. It will be interesting to find out what shapes and angles of roofs have the most and the least lift. To test our procedure, we will build a wind tunnel and model houses and roofs.

Because airplane wings, which are designed for lift, are curved, we believe that if a roof is curved, its lift is higher than that of a gable roof. We think the lift on a shed roof is higher than the lift on a gable roof of the same angle because the wind will not have a smooth or symmetrical surface to flow over.

Methods/Materials

tape,box fan, cardboard,box with dividers, thin plastic, foam core, glue gun, removable tape, electric scale that measures in grams, protractor, knife, Yardstick, Ruler

Testing Procedure

We built a wind tunnel with cardboard, placed a house with different shaped roofs inside. We messured with a scale the lift created by the wind. A fan blew wind in the tunnel.

Results

The steeper the pitch, the lower the lift. A 15° gable roof has the same lift as a 15° shed roof with the vertical side facing wind. The curved roof has a little lower lift, and the 15° shed sloped side has a small down force.

Conclusions/Discussion

It was observed after a hurricane that most of the steep roofs were still attached to the rest of the house, and the shallower roofs were detached. The lifts on the roofs shown in that graph support this idea because the shallower roofs have much more lift than the steep roofs.

This experiment indicates that the safest roof angle on a house that avoids both lift and downward force where tornadoes or hurricanes are common is around 30 or 35°. If an avoidance of lift alone is the primary concern, then the data indicates that steeper is better.

Summary Statement

How the angle and shape of a roof affects its lift in high winds

Help Received

Nathalie's mother helped to make the wind tunnel and solved problems with the graphs.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Jessica M. Fallon

Project Number
J0107

Project Title
Which Hull Style Will Go the Mile?

Abstract

Objectives/Goals
To determine the affect of boat hull shape on the time it takes to move a boat some distance at certain power levels. I believe that the catamaran hull will take less time.

Methods/Materials
I constructed four boat hulls with identical weight and static length at the waterline, all made from Styrofoam and fiberglass: a barge, a cruise ship, a vee-hull, and a catamaran. One radio-controlled boat motor was transferred from hull to hull to eliminate drive differences. The hulls were timed as they were propelled back and forth across a 25-meter course at five power settings.

Results
The vee-hull consistently reached the end of the course more quickly than the other hull shapes at every power setting. The barge always stopped accelerating first, its greater drag resulted in slower speeds.

Conclusions/Discussion
The shape of a boat hull affects the efficiency of transport across water. Less surface area in the water when the hull is in motion appears to be related to the time it takes to traverse the course.

Summary Statement
This project investigated how the shapes of four boat hulls affects drag and efficiancy over a 25 meter course.

Help Received
My father bought the motor and the materials used to construct the boats. He assisted in the construction by holding the guides as I pulled the hot-wire Styrofoam cutter. He also indicated when the boat crossed the far end of the course so I could stop the stopwatch. My mother helped type the report.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Ian N. Fisher

Project Number
J0108

Project Title
Down Force of a Stock Car

Abstract

Objectives/Goals
The purpose of my experiment was to determine which type of car design generated the most downforce C.O.T. or current. My hypothesis was that the C.O.T. would produce the most down force.

Methods/Materials
Methods
The experiment involved building a wind tunnel. To make the tunnel, you will need a 20" window fan, any cardboard box, a clear plastic report cover, and duct tape. Cut the cardboard box into ten rectangles. Tape four of the rectangles together to make the sides of the air scoop and cut an opening in another to make an observation window for the tunnel. Tape the plastic report which is the observation window over the opening, and then join the parts with tape. When you use the tunnel, tape the scoop to the fan and the foot to the table so the tunnel does not shift while you are testung.

Materials

My materials were:

1 C.O.T. 1/24 Scale Stock Car
1 Current 1/24 Scale Stock Car
2 Cardboard Display Boards (Wind Tunnel)
1 Common Household Fan
1 Box of avery 2" labels

Results
The experimental results proved my hypothesis, The C.O.T did produce the most down force.

Conclusions/Discussion
As stated in my hypothesis, I believed that the COT would produce the most down force. The experimental results proved my hypothesis. a question that was brought up was would the lateral angle of the car produce a different result. if I were to conduct these experiments again I would test the lateral angle and the type of car, not just the type of the car. These results could be used by NASCAR teams to create better car setups or fuel miles.

Summary Statement
The purpose of this project was to find out which car type C.O.T. or Current would produce more aerodynamic down force on the racetrack.

Help Received
I would like to thank my friends for their support and opinions, my old art teacher for introducing me to the sport of NASCAR, my new science teacher Mr. Scott, my parents, and God

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Calum B. Johnson

Project Number
J0109

Project Title
Perfect Propeller Performance

Abstract

Objectives/Goals
My objective was to learn which propeller was the most efficient for my remote control airplane.

Methods/Materials
I used a watt meter to measure power used by the motor, and a digital scale and thrust stand to measure thrust produced by the propeller. I used nine propellers in my experiments. First I attached a propeller to the motor. Then I went through all the throttle settings of my transmitter and measured the watts consumed by the motor and the newtons of force measured by the scale. I recorded all the data in my notebook. I repeated the experiment three times for each propeller. The propeller sizes were 7x4, 7x5, 7x6, 8x6, 9x3.8, 9x4.7, 9x6, 10x3.8, 10x4.7, with the first number measuring diameter in inches and the second number measuring average pitch in degrees.

Results
The propellers in order of efficiency are the 9x3.8, 10x3.8, 9x4.7, 10x4.7, 9x6, 7x4, 8x6, 7x5, 7x6.

Conclusions/Discussion
My experiments showed that propellers with less pitch were more efficient. However, the diameter of the propeller did not greatly affect propeller efficiency.

Summary Statement
My project is about finding the most efficient propeller for my remote control airplane.

Help Received
Mother helped type the report and make graphs. Father helped build the thrust stand.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Emily M. Johnson

Project Number
J0110

Project Title
Windmill Blade Shapes

Abstract

Objectives/Goals
My project was used to determine whether the blade shape of a windmill would affect how much electricity it generated.

Methods/Materials
I used a model of a windmill, composed of PVC pipe, balsa wood blade shapes, a motor, a hole crimping hub to hold the blades, wires with alligator clips on the ends, and a multimeter. I put a fan two feet away from the model of a windmill and turned it on high. This was held for one minute. Then the fan was turned off. I did this process twice, once with the multimeter set to milliamps, the other time with the multimeter set to volts. I then did this process for all four of my blade shapes. I had to convert the milliamps to amps so I could put it in the equation Volts x Amps = Watts in order to find how many watts were generated per blade shape.

Results
My results show that the rectangle blade shape generated the most electricity followed by the oval (flat bottom) blad shape, then the rectangle (rounded corners) blade shape, and lastly the oval (flat top and bottom) blade shape.

Conclusions/Discussion
In conclusion, my results do support my hypothesis in that the rectangle blade shape generated the most electricity. My porject also shows that the surface area, shape, and amount of drag affect how much electricity was generated.

Summary Statement
My project is about how windmills are a good source of energy and that how they are built with blade shapes affects how much electricity they generate.

Help Received
My mother and father checked over my report, gave me financial support, and gave me moral support. Also, my teacher Ms. Elliott gave me advice and guidelines to follow for my project.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
William C. Jones, III

Project Number
J0111

Project Title
Hovercraft and Laws of Motion

Abstract

Objectives/Goals
My goal was to build a hovercraft that met the basic requirement for lift of up to 200lb and travel in a straight line unless acted upon by another force, then use it to verify basic laws of motion and trajectory.

Methods/Materials
1- 35 5/8# diam. x 3/4# precut plywood disc.
18 volt cordless leaf blower.
4 ft of 6 mil. black plastic.
2- plumbing line insulation tubes.
1- 4# #L# bracket.
1- 1/4# #T# nut and 3/4# screw.
1- roll of duct tape.
1- coffee can lid replaced with a metal plumbing cover.
1/4# staples for T- 50 stapler.

Results
The design of the craft using a battery powered leaf blower which more than met the requirements for lift, enabled me to hover long distances without being impeded which in turn helped to create more accurate tests data collection.

Conclusions/Discussion
I concluded the basic laws of lift, motion and trajectory are correct.

Summary Statement
I wanted to create a realistic way to show the actual effects of the basic laws of lift, motion and trajectory.

Help Received
Dad helped build craft and display and helped with tests.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Austin B.T. Keys

Project Number
J0112

Project Title
Golf Ball Dimples and Drag

Abstract

Objectives/Goals
Do golf balls really have to have dimples? That is what my science fair project is about. The purpose of this project is to see if golf balls really need dimples to travel a greater distance.

Methods/Materials
Two golf balls of similar size and shape, in addition, another golf ball was prepared by sanding the surface to a smooth finish. The tests were performed by placing the ball in the rubber slingshot and pulling it back to a starting point marked on a wooden platform. The device was released and the distance the golf ball traveled from the starting point was then measured in feet, using a measuring wheel.

Results
The golf ball with dimples traveled a greater distance than the one without dimples. Dimples make the golf ball go further.

Conclusions/Discussion
The project did support the hypothesis because the golf ball with dimples went a greater distance than the golf ball that was sanded down.

Summary Statement
Proving whether or not golf balls need dimples.

Help Received
Mom helped with gluing board; dad helped build the "slingshot"; Chris Barnum, student mentor, helped with ideas; Joan Piper and Kim Cantrell, teachers, helped with research ideas

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Muzammil A. Khan

Project Number
J0113

Project Title
SPLASH! The Effect of Size of Blades and Number of Blades on the Voltage Output of Waterwheels

Abstract

Objectives/Goals
The purpose of this project is to investigate to see if the size of blades and number of blades affect the voltage output of a water wheel. Based on my research, the hypothesis I formed is by increasing the number of blades up to a certain point and increasing the size of blades up to a certain point will increase the voltage output of a waterwheel.

Methods/Materials
First I built the waterwheel stand (part with the generator). Then I constructed six waterwheels. Three were for testing the effect of blade size on voltage and the other three the effect of number of blades on voltage output. Three wheels had different sizes of blades (7.5cm, 15cm, and 22.5cm). The other three wheels had different number of blades (8 blades,12 blades, and 16 blades). I connected these wheels to the stand and after attaching the voltmeter ran each of them under water for 30 seconds. I watched the reading of the voltmeter and recorded the highest voltage that I saw. I then repeated this 4 times for each wheel.

Results
The results for the (blade size) were that the 7.5cm blade waterwheel produced an average of 2.0mV. The 15cm blade waterwheel produced an average of 4.6mV. The 22.5cm blade waterwheel produced an average of 7.5mV. The results for the (number of blades) were that the 8 blade waterwheel produced an average of 3.8mV. The 12 blade waterwheel produced an average of 4.7mV. The 16 blade waterwheel produced an average of 6.5mV.

Conclusions/Discussion
My hypotheses of the waterwheel producing more voltage when there are more blades up to a certain point and of the waterwheel producing more voltage when the blades are bigger up to a certain point were supported. The reason for the waterwheel producing more voltage than the wheels with fewer blades is that when it had fewer blades the water strikes each blade and between each strike is a delay. This delay allows the wheel to slow down so less voltage is produced. But when there were more blades there is less time between each strike so less speed was lost. Since less speed was lost the waterwheel could produce more energy as the magnet turned faster moving the electrons faster producing more energy. The longer blades had more torque and therefore the waterwheel produced more voltage. With this information waterwheels can be constructed to produce energy more efficiently and by doing this we are a step closer from getting away from our dependency on oil.

Summary Statement
My project is about investigating the effect of blade size and number of blades on the voltage output of a water wheel.

Help Received
My mother checked board for errors, judge from school science fair helped correct errors, my father helped in assembly of water wheels (cutting and super gluing) and revised documents for errors, and my teacher gave advice.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Kyle Leverett; Daniel Skeldon

Project Number
J0114

Project Title
Gone with the Wind

Abstract

Objectives/Goals
My partner were attempting to find which windmill blade shape whould produce the most electricity.

Methods/Materials
What we did is build a small windmill and shapes for the blades that will be all the same surface area. then we tested the blades electrical output. we used a fan, wood planks, nails, a hammer, a battery, and a millivoltimeter

Results
The information we learned was the electricity generated by each blade shape. both the rectangles and squares were close but the triangles didn't compare. the squares and rectangles where in the high eighties but the triangles were in the thirties.

Conclusions/Discussion
the reason we belived the squares one was because they had the biggest width area out of all the shapes. our biggest question is if this is true, why aren't we using this technology on windmills today. this must be because of bigger scales and weight.

Summary Statement
The design and testing of different windmill blade shapes.

Help Received
Mother helped to proofread and design the board, Mrs. Avila approved our project and told us how to do the booklet, Lisa Skeldon helped gives us ideas in the process of the project

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Patrick A. Lowe

Project Number
J0115

Project Title
Spoilers, Inverted Wings, Ground Effects: Which Will Make Down Force Efficiently?

Abstract

Objectives/Goals
To find the most efficient way of producing downforcein a car by altering aerodynamics.

Methods/Materials
Using a wind tunnel I tested car bodies I designed & carved out of foam. One body was made that could be modified to accomodate spoilers, inverted wings,and ground effects. Each version was tested multiple times for drag and down force. The results were graphed and put into a ratio of down force to drag. The car with the highest ratio (the steepest positively line) is the most efficient.

Results
My hypothesis that ground effects would be the most efficient was disproved. Instead spoilers were found to be the most efficient at generating down force in a car body.

Conclusions/Discussion
I made my hypothesis based on the fact that ground effects adds little if any extra drag. I thought that the small amount of drag would make it efficient. I did not think spoilers would be efficient because they generate quite a bit of drag. They were the best though because they produced enough down force to counter act the drag. My tests went well and the only thing that I would do differently if I did it again would be to equip my wind tunnel with an anemometer so I could use Reynold's number. If I continued this project I would test spoiler angle, placement of spoilers and wings, hieght of car, and combinations of spoilers, inverted wings, and ground effects.

Summary Statement
Finding the most efficient way of generating down force out of spoilers, inverted wings, and ground effects by altering car body aerodynamics.

Help Received
My dad helped me drill holes and cut wood in the construction of my wind tunnel.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Kylen C. Maple

Project Number
J0116

Project Title
How Does Shooting a Soccer Ball at a Target with Different Angles and with Spin Affect Your Success?

Abstract

Objectives/Goals
My project was to determine how angle and spin affect the trajectory of a kicked soccer ball.

My objective was to learn how my success rate would vary by shooting a soccer ball with or without spin from different angles.

Methods/Materials
A soccer ball was shot at a goal divided into three equal sections from five angles. Each angle was exactly 32 feet apart on a line that's precise center point was 18 yards from the goal. At each angle the soccer ball was kicked on a left, right and center point with enough force to produce the desired loft and curve trajectory (Magnus force).
Materials used were size four soccer balls, size four soccer cleats, tape measure and a regulation size goal and soccer field. A right-footed, 75 pound eleven year old was used as the kicker.

Results
My results showed that shooting a soccer ball on it's center point consistently hits it's target more than kicking it on it's left or right point with spin. I realized that spin has a big affect on the trajectory of a kicked soccer ball.

Conclusions/Discussion
In a real game situation, the shot I least made (the one with spin and curve) may be the best. This is because at my age group this is the hardest shot to accomplish and the least expected. The ultimate intention is to deceive the goalie.

Summary Statement
How my success rate would vary by shooting a soccer ball with spin or without spin from different angles.

Help Received
My parents helped with data logs, editing and typing. My science teacher Mr. Lane advised on my project.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Ian H. Meeder

Project Number
J0117

Project Title
Gone With the Wind: How Windbreaks Affect Wind Flow

Abstract

Objectives/Goals
I tested how the type of windbreak affects wind flow. Windbreaks are purposefully built blockades against the wind. Although those are usually used for farms and crops, they are also used in windy areas on roads. High-speed winds are quite dangerous, especially for high profile vehicles. So, I found out which of these windbreaks was the most effective.

Methods/Materials
Basically, for my procedure I built a rig in which there is a fan mounted at one end. At the other end there was a flat surface glued around an axel, which is mounted to the rig. There is a weight on this surface, forcing it upright. I then replaced different windbreaks between the two and then record the angle degree the surface was at. So, the independent variable in the test is the different windbreaks while the dependent variable is the angle degree the sail is at. I am keeping this test as controlled as possible by having a steady wind source, and by screwing everything in place on the rig.

Results
The outcome of my testing resulted with the wall windbreak being the most effective. The slope windbreak came second with the screen, trees, and metal fence following it. The wall came to a 82.05º average while the slope came to 69.15º, the screen at 68.85º, the trees at 64.95º, and the fence at 65.55º.

Conclusions/Discussion
The overall result was that the wall was the best windbreak followed by the slope, the screen, the trees, and then the metal fence. My hypothesis was proven correct with the wall windbreak neing the most effective.

Summary Statement
I tested how different windbreaks affect the wind flow from a fan.

Help Received
My parents helped with the initial ideas about my project; my father, more specifically, helped build my rig.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Tustin K. Moore

Project Number
J0118

Project Title
To Dimple or Not To Dimple: Can the Distance of a BB Be Improved by Dimpling Its Surface?

Abstract

Objectives/Goals
The objective of this experiment was to determine if dimpling the exterior of a BB will improve the distance it will travel when fired from a BB rifle.

Methods/Materials
The exterior surfaces of 5 plastic BBs were dimpled and then 5 non-dimpled BBs were used as a control group. Each of the 10 BBs was fired from a rifle 7 times each. The height of the impact on a target placed at the end of a hallway was then measured.

Results
The results showed that the dimpled BBs hit the target an average of 38% higher than the non-dimpled BBs.

Conclusions/Discussion
The results of my experiment supported my hypothesis as the dimpled BBs did strike the target at a higher mark. However the trajectory of the dimpled BBs was erratic. By creating a more uniform dimpled pattern, the flight of the BB should be more normal.

Summary Statement
An experiment to see if adding dimples to the exterior of a BB will increase its distance when fired from a rifle.

Help Received
Father helped dimple BBs, set up firing range to test experiment, and helped type report.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Nathan G. Nadeau

Project Number
J0119

Project Title
Maintaining Altitude

Abstract

Objectives/Goals
To determine which of the six horizontal stabilizers will be most effective on the flight of an airplane.

Methods/Materials
Create six different designs of horizontal stabilizers from balsa wood. Test each design by placing the stabilizer securely in the slot in the back of the airplane. Build a launcher-control unit using plywood and attach a special release device to launch the aircraft. Place the airplane at a 20 degree angle and clamp it down on the launcher unit attaching the rubber band that extends 28 cm. Launch by pressing the quick release trigger located on clamp at the height of 2'10". The mean (average) is calculated by the results of all twelve trails in milliseconds (time traveled) and both centimeters/feet (distance traveled) using a stopwatch and tape measure. All results are recorded on a data sheet for each individual horizontal stabilizer. The same "Gullow's Folding Wing Glider" is used for each launch to test each horizontal stabilizer.

Results
The triangular stabilizer(F) was most effective traveling the distance of 635.00 cm (250") and time of 2.44 milliseconds. The rectangle stabilizer(A) came in second in distance and time of 614.68 cm and 1.92 milliseconds. The trapezoid(E2) came in third with 548.64 cm in distance and 1.88 milliseconds. The curved stabilizer(C) ranked fourth in distance of 541.02 cm and 1.64 milliseconds. Fifth is the M-shape stabilizer(D) traveling the distance of 490.22 cm and 1.49 milliseconds. The V-shaped stabilizer(B) came in last in distance and time of 452.12 cm (178") and 1.42 milliseconds.

Conclusions/Discussion
My hypothesis that the curved horizontal stabilizer(C) would be most effective was incorrect. The triangular horizontal stabilizer(F) was most effective because its design allowed air to transfer smoothly and evenly over the stabilizer without it losing altitude. The curved shaped stabilizer had enough surface area to keep it elevated, but it was too heavy to keep it in the air.

Summary Statement
Design and test six horizontal stabilizer to determine which would be most aerodynamic to keep the plane elevated the longest and travel the greatest distance.

Help Received
My uncle, Chief Master Sergeant Young, took me to the March Field Air Museum so I could see where the horizontal stabilizers were located on certain aircrafts. He also gave me guidance when constructing the aircraft launcher. My mother took pictures at the museum and helped display them in my notebook.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Ayla L. Nelson

Project Number
J0120

Project Title
Shapes of Parachutes and Descent Rates

Abstract

Objectives/Goals
What I wanted to find out was, if keeping the surface area constant, how does the shape of a parachute affect the descent rate of a given load?

Methods/Materials
To find this out I decided to create three parachutes. Each of the parachutes has the same surface area yet the shape of each parachute differs. Parachute one is a square. Parachute two is a rectangle. Parachute three is a rectangle like the second parachute with the exception that it has a shorter width and a longer length then the second parachute does.

When the parachutes were created, I made a model rocket that would get the parachutes up in the sky a substantial distance so that I would have more time to collect data than if I were to drop the parachutes off a ten foot roof.

The rocket provided another plus; I could place an altimeter in the payload of the rocket to help measure the height and time of the parachutes# descents. The altimeter being an electrical device helped make sure the data was more accurate.

I launched each parachute three times each. That way I could collect more samples, so I could have a more accurate average decent rate for each parachute.

Results
I found that, as I hypothesized, the more rectangular, and less square, a given parachute is, the faster the descent rate.

Summary Statement
The purpose of my project was to find out how changing the shape of a parachute, yet keeping the surface area constant, changes the descent rate of a given load.

Help Received
Father ordered equipment; supervised rocketry activities; drove to the lake; helped with Excel; assisted in gluing the board.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Loren J. Newton

Project Number
J0121

Project Title
Prop Job: The Efficiency of a Propeller

Abstract

Objectives/Goals
To determine the optimal combination of blades' design factors to achieve the maximum propeller efficiency at a given engine power level.

Methods/Materials
Based on the theory of propeller design, I applied algebra to adapt proven laws of physics and derive a formula with factors I could work with.
I then designed and assembled a test platform.
I also derived various propeller configurations, with different length, width, and number of blades.
I then crafted the blades from balsa wood.
After mounting each propeller configuration on the platform, I measured and recorded the distance traveled during a 20 second period.

Results
Long and wide blades had the best results overall.
Four blade propellers worked best with short blades, while 2 blade propellers worked best with long blades.
The best performing combination was the long and wide 2 blade propeller, and the worst performer was the short and narrow 6 blade propeller.

Conclusions/Discussion
The thrust power produced by the propeller is shown by overcoming the propeller weight (P*L*W*#)and produce a distance traveled.
Propeller design is deriving an optimal combination of blade design factors to match its functional purpose.

Summary Statement
To determine the optimal combination of length, width, and number of blades in a propeller combination that would generate the highest efficiency measured by distance traveled ; % = (P * L * W * # * D) / (E * T).

Help Received
My dad bought the material and helped build the test fixture. My mom helped me with the presentation board.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Ryan G. Patrick

Project Number
J0122

Project Title
Wind Turbine Energy

Abstract

Objectives/Goals
The objective for this experiment was to investigate the electrical voltage that could be generated at a given wind speed using a simple wind turbine design.

Methods/Materials
To start the project I constructed a wind turbine using a set of plans I found on the internet. Most of the materials for the construction of the turbine were purchased at a hardware store, online or found in my grandfather's garage. Once built, I spun the turbine by hand to see if it would light a low voltage LED. Prior to collecting data, I set up a voltmeter to read ac voltage and a wind meter to read mph. In order to control the wind velocity I used a two speed hairdryer and varied the distance between the dryer and turbine. I obtained rare earth magnets of different thicknesses to check the affect this has on the electrical output of the turbine. I documented the readings from both meters to allow me to graph the results and make my conclusions.

Results
As the wind speed increased so did the voltage. I tested four 1/4" thick by 1" diameter magnets and four 1/8" thick by 1" diameter magnets. While collecting the data I found that it required more wind speed to create the same voltage for the thicker magnets. I'm sure this is due to the increased mass of these magnets.

Conclusions/Discussion
The objective for this experiment was a success. Next time to expand the project I will use coils with more turns. I believe this will have a positive affect on the power generated. During the experiment I realized that the magnets were affected by centrifugal force, since one of the magnets detached from the rotor during the experiment.

Summary Statement
My project demonstrates the wind speed it takes to create electrical voltage using a simple turbine.

Help Received
Father helped with cutting bottles, winding coils and emphasized safe use of table and band saws.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Philip A. Potvin

Project Number
J0123

Project Title
The Aerodynamics of the Wing

Abstract

Objectives/Goals
For my science fair I am doing aerodynamics of the wing. I thought of this topic when I was flying back to LA from Indianapolis. I saw through the window of the plane, the movements of the wing and I was curious. My hypothesis is the aerodynamics of different wings creates the same air patterns.

Methods/Materials
I am looking for the different wind patterns at the end of three different types of wings.
I am going to test 3 different airplane wings with my dad. My father and I will build these 3 different wings together or order them of the internet.
(We are going to use F-22 wings, B-747/A-380 wings, and tradition biplane or triplane wings)
Then my dad will help me build a wind tunnel to test the wings in.
(The wind tunnel will be 2 ft by 4 ft by 2 ft. The size will vary on the materials available.)
In order to see what the air is doing I will create fog to see the air patterns. I will also record the observations and compare them. I will do this by taking pictures & videotaping. We will watch the footage after the tests.

Results
The results of my experiment are that for each wind speed there is more of a certain type of pattern for different wings. There are more many more vortices for a high wind speed than a slower wind speed. And there are fewer curves at a higher wind speed than at a lower wind speed.

Conclusions/Discussion
What I learned from my data is that different wings do create different wind patterns or do not create wind patterns at all like with the F-117 Night Hawk which barely caused any wind activity. The P-40, on the other hand created many vortices and ripples especially at medium and high wind speeds.
My hypothesis was wrong because different planes are designed with different aerodynamics to suit their needs.

Summary Statement
Observations of turbulance patterns at the trailing edge of wings

Help Received
Dad helped build wind tunnel. Mom helped type and check the final papers.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Karina Ramirez

Project Number
J0124

Project Title
The Effect of Parachute Material on Parachute Speed

Abstract

Objectives/Goals
My project was to determine if the parachute's material would effect the speed of the parachute's descent. I believe that a parachute with a heavier material will fall faster than a parachute with a lighter material because of the added weight.

Methods/Materials
I made 10 parachutes of the exact same size, but different materials. I tied them to a plastic army man, and dropped them all 15 times from a 10 foot ceiling. I timed their fall to see if they fell at the same rate. Then I averaged each parachute type and divided by 10 to get the speed in feet per second.

Results
The parachute with the lightest material took longer to fall on average and the parachute with the heaviest material did fall faster on average.

Conclusions/Discussion
My conclusion is that my hypothesis was supported. The parachute with the heavier weight did fall faster than the parachute with the lighter weight. Therefore the speed of the parachute was effected by the parachute material.

Summary Statement
I tested parachutes of different materials to see if this has an effect on the speed a parachute falls.

Help Received
Mother helped with board; Teacher helped with report.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)

Christopher Sauer; Jonathan Zdasiuk

Project Number

J0125

Project Title

An Engine with Nothing Inside? Building a Magnetohydrodynamic Drive

Abstract

Objectives/Goals

To investigate magnetohydrodynamic (MHD) thrust, an intriguing force that can quietly power a boat without moving parts. To design, test and improve a series of MHD engines made from readily available materials. To see if an MHD engine could power a small toy boat.

Methods/Materials

-Understand the Lorentz force that creates MHD thrust and determine how to measure the thrust.
-Test magnets (NdFeB and ceramic) and metal electrodes (Al, Cu, Mo, Ti, Ta, Sn, 304 stainless steel, brass, galvanized steel, Haynes 214) for building MHD engines.
-Build prototypes (using rectangular plastic tubing, electrical tape, duct tape and an adjustable power supply), optimizing magnets, tube dimensions, electrode sizes, and wire-to-electrode contacts.
-Measure the thrust of the engines by suspending them from a pendulum (fishing line) in salt water (with salinity of seawater) and calculating thrust from deflection.
-Select the engine with the best thrust/weight ratio.
-Determine whether thrust vs. current is linear.
-Create and test MHD demos that propel small plastic spheres and a toy boat.

Results

-Thrust was proportional to current, but lower than predicted.
-The best electrodes were aluminum, because they corroded least.
-Making the electrodes shorter than the magnets produced more thrust by forcing the current through the highest magnetic field.
-Keeping the weight low is especially important due to low thrust.
-The engine produced "gunk" and gas bubbles.
-We could power a toy boat, but not very quickly.

Conclusions/Discussion

-A simple equation really did generally predict thrust as it should have:
Thrust = (current) x (engine width) x (magnetic field)
-Narrowing the electrodes to keep current flowing in the region with the strongest magnetic field significantly improved our results.
-It is exciting to see water propelled through a seemingly empty tube.
-MHD engines do work, but even with ideal performance, the thrust is limited with our power supply and magnets. We could power a small toy boat, but it did not move very quickly.

Summary Statement

We built and tested several MHD engine prototypes, found an equation that roughly predicted the thrust, measured the thrust, and discovered that despite all its advantages, MHD has the disadvantages of low thrust and pollution.

Help Received

Parents helped with physics derivations, troubleshooting problems, buying equipment, and some editing and typing. They also provided moral support.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Sara Z. Shah

Project Number
J0126

Project Title
Torpedinidae in the Bay: Salinity Altering Viscosity, Changing the Velocity

Abstract

Objectives/Goals
This project focuses on how the salinity of water influences the travel of a torpedo. My initial thoughts on the outcome of this scientific experimentation was that as salinity increased, the lower the velocity, time, and distance traveled. I hypothesized this because I researched that salt adds density to water, and the denser the liquid, the more problematic it is for an object to travel through it. I resolved my question by building a model torpedo and launching it through water with four varying levels of salinity.

Methods/Materials
My procedure was extended and complex; it included building the torpedo based off of a model rocket design, a runway setup process, and a lengthy testing procedure in which time and distance were collected (velocity was calculated). My independent variable was the differing levels of salinity, and my main dependent variable was the average velocity of the torpedo. I controlled the slope of the runway, the amount of water, guide wire positioning, and engine size, among other variables. A surprising event that occurred while testing was that the torpedo actually flew out of the runway once and landed nose down in the dirt! A remarkable fact I learned was that one cubic foot of water will produce 1700 cubic feet of vapor at sea level pressure!

Results
The torpedo traveled at the highest velocity in the control test, where the water#s salinity level was 0 psu (1.89 meters/second). Other rates included 1.64 m/s (15 psu), 1.86 m/s (25 psu), and 1.63 m/s (35 psu).

Summary Statement
How does salinity affect the velocity of a torpedo?

Help Received
Parents and brother helped while testing; Parents helped put together board, binder

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Shalin N. Shah

Project Number
J0127

Project Title
Transport Phenomena

Abstract

Objectives/Goals

The object of this project is to see if the density of a liquid exerts the same resistance to flow as the liquid's viscosity.

Because viscosity is a fluid's resistance to flow, and a denser liquid has more concentration, I arrived at the hypothesis that they do exert the same resistance to flow.

Methods/Materials

The materials I used to perform this experiment were a measuring cup, a stopcock with a reservoir, a 90 degree pvc elbow, a one foot long pvc pipe, a collecting cup, a mass balance, and a stopwatch. The liquids I ran my experiment on were water, milk, 7-Up, normal saline, canola oil, and corn syrup.

Using the reservoir, the pvc elbow joint, and the pvc pipe, I made a flow apparatus. Through this apparatus, I allowed 500mL of liquid to flow horizontally through pipe into a collecting vessel at the other end, and recorded the time it took. I experimented on all six of the liquids in this way, performing three trials for each, and ranked them all in order from most to least time, or most to least viscous. I found the density of the liquids by dividing its mass, which I measured on the mass balance, by its volume. I also ranked them in order from most to least dense. I compared the rankings of liquids viscosities and densities.

Results

For the results, the average times of the liquids in order of most to least viscous came out to corn syrup with 823.6 seconds, Canola oil with 24.8 seconds, 7-Up with 17.9 seconds, milk with 15.4 seconds, water with 14.7 seconds, and saline solution with 13.8 seconds. The order of liquids from most to least dense was corn syrup-1.71g/mL, 7-Up-1.25g/mL, milk-1.18g/mL, saline solution-1.17g/mL, water-1g/mL, and canola oil-.81g/mL. The order of most to least viscous liquids didn't match with the order of most to least dense liquids.

Conclusions/Discussion

In conclusion, my hypothesis was incorrect. My experiment proved that density and viscosity do not exert the same resistance to flow.

One of the things I applied this project to was the circulatory system, because the process of liquids flowing through a pipe like the way blood flowing through arteries, and the effects of changes in viscosity and density to fluids is similar to the war coronary artery disease works.

Summary Statement

My project determines whether the density of a liquid exerts the same resistance to flow as as the liquid's viscosity, and this concept can be applied to the circulatory system.

Help Received

Mother helped collect materials and assemble the apparatus.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Nicholas Vanhecke

Project Number
J0128

Project Title
Aerodynamic Efficiency

Abstract

Objectives/Goals
The objective of my science project is to find out, with the help of my scratch built wind tunnel, if the aerodynamics of a locomotive affects its wind resistance. I am also trying to find out which locomotive is the most aerodynamic out of the four I am going to test.

Methods/Materials
Four locomotives will be built from different eras: A 1920's steam locomotive. A 1950's streamlined diesel-electric locomotive. A 1980's flat nosed freight locomotive and a modern bullet train. These will be placed in the wind tunnel and subjected to different wind speeds. The resistance of each locomotive will be measured in grams by a slim pen scale attached to the front of the locomotive and the stationary base.

Results
The locomotive with the least amount of resistance was the modern bullet styled locomotive. The second was the streamlined 1950's diesel. The 1980's freight locomotive was third and the 1920's steam locomotive was fourth.

Conclusions/Discussion
My conclusion is that aerodynamics plays a very important role in the locomotives efficiency. The earlier locomotives did not reach high speeds and therefore wind resistance was not taken into consideration. As locomotives became more powerful and their speed increased, aerodynamics had to be taken into consideration for efficiency, speed and safety.

Summary Statement
Aerodynamic efficiency of train locomotives over the past 100 years.

Help Received
Mrs. Lashlee (Science teacher): Project preparation. Father: Use of power tools in construction. Photographs.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Eric J. Walz

Project Number
J0129

Project Title
Hydrodynamics and Drag

Abstract

Objectives/Goals
Boats and subnarunes both use a lot of gas to run. These vessels might be able to have a better hydrodynamic shape which would reduce drag and fuel expenses. My goal was to see if there was a way that the shape of boats could be altered to create less drag and be more fuel efficient.
Question: How does the shape of a body afect its hydrodynamic characteristics in water?
Hypothesis: I hypothesized that a rounded body affects the hydrodynamic characteristics by forcing all of the pressure off from the middle of the craft which will reduce drag

Methods/Materials
Materials: 4, 90 degree corner 4 inch diameter ABS pipes, 10 ft length 4 inch diameter ABS pipe, drill, band saw, Miter saw, band sander, disk sander, 1 inch drill bit, 1/2 inch drill bit, 4 ft length 2 inch diameter wooden dowel, lead weights, hose, 1/8 inch rod bent and tack welded to form lever, mail scale, sanding sealer, fishing hooks, fishing line, eyelet screws.
Method: I used my materials to build a circular track that would allow water to run through and create a pull of water.

Results
The rounder the shape the less drag that was created. Boats that had a blunt front caused the most drag, boats with smooth fronts caused the least amount of drag due to the surface area of the boat. I also tested the effects on the backs of the boats. Boats with smooth ends more often than not preformed better than boats with blunt ends. THe shape that preformed the best was the eliptical shape.

Conclusions/Discussion
The shape of a body affects the characteristics by allowing certain amounts of water to pass around the craft at different speeds and angles. The different shape causes different things to happen in the water. The front end and the back end both play a role in the hydrodynamic characteristics. My hypothesis was correct. The rounder shape had the least amount of drag along with the elliptical shape which had similar results. The rounder the shape the more hydrodynamic it is in the water. Fineness Ratio is a ratio of the length over the width, so a long slender object with a curved front creates the least amount of drag.

Summary Statement
To determine the amount of drag created from different shapes on the front and back of boats

Help Received
Father helped with cutting the curve in the track; Mother and Father helped with glueing board;

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Connor Werner

Project Number
J0130

Project Title
You Are Cleared for Takeoff: Propeller Design

Abstract

Objectives/Goals

The purpose of this experiment is to test different characteristics of airplane propellers (number of blades, blade pitch, and chord) to find which propeller design is most efficient, and which is the most powerful.

Methods/Materials

1. Propellers were built using sheets of curved plastic to create the propeller blades. To test the effect of different chords, some plastic model airplane propellers were bought. For variety#s sake an ellipse propeller was also tested.

2. A wind tunnel was built out of a cardboard tube using a motor cannibalized from a remote control airplane to turn the propeller.

3. Each propeller was tested at different RPM. Motor speed was varied using a variable voltage power supply. RPM was measured using an optical tachometer designed for RC Airplanes. Airflow (ft/m) at the end of the wind tunnel was measured using an anemometer. At each RPM step, the voltage, current and airflow were recorded.

4. All of the data was put into Excel to calculate Watts (Volts * Amps) and create graphs of ft/m vs. RPM, ft/m vs. Watts, and RPM vs. Watts for each propeller.

Results

The 4-bladed, wide chord propeller at 30-degrees of pitch was the most powerful, creating 395 ft/m (feet per minute) at 1000 RPM, however it was also the least efficient.

The most efficient propeller was the 3-bladed, narrow chord propeller with a 20 degree pitch. The efficiency was determined by dividing the ft/m by the amount of Watts used. As the ft/m went up the efficiency went down.

Conclusions/Discussion

Generally, the higher the blade count and pitch, the higher the airflow generated, and vice versa. Propellers with large chords and high pitch were best for moving air at low RPM, and propellers with smaller chords were best at high RPM.

Summary Statement

To test different characteristics of airplane propellers (number of blades, blade pitch, and chord) to find which propeller design is most efficient, and which is the most powerful.

Help Received

My father helped build the wind tunnel and suggested I measure energy in watts. He borrowed the power supply and anemometer from work.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Alanna K. Williams

Project Number
J0131

Project Title
What Makes a Whirlpool?

Abstract

Objectives/Goals
The objective of my experiment was to see which of the variables of drain size, depth of liquid, flow rate, inclusion of a solid object and viscosity of liquid affected the size and strength of a whirlpool. I hypothesized that each of these components would have some effect on the whirlpools.

Methods/Materials
To do my investigation, I took a clear plastic tub with depth markers up the side and a variably sized hole in the bottom and filled it up with either water or soybean oil. I let the liquid drain while measuring the size of the whirlpool (in terms of its diameter at the surface) and its rotations per minute at a two centimeter radius at varying depths. I also measured drainage rates. This was all repeated with a small piece of wood and with different drain sizes.

Results
My results were that the soybean oil only made a whirlpool at the largest drain size, while the water made one for all drain sizes. The whirlpools had the greatest average diameter and RPMs at intermediate liquid depths. Also, when a piece of wood was added the vortices were generally substantially smaller and slower. The larger drain sizes, which had higher flow rates, produced quicker and bigger whirlpools.

Conclusions/Discussion
Based on my results, my hypothesis that all the variables would have an effect on the vortices was proven. Every single component I tested had some impact on the dynamics of the whirlpools. Their size and speed was maximized in intermediate depths of water with no solid objects, at larger drain sizes and once circular flow was established.

Summary Statement
My project investigates the effects of different variables on the dynamics of whirlpools.

Help Received
Father helped drill holes and offered pointers; Mother cheered me on; Teacher gave advice.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Drew J. Wodecki

Project Number
J0132

Project Title
Wind Turbine: Do More Blades Mean More Power?

Abstract

Objectives/Goals
Goal: To see how many propellers would have the most electricity output on a home made wind turbine.

Methods/Materials
Method:
1. Created frame from PVC pipe using glue, saw and file.
2. Made propellers and hub from balsa wood using exact measurements for each.
3. Connect computer fan motor into PVC frame.
4. Tested under household fan with same distance and speed for each test.
5. Took ten readings from 3,4,5 and 6 propellers on the turbine and divided by ten to find average result for each. Computed data with a calculator and own brain to establish a clear result.

Results
The 3 blade wind turbine produced an average of 0.2431 volts. The 4 blade produced 0.2549 volts. The 5 blade turbine produced 0.2664 volts and the 6 blade produced 0.2516 volts.

The 5 blade propeller was the best at capturing and converting wind to create power.

Conclusions/Discussion
In conclusion, more blades generally equaled more power, but when there was too much weight on the wind turbine the output dwindled. For my experiment, the 5 blade wind turbine was the best at capturing and converting wind to power.

I would have liked to curve the blades to capture more wind. I would have liked to use a stronger motor and I would have liked to have a longer period to test each method.

Summary Statement
This project shows that for my wind turbine, five blades captured and converted more power than more or less blades.

Help Received
Dad helped with power tools, Evan at Capitola Hobbies for info on DC motors and science-math teacher Mr. Evert.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Mark R. Wolford, Jr.

Project Number
J0133

Project Title
Hurricane of Water

Abstract

Objectives/Goals
COMPARISON OF LAMINAR WATER FLOW TO VORTEX FLOW IN THE GENERATION OF ELECTRICITY IN A HYDROELECTRIC DAM

The objective is to determine if a vortex of spinning water would provide more kinetic energy than a laminar flow of water and would therefore increase electrical power output in a hydroelectric dam.

Methods/Materials
I constructed an operating model of a hydroelectric "dam" with the ability to provide either a laminar flow of water or a vortex spinning flow of water to the turbine. An electrical generator is turned by the movement of the turbine and the electrical output of the generator is measured for both types of water flow.

Results
Water flowing with a vortex spin provided approximately 12% more voltage and 19% more amperage output (measured by the Volt/Ohm meter) as compared to the standard laminar flow.

Conclusions/Discussion
The vortex spin of the water increases the kinetic energy created from the force of the falling water. Today's hydroelectric plants do not allow a vortex (such as in a bathtub drain) to form. The conclusions shown here would support a modification to the conventional hydroelectric dam so as to maintain a vortex spin--rather than a laminar--which would then increase efficiency.

Summary Statement
Increasing the electrical output of hydroelectric dam by adding a vortex of spinning water.

Help Received
Parents Mark and Deborah Wolford with typing, design and construction and Grandfather Merit Arnold with design.

CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
Nickolas W. Zurlinden

Project Number
J0134

Project Title
Stability of Rockets

Abstract

Objectives/Goals
I believe that if a rocket's center of gravity (CG) is significantly ahead of the rockets center of wind pressure (CP) it should fly stably. By increasing the distance between the center of the gravity and the center of wind pressure the rockets stability will increase the rockets performance in flight.

Methods/Materials
Methods:
1. Build rocket of random design.
2. Create internal weighting system for rocket.
3. Find rocket center of gravity (CG) by hanging from string.
4. Incrementally move weight system and spin test rocket for each weight position. Take data for each position.
5. Verify spin data with wind tunnel testing if possible. Take data for each postion.
Materials: - Balsa wood (fins); - Rocket engine (for accounting for the engines weight); - Cardboard tube (rocket fuselage); - Fishing weight (moveable weight inside the rocket); - Internal rail for accurately placing weight; - Glue; - String; - Wind tunnel.

Results
Observations:
-When I tested my rocket at CG zero the rocket was so unstable it flew backwards, but by the time I got to CG point number six, by five to six revolutions it righted it self and went nose first. By CG point number ten the rocket became stabile by one and three quarters to two and a half revolutions. This shows that you can make a rocket more stabile by changing the CG point.
-In order to keep your results fair and constant for testing purposes I kept the revolutions per second between one and two.

Conclusions/Discussion
I have determined that a rocket flies more stably if the center of gravity (CG) is in front of the center of wind pressure. If the distance between the CG and the center of wind pressure is greater, the rocket will also be more stable.

Summary Statement
Investigate rocket stability based on the relationship of the center of gravity(CG) and center of wind pressure.

Help Received
Father helped me modify my school's wind tunnel.