Abstract: Science and Engineering Fair of Houston

1001

Stealthiest Super Jet

Karla Barry

Clear Creek ISD /Seabrook Intermediate School

Category:

Aerospace Engineering

This project was about how jets reflect light and how that relates to jets' stealth. The experiment was to see if jets with the most stealth reflect the least amount of light. The hypothesis was that, if different jet body designs are tested, then B-2 Sprit jet body design and shape will reflect the least amount of light. This was the hypothesis because in the real world the B-2 Spirt Stealth has the highest stealth than any other fighter jet. In this project 5 model jets (C-17, F-16, F -22, F-117, and B-2) were placed inside of a black box with a light shining on them, to see which reflected the least amount of light. Light reflected was measured with a lux meter. The results from this experiment are that B-2 had an average of 0, F-117 had an average of .8, F-22 had an average of 3.71, F-16 had an average of 6.56, and C-17 had an average of 9.07. So, the hypothesis was correct, because the B-2 reflected the least amount of light. One thing that could have been unreliable in the results was that the lux meters didn't go that far into decimals. Areas of future experimentation could be to see if the color of the box or the color of the jet affects the amount of light reflected. Another thing could be to see if the brand of jets affects the amount of light reflected.

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Abstract: Science and Engineering Fair of Houston

1002

IMBRS-1 Interplanetary Mobile Botanical Research Station

Category:

Aerospace Engineering

Abyaz Bhuiyan, Aleksander Graves

Cypress-Fairbanks ISD/Spillane MS

Title of Project: I.M.B.R.S. Rover (Interplanetary, Mobile, Botanical, Research, Station) Student Name(s): Abyaz Bhuiyan and Aleksander Graves Student School: Spillane Middle School, Cypress, Texas, United States 77429, Cypress Fairbanks Independent School District Abstract: The purpose of our project is to build and test the I.M.B.R.S. Rover for plant cultivation on Mars. Unlike other Mars rovers, which are equipped with numerous scientific experiments, the I.M.B.R.S. focuses solely on growing plants. With the help of AutoCAD software, we designed the I.M.B.R.S. layout, which included resource containers, a piping system, dome housing, and domes. We then built a prototype. Following an umbrella like design, the dome protects the plants from the Martian environment. It consists of a circular polyethylene shield supported by eight flexible legs made of Kevlar backed with polyurethane foam. The dome also includes a central opening that allows four connected pipes to pass through. Four flexible rubber pipes coming from the resource containers join with four plastic straws, and the other ends of the plastic straws are inserted through the stacked domes' center holes. The containers contain soil with fertilizer, water, seeds, and carbon dioxide. Using a releasing mechanism, the lower dome is pushed with four straws and rests on the Martian ground, and then the pipes treat the ground with the resources. After that, the four straws retract into the rover and move forward to the next position. In between, the dome's top opening will close, using a spring-loaded cover. In conclusion, the I.M.B.R.S. Rover is designed to support future Mars missions by helping NASA learn how to grow plants on Mars more reliably so that humans don't just survive on Mars but can thrive there.

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Abstract: Science and Engineering Fair of Houston

1003

What parachute is the most effective

Elliot Myers, William Moore

Conroe ISD /York Junior High

Category:

Aerospace Engineering

In this experiment, we will investigate how different materials affect a parachutes aerodynamic lift & drag. The goal is to observe how variations in parachute material affect the rate of descent and ability to float using both upward and downward momentum. In one part of this experiment, we will attach parachutes made from a variety of materials to a plastic parachuter and drop them into a vertical tube that contains a fan at the bottom. The fan will blow air upward, creating resistance that simulates wind conditions and increases the effects of lift on the parachute. We will record each parachutes ability to float. In the next part of the experiment the parachutes will be dropped from the same height to ensure consistent testing conditions. As the parachutes fall, we will carefully observe and record how fast they descend and how stable they remain. We will repeat the experiments multiple times for each parachute design to ensure accurate and reliable results and record our findings.

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Abstract: Science and Engineering Fair of Houston

1004

3, 2, 1, BLAST OFF! How the Kinetic Launch System works in rockets

Aadya Rajesh

Clear Creek ISD /Westbrook Intermediate School

Category:

Aerospace Engineering

The current rocket launch system uses fuel exhaust to launch the rockets, which is bad for the environment. This project is about finding an alternative to this without using a lot of fuel. The method proposed is a disc launcher, which launches unmanned rockets in shape of discs thanks to its kinetic launch system. This project explores the mechanism of building a disc launcher and shows it is easier to use the curvature path and launch the rocket just like disc throw instead of launching the rocket directly to space using current technology of burning fuel. In this project 2 different geometries of discs (Discs and Donuts) were tested and launched at 4 different angles. The distance travelled were measured, and the data showed that Discs travelled the farthest and angle for optimal launch to be 15°. This idea can be explored and extended further for large-scale launches.(California based Company , SpinLaunch is exploring a similar idea of using a sling shot mechanism to launch objects into space)

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Abstract: Science and Engineering Fair of Houston

1005

Where are the space-junk hotspots? Mapping object density by altitude in Earth orbit.

Akshin Vedanth, Surya Alli

Friendswood ISD /Friendswood Junior High

Category:

Aerospace Engineering

Human reliance on satellites for communication, navigation, and Earth observation has increased the number of objects in Earth orbit and the amount of long-lived space debris. This study tested the hypothesis that Low Earth Orbit (LEO; ≤2,000 km) contained the highest concentration of orbital objects and debris compared to higher-altitude regions. Two public datasets were analyzed: the CelesTrak SATCAT catalog, which tracks payloads, rocket bodies, and debris, and the Union of Concerned Scientists (UCS) Satellite Database, which contains information on active satellites. For each object, a representative orbital altitude was calculated as the average of apogee and perigee. Objects were then classified into LEO, Medium Earth Orbit (MEO), Geostationary Orbit (GEO), or Highly Elliptical Orbit (HEO) using altitude-based thresholds. Altitudes were grouped into 100-km bins, and pivot-table aggregation was used to count objects per bin and summarize totals by orbital region, including comparisons between debris-dominated and active-satellite distributions. Spatial patterns in Low Earth Orbit were additionally examined using the LeoLabs Low Earth Orbit visualization tool to provide qualitative context for debris clustering; no quantitative data were extracted from this visualization. The results showed that LEO contained the largest concentration of orbital objects, with a pronounced hotspot around 500–600 km, while MEO and GEO showed narrower altitude-specific clusters and HEO remained relatively sparse. These findings supported the hypothesis that LEO was the most congested and debris-rich orbital region, indicating that debris mitigation and space traffic management efforts should prioritize the densest LEO altitude bands.

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Abstract: Science and Engineering Fair of Houston

1006

Going Down! Wing Tip Aspect Ratio Negatively Affects Glide Ratio

Devier Wyatt

Houston ISD/BCM Academy at James D Ryan - MS

Category:

Aerospace Engineering

This project explores the effects of the aspect ratio of attachable wingtip tabs on a paper airplane when measuring glide distance. My testable question is "How does varying aspect ratios (low, square, and high) of a wingtip tab affect glide distance of a paper airplane?" with my independent variable being the aspect ratio of the wingtip tabs and the dependent variable being the glide distance. My data collection procedures consist of launching 4 paper airplanes using a paper airplane launcher; one control airplane and 3 wingtip tabbed airplanes with varying wingtip tab aspect ratios (low, square, and high). The glide distance will be measured in feet and inches starting from the launch point to the tip of where the airplane lands. This is done for 10 trials to find an average distance for each airplane. After the data collection process was finished I found the square aspect ratio wingtip tabbed airplane glided the furthest. This project is important as wingtip devices can increase fuel efficiency of airplanes by reducing induced drag and overall reducing harmful greenhouse gasses from polluting the air. In conclusion, the aspect ratio of a wingtip tab increases the glide distance of a paper airplane most in a square or 1:1 ratio.

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Abstract: Science and Engineering Fair of Houston

1007

Truss this Wing

Caroline Erdem

Clear Creek ISD /Seabrook Intermediate School

Category:

Aerospace Engineering

Air travel is one of the most popular forms of travel, yet it remains costly. One way of lowering costs is by making the plane more efficient. If one can improve the propellers, it may lead to more efficiency in terms of power use, aerodynamics and thrust. This project tested different propeller styles in four different experiments. To start, 4 different types of propellers were designed and 3-D printed. For each test, the propellers were attached to the plane and results were recorded. For the first test, the plane was attached to a protractor using a string so that forward movement could be recorded. For the second, a watt meter was attached to the engine and the amount of electrical power was recorded. For the third, a smoke machine was turned on to record air flow. For the fourth, an outdoor flight was conducted, and maneuvers were recorded to compare thrust, handling, maneuverability, and aerodynamics. The data showed that in all four tests the toroidal propellers pulled significantly less wattage, created a much narrower flow of air over the plane, had a higher degree of pull, and ranked higher in each recorded area of the flight test. In conclusion, the hypothesis was correct. In each of the 4 tests, the toroidal propellers outperformed the classic propellers. For real world uses, toroidal propellers could be utilized in commercial airplanes to make them more efficient while improving the aerodynamics, maneuverability, and handling. The end result could be lower costs for air travel.

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Abstract: Science and Engineering Fair of Houston

1008

Sky Logic

Category:

Aerospace Engineering

Muhammad Asad, Amaan Rahman

Stafford SMSD/Stafford STEM Magnet Academy

This project investigates how changing the angle of attack affects the battery life of an AI□controlled glider. The research question guiding the study is: How does dynamic angle of attack control influence energy efficiency compared to a fixed angle of attack? The hypothesis predicts that if the AI adjusts the angle of attack during flight, then the aircraft will have a higher battery percentage at the end of flight, because it will maintain optimal lift and reduce drag. To test this hypothesis, a foam□board glider was constructed and equipped with a Matek F405□WING V2 flight controller, GPS, IMU, barometer, and an A2212 1000KV brushless motor. The glider was programmed to operate in two modes: fixed angle of attack and dynamic angle of attack. Controlled trials were conducted in open outdoor areas, with battery percentage, glide distance, and stall frequency recorded after each flight. Data was analyzed using tables, graphs, and averages to compare performance between the two modes. The expected outcome is that flights with fixed angle of attack will show lower battery percentage, shorter glide distances, and more stalls, while flights with dynamic angle of attack will show higher battery percentage, longer glide distances, and smoother flight performance. These results would demonstrate that adaptive angle of attack control conserves energy, providing a student□scale model of fuel efficiency in aviation. The project highlights both the scientific importance of aerodynamic efficiency and the societal impact of sustainable aviation technologies.

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Abstract: Science and Engineering Fair of Houston

1009

Voronoi Tessellations Improve Durability of 3D Printed Command Modules

Dhanashi Dhriti

Houston ISD/BCM Academy at James D Ryan - MS

Category:

Aerospace Engineering

This project explores whether applying Voronoi tessellation surface patterns to 3D-printed spacecraft models improves their durability in simulated physical tests. Voronoi patterns, which naturally occur in strong biological structures such as turtle shells and sea urchin tubercles, are known for efficiently distributing stress and forming high strength-to-weight frameworks. To test their effectiveness on spacecraft design, both Voronoi-patterned and regular models were subjected to a drop test from 5 to 8.5 feet and a weight-compression test using sand loads from 5 to 30 pounds. All models—Voronoi and regular—showed no damage during the drop test. However, the weight-compression test revealed differences: Voronoi models remained intact until 25 pounds, then broke internally, and two out of three also broke externally at 30 pounds. Regular models broke at the top as early as 10 pounds, experienced no additional damage at 15 or 20 pounds, and later broke internally at 25 pounds without external failure at 30 pounds. These results indicate that Voronoi tessellations did not provide greater durability overall, contradicting the initial hypothesis. The findings suggest that Voronoi structures may resist sudden impact but struggle with slow, direct compression, and that open-cell designs may weaken structural integrity. This research provides useful insights for future bio-inspired spacecraft engineering and highlights modifications, such as using different materials or closed-cell designs, for further investigation.

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Abstract: Science and Engineering Fair of Houston

1010

The Effects of Weather Conditions on Rocket Engine Efficiency

Akshat Chhokra

Fort Bend ISD /Fort Settlement Middle School

Category:

Aerospace Engineering

This project investigates how weather conditions—including temperature, humidity, air pressure, and wind—affect the efficiency of a solid-fuel model rocket engine. Unlike most rocket studies that focus on launch success or maximum height alone, this experiment examines overall engine efficiency, measured through changes in altitude, burn time, and flight performance under different environmental conditions. A standardized model rocket and motor were launched repeatedly while weather data was recorded for each test. The results were compared to predicted performance based on known aerodynamic principles, such as air density and drag. This research demonstrates that even small weather changes can influence rocket efficiency, similar to the factors NASA evaluates before real launches. By using accessible equipment to model real aerospace challenges, this project highlights the importance of understanding environmental effects on rocket performance rather than simply evaluating whether a launch succeeds or fails.

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Abstract: Science and Engineering Fair of Houston

1011

Bio-Responsive Launchpads: Testing Nature's Engineering Under Pressure

Sasiri Dissanayake

Clear Creek ISD /Westbrook Intermediate School

Category:

Aerospace Engineering

This project tested four materials; foam, agar, gelatin, and sheet moss to see how well they could handle heat, vibration, and weight. Each material was tested by checking how much it compressed under 989 grams, measuring how much it vibrated at 20 Hz, 40 Hz, and 80 Hz, and heating the material to 121 °C then checking the temperature of the material and the compression. All the data was used to see whether the biomaterials; foam, agar, and gelatin could work as well as or better than foam as a launchpad. This is to see if eco-friendly materials could replace manufactured materials that harm the earth. The results showed that each material had different strengths. Foam was the most balanced because it handled high heat well, didn't compress too much, and had steady vibration readings. Moss absorbed vibrations the best, especially at 40 Hz, but it squished more under weight. Agar softened at a lower temperature, but it barely changed shape, making it the strongest under compression. Gelatin absorbed some vibration but melted and deformed the most when heated or weighted. Overall, foam was the most versatile, moss was the best at absorbing wave energy, agar was the strongest underweight, and gelatin was not reliable for high□stress situations. This helps future aerospace engineers decide whether they'll use biomaterials to replace manufactured materials of a rocket launchpad.

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Abstract: Science and Engineering Fair of Houston

1012

Helicopter stability test

Robert Lozano

Houston ISD/BCM Biotech Academy at Rusk - MS

Category:

Aerospace Engineering

My project is about how wind effects the tilt of a helicopter, and what I did is I had a RC helicopter and used foil to represent the weight of people and cargo as a extra variable. The way I messured the tilt and sway was to record a video of the plane flying in the wind and having a protractor next to it and slowing it down to get a angle of the nose. I repeated this process 5 times with the different wind settings (none,low,medium,high) and different weight (no weight and foil weight) to total to around 20 different results. I averaged these results and then used that data to make charts and the reason for of this project is to represent the different adversity that emergency helicopters have to deal with and how helicopters when they are made avoid and ensure these problems dont occur.

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Abstract: Science and Engineering Fair of Houston

1013

Taper Ratio Negatively Impacts Glide Ratio on Cardboard Airplanes

Kiley Williams

Houston ISD/BCM Academy at James D Ryan - MS

Category:

Aerospace Engineering

This project investigates how wing taper ratio affects the glide ratio of cardboard airplanes. The independent variable is the taper ratio of the wings, with four variations (0:100, 3:100, 6:100, and 9:100), and the dependent variables are the distance traveled, peak height, and glide ratio of each flight. To test this, planes are constructed from cardboard by sketching and cutting the fuselage, cockpit, stabilizers, and wings. The wings are inserted into slots in the fuselage, allowing easy swapping without glue or tape. Each plane is thrown from a height of two meters, and the distance traveled and peak height are recorded over thirty trials per wing configuration. Data is used to calculate lift, drag, and glide ratio, and results are compared using bar graphs. The findings show that wings with less taper and greater surface area produced higher lift, resulting in greater peak heights, while wings with more taper reduced drag, allowing the planes to travel farther horizontally. Such outcomes exhibit the exchange between lift and drag and as well as indicate that wing taper has a major effect on the performance of the glide. Comprehending such a connection is essential for fundamental aerodynamic design and it can be utilized for the purpose of wing optimization in gliders or light aircraft. The testable question is resolved by the experiment as it evidences that an increase in taper resulted in a decrease in lift and drag reduction, whereas a decrease in taper increased lift as well as drag. The next enhancements might guarantee a higher level of reliability by employing a mechanical launcher, testing indoors in order to eliminate the influence of wind, or making the planes more durable so that they can keep their shape during repeated trials.

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Abstract: Science and Engineering Fair of Houston

1014

Designing a Robotic Model for Debris Retrieval

Tram Huynh

Charter/SST - Champions College Prep - MS

Category:

Aerospace Engineering

This project involves the design and construction of an independent debris-collection robot capable of detecting and collecting objects of different sizes. The robot is capable of sensing ranges and a close measurement of distance to scale the debris at varying ranges. The machine includes a variety of different mechanisms to collect debris based on the detected distance, including a sticky tray for small debris, an air-pump system for medium debris, and a net mechanism for large debris, which is represented with aluminum foiled balls. The system is designed to deploy each collection method only once, and return to its starting position after completing its tasks. The main goal is to extend solutions on the widely overlooked topic of space debris and design a machine that can model a real life solution effectively. This project demonstrates the integration of mechanical design, electronics, and programming to solve a real-world problem through autonomous robotic systems and sets an in depth example of how we can resolve this urgent issue efficiently.

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Abstract: Science and Engineering Fair of Houston

1015

Aerodynamics Of Paper Airplanes

Katherine Vicente, Zoey Zaragoza

Charter/SST - Champions College Prep - MS

Category:

Aerospace Engineering

The main purpose of our project was to make an experiment of different paper airplanes testing how far will they fly. We decided to make this project because it helps students know more about science and lessons of flying. We think this project can be helpful because it helps NASA people who are in charge of building real airplanes, to try different ways how to make an airplane to fly the farthest. The way we did our experiment was that we will have 3 different paper of each type, we will make the airplane and then test it on a solid floor 3 times and put it on our data and see which one had the longer distance than the other and by how much. After finishing our experiment we were able to gather our results from it. The result of our project was that we were able to notice that the printer paper was the one who had a long distance. Construction paper came in second place, and card stock with a low distance. Why is this? So if paper weighs less it makes it to move around easily than having a paper that weighs more.

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