

AIAA NCS Completes Science Fair Marathon for 2007

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This spring, members of the AIAA National Capital Section (NCS) completed our annual marathon of science fair judging. A total of 24 volunteers judged aerospace-related projects at eight local science fairs, spanning the entire scope of science fairs in the official NCS jurisdiction – from the shores of the Chesapeake Bay to the border of West Virginia.

Through the generous support of our sponsors – *The U.S. Space & Rocket Center, Aerojet, AeroAstro, BAE Systems, Ball Aerospace, Integrity Applications, Lockheed Martin and Rockwell Collins* – we were able to continue our full coverage this year to all of the jurisdictions that have science fair in the metropolitan area: Northern Virginia (which includes Arlington, Alexandria and Falls Church), Fairfax Co., Loudoun Co. and Prince William Co. in Virginia, Montgomery Co., Prince George's Co. (which includes St Mary's and Calvert Counties), and Charles Co. in Maryland, and Washington, D.C.!

AIAA awarded prizes to students with the top three aerospace-related projects at each fair, for a total of 24 prize winners (additionally, certificates were given out to deserving Honorable Mention students). Prizes for the top three winners include the following:

- 1st Prize is a week at the US Space & Rocket Center's Space Camp or Aviation Challenge (www.spacecamp.com)
- 2nd Prize is \$100
- 3rd Prize is \$75

All three of the top winners at each fair are also offered a one-year student membership

in AIAA and invitations to display their projects at the annual NCS Awards Banquet on June 7th. Make plans to attend the awards banquet (see www.aiaa-ncs.org) and you can see for yourself the impressive work by these future science and technology leaders of America. Thanks to our corporate sponsors, AIAA NCS was able to provide over \$13,000 worth of prizes to our winners.

Charles County Science Fair

The Charles County Science Fair was held on Saturday March 3 at North Point High School, Waldorf, MD. The AIAA NCS judges were Mike Hirschberg (CENTRA Technology), Michael Poliszuk (NAVAIR), and Dean Meloney (JSF).



First prize went to Victoria Ritter of La Plata High School for her project, "All that Drag: Aerodynamic Drag vs. Car Shapes." Victoria developed an innovative wind tunnel to measure drag of 18 different automobile models. She used a leaf blower to generate wind through the tunnel and a vacuum cleaner exhaust to produce an air bearing like an air hockey table.



Second prize was awarded to seventh grader Cayley Dymond of Matthew Henson Middle School for her project entitled "Satellite Orientation and Drag Force." She used a novel balance arrangement to measure the drag on satellite shapes in different orientations and compared trends.

Shijie Shen, also of La Plata High School, won third place for his project, "The Effects of Magnetic Storms on Earth and Space." Shijie built a device that measured the magnetic flux of the sun and compared his observations with published data.



Honorable mention was awarded to Emily Kuhn of Thomas Stone High School for "What Will Keep a Parachute Suspended the Longest?" Emily conducted over 100 drops of various shapes of parachutes to determine which ones minimized the descent speed.

Loudoun County Science and Engineering Fair

On Thursday, March 15th, Michael McFarland (Orbital Science Corp), Michael Collins (ASRC Management Services), and Will Michaux (Applied Signal Technology) judged the Loudoun County Regional Science and Engineering Fair held at Dominion High School in Sterling, Virginia.



First prize went to Kenneth Harbour, a sophomore at Park View High School, whose project was titled “The Effect of Nose Cones on a Model Rocket”. This project examined the effect of nose cone shape as a function of drag and altitude. Numerous wind tunnel and field tests were performed to test this hypothesis.



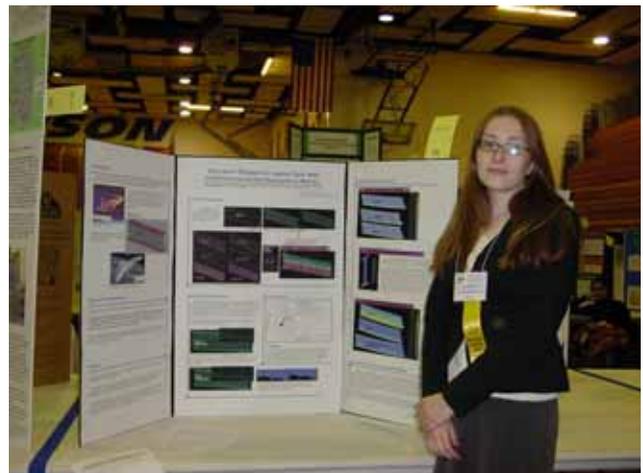
Third Prize went to Kathleen Harrison, a freshman at Potomac Falls High School, whose project was titled “The Relationship between Winglet Design and the Affect on Vortexes”. This experiment examined the effect of different winglet designs on vortex shape and length.

Fairfax County Regional Science and Engineering Fair

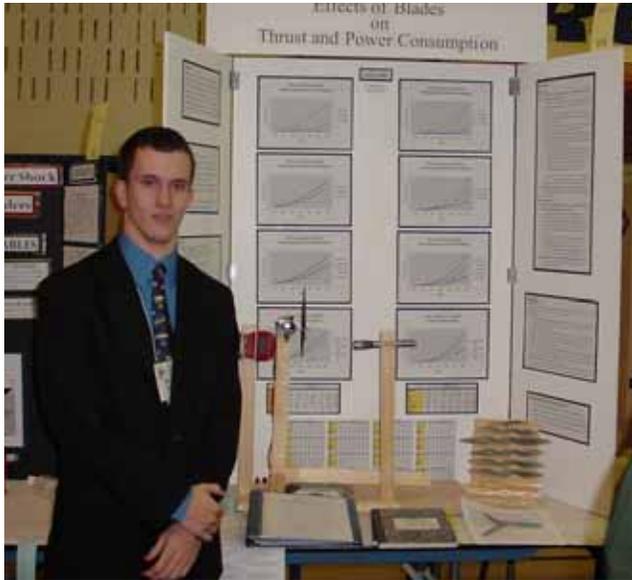
The Fairfax County Regional Science and Engineering Fair was held two days later, on Saturday March 17th, at Robinson Secondary School, in Fairfax, Virginia. The AIAA judges were Sean Griffin (Dept of Navy), Supriya Banerjee (SAIC), and John Schumacher (Aerojet).



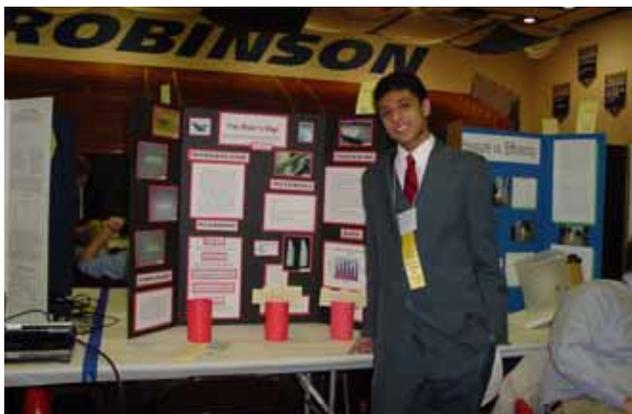
Second prize went to James Flynn III, a senior at Heritage High School, whose project was titled “Preventing Airplane Tire Blowouts: Spin versus Wear”. This project demonstrated that spinning up a tire on an airplane before landing will reduce wear on the tire itself. This would increase the life of the tire and promote safety.



First Place went to “Corrugated Spar Performance During Reentry” by Anastasia Rumiantsev, a senior at Thomas Jefferson High School. She used finite element analysis to analyze the thermal stresses in a wing spar of a reentry craft and the effect on the thermal stresses of introducing different wing spar web corrugation profiles and attachment methods.



Second Place went to junior Matt Smith of Fairfax High School for his project, “Effects of Blades on Thrust and Power Consumption.” Matt built on last year’s project by testing propellers made of different materials and blade numbers using a unique scale design to measure force.



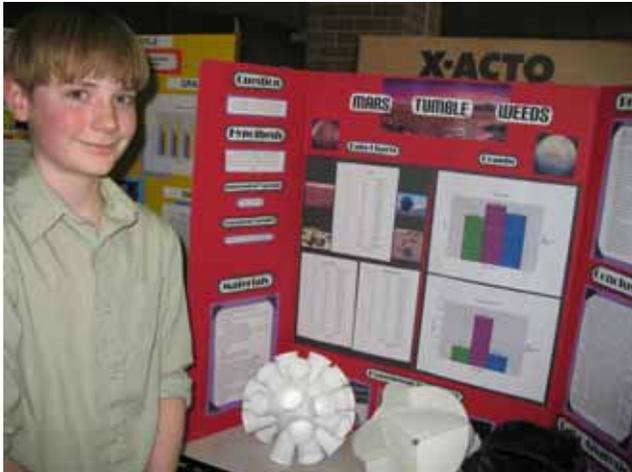
Steve D’Souza won third place with his project “From Whales to Wings: Flipper Inspired Airfoils”. Steve, a senior at Robinson High School, applied the tubercles found in nature on the humpback whale’s fins and other sea creatures by constructing various wing designs incorporating tubercles and, through testing, found that stall could be delayed by correct introduction of this design feature.

Honorable Mention: Up, Up and Away – Katherine Bannon (Grade 9) measured the propulsive characteristics of various liquid fuels used to power the hot air balloon that she had constructed.

Honorable Mention: Effect of Tiny Feather Motions on Air Turbulence – Caroline Boulanger (Chantilly HS, Grade 11) conducted an experiment to test to see if the angled barbs on a bird’s feature improve the flight of a bird by pushing the turbulence outward away from the bird or inward toward the bird’s body.

Prince William-Manassas Regional Science Fair

Joe Marshall (BAE Systems), Nils Jespersen (The Aerospace Corporation), and Jim Heiertz (Boeing) officiated at the Prince William County Science Fair, also on March 17th, at Garfield High School in Woodbridge, VA. The following students and their projects were selected recipients of AIAA awards:



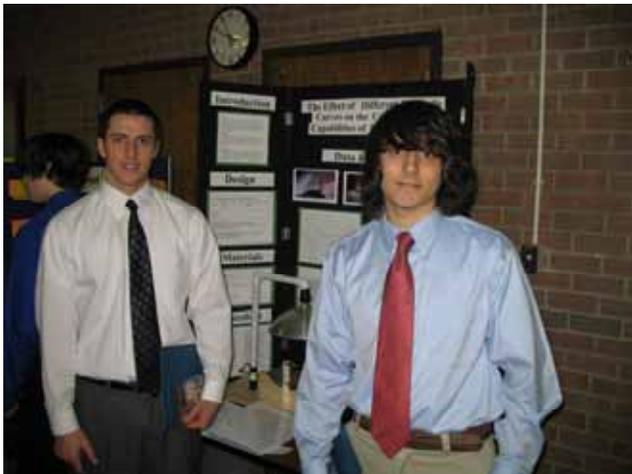
First place was awarded to Jake Gates for his project "Mars Tumbleweeds." Jake built concept models for a rover configuration that essentially would be blown wherever the Martian planetary winds would take it. His premise was to design the optimal wind-catching configuration that would carry the vehicle the best for a given wind velocity. The combination of concepts for remote unmanned exploration and fluid dynamics in a middle school student was innovative and creative. The project touches on valid aerospace engineering areas with ideas that could potentially be developed for application to real problems. There were three different designs created, and as problems came up with the designs and test equipment during experiments, solutions were engineered to test these out including the development of a wind tunnel. The data was impressive, as well as the background NASA Research done by the student. This student definitely has his eyes on space, and seems a great candidate for an aerospace engineering career.



Second prize went to Patrick Wilshere for "Cracks Kill: An Examination of Treatments to Strengthen Space Shuttle Tank Insulating Foam". Designed to address current problems with the shuttle external fuel tank insulating foam, Patrick explored various coatings over foam on simulated scale versions (soda bottles). The student's premise was to investigate various surface treatments of foam insulation that would minimize erosion, cracking and flaking. He applied various coatings and coverings, and he quantified the material loss under consistent conditions. Student built a wind tunnel with output filtering to catch fragments. He built 30 models to get the 15 he used with good conclusions and analysis of the data. This project shows a clear interest in solving current problems in aerospace engineering.



Sarah Bui won third place for her project entitled, "Tower Power." Sarah constructed ten samples each of four different lattice structure designs, each design with progressively more inclusion of diagonal struts. The 40 towers built were each tested to failure. Her objective was to maintain consistent minimum mass of the structures while measuring the yield strength of each of the four designs. The work was meticulous and the data reduction was nicely executed. The work has clear application to strength of materials and structural engineering in aerospace design.



Honorable Mention was given to Joseph Bruno & Arturo Buzzalino for "The Effect of Different Parabolic Curves on the Concentrating Capabilities of Solar Reflectors." This project was performed as a team effort between two students wherein they were investigating the solar concentration efficiency of various parabolic shapes of constant projected aperture area. Interesting hypothesis that would apply to antenna design for spacecraft or ground stations or solar collectors. More math derivation than any other project and honed in with experimental testing to optimum solution.



Another Honorable Mention was presented to Drayton Munster for "The Effect of Magnetic State on the Absorption of Beta Radiation." Drayton used a Geiger counter and a Beta radiation source to characterized the absorption properties of a difuferent materials. The number of materials was limited, but the data reduction was well executed. This topic has obvious application to protection concerns of assets operating in the space environment.

Northern Virginia Science and Engineering Fair

The Northern Virginia Regional Science and Engineering Fair (covering Alexandria, Arlington and Falls Church) was held at Wakefield High School, Arlington, VA also on Saturday, March 17. Judges were David Brandt (Lockheed Martin), Sakura Therrien (US Army Space & Missile Defense Command) and Joe Chan (Intelsat).



The First Prize was awarded to 10th grader Nicholas Kelleher of Washington-Lee High School for his project, "The Effect of the Location of the Point of Maximum Thickness on the Amount of Lift an Airfoil will Generate." Nick built a wind chamber to test his theory on maximum thickness location of an airfoil. He cleverly built a moveable structure to test this thickness and displayed both technical competence and solid communications skills in impressing the judges.



The Second Prize Winner was Jennifer Lee, a 9th grader at Bishop O'Connell High School. Jennifer's project was "Rocket Aerodynamics", and she exhibited strong technical inquisitiveness in using multiple

sizes and shapes of fins on a series of model rockets. Jennifer's presentation was very strong and she clearly understood the physics of Newton's Laws and applied them to her project.



The Third Prize Winner was Mary Matecki, a 7th grader at St. James Middle School. Mary built a wooden pendulum and tested different sizes and shapes for her project, "Wind Resistance of Two Dimensional Shapes." Mary exhibited excellent potential for a future career in a technical field with her mixture of strong technical drawings, research into the basic aerodynamic laws, and her skillfully communicated presentation.

District of Columbia Mathematics, Science and Technology Fair

The District of Columbia Mathematics, Science and Technology Fair was also held on Saturday March 17th at McKinley Technology High School in Washington, D.C. The judges were Thomas Kashangaki (Futron), Elaine Camhi (AIAA Headquarters) and Stephen Day (International Ventures Associates).



First place went to Aldo Cruz, a seventh grader at Paul Public Charter School; his project was entitled "How High Can It Go?" Aldo conducted significant experimentation and measurements on a model rocket. He tested three different sizes of Estes engines to see what effect the amount of fuel had on the altitude of a rocket's flight. He found that B engines had an apogee that was about three times as high as an A, and the C engine was about three times as high as B.



Second place was awarded to Madison Hartke-Weber, a sixth grade student at Stuart Hobson Middle School, for her project, "To the Moon and Beyond: Lunar and Martian Bases." Madison did a survey-based project on a lunar base, conducting a thorough analysis of some of the tough

issues of building a research station in a hostile environment. After compiling facts about the pros and cons of building bases on both the Moon and Mars, she then asked fellow students to respond to a series of questions about which environment they thought was best suited to a research station. While her hypothesis was that either place would be suitable, her research led her to the conclusion that the Moon was a more viable option.

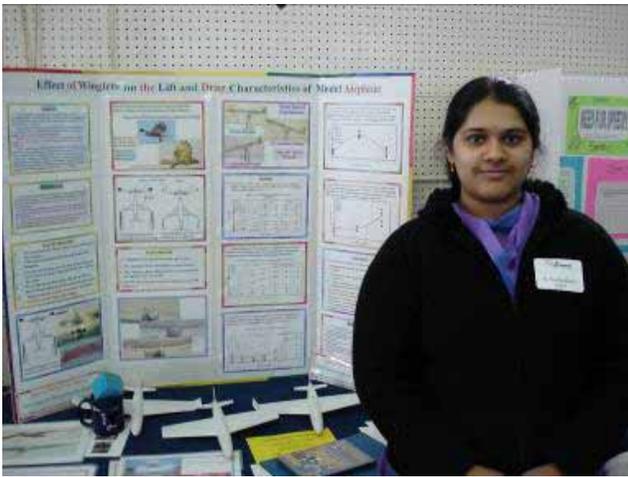


Third place went to Jimmy Gomez, in grade 12 at Benjamin Banneker Academic High School. For his project on "Solar Cells," Jimmy conducted extensive experimentation with copper based solar cells.

Honorable Mentions were awarded to Chidi Agbaeruneke and Kevin Contraras. Chidi is an 8th grader at Paul Public Charter School. His project was entitled, "How does the intensity of light affect the power output of solar cells?" Kevin, a seventh grader at Hardy Middle School, conducted a project on Magnetism, where he conducted experiments with magnets to simulate the action/reaction between the Earth's magnetic field and the Moon. He tested the field force corresponding to the size and distance of the small magnets relative to each other.

Montgomery County Science Fair

The Montgomery County Science Fair was also held on Saturday March 17th at Montgomery County Fair Grounds in Gaithersburg, MD. Judges Ed Habib (Hab-Com, Inc.), Larry Evans (NASA Goddard), and Kevin Leath (Boeing) report that they spoke with some very interesting students and reviewed some impressive research efforts spanning the range of wing design, to spacecraft orbits, to environmental phenomenology and GPS use.



First place went to A. Yashodhara Rao, a Senior division student from Walt Whitman High School. Her project, entitled "Effect of Winglets on the Lift and Drag Characteristics of a Model Airplane," was a well thought out assessment of winglet-to-wing angle optimization, as measured in terms of lift to drag effect. This project showed good use of empirical data to determine results and was very well articulated.



Second place went to Daniel Hyde, a Junior division student from Roberto Clemente Middle School. Daniel's project, entitled "Wind Turbine Designs," used measurements of electrical outputs from the turbine to determine optimal orientation of the turbine blades to the wind. Daniel constructed the blades, hub, and core electronics used in conducting the experiment.



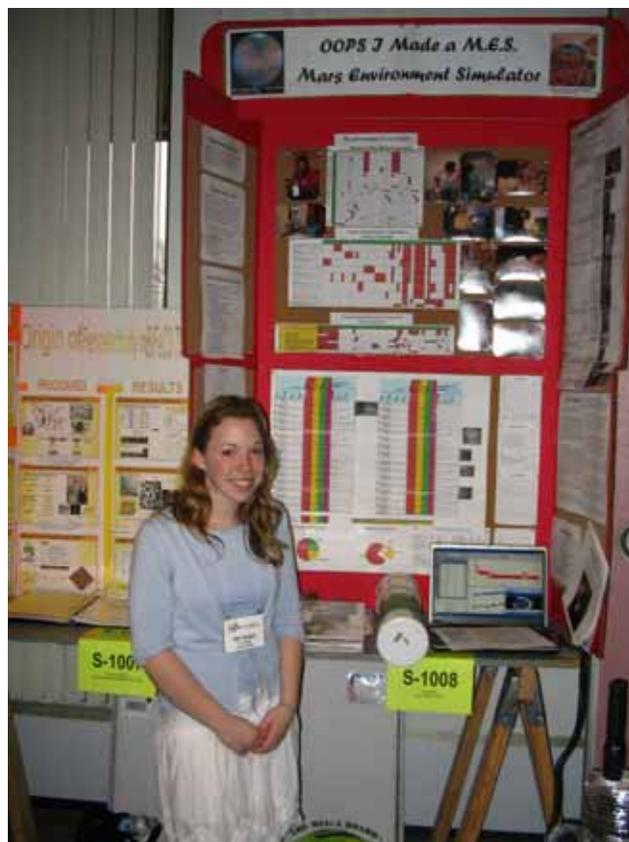
Third place went to Louis Wu, a Senior division student from Montgomery Blair High School. His project, entitled "A Computer Model of Flapping Wing Dynamics," simulated aspects of insects' flapping wings to characterize the relationships among key descriptive parameters.

An Honorable Mention was given to the team of James Farace and Nicholas Von Utter, Junior division students from St. Andrew Apostle School. Their project, entitled "Aerodynamics of Shapes," determined the effect of shape on aerodynamic drag. James and Nicholas built their own wind tunnel and collected consistent test data to achieve their objectives.

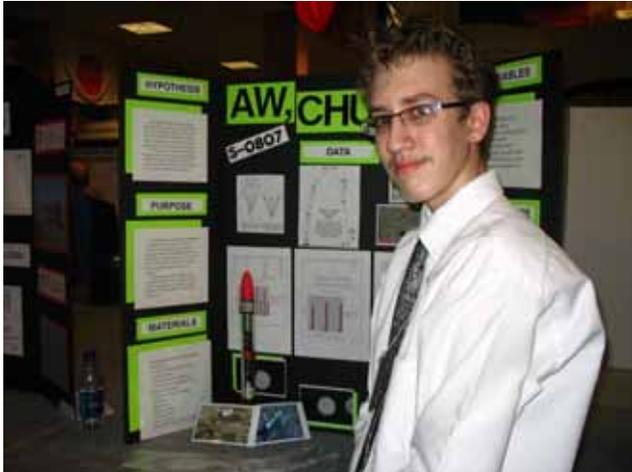
Another Honorable Mention award went to Hannah Dario, Junior division student from Argyle Middle School. Her project, entitled "Is the Accuracy of a Global Positioning System (GPS) Receiver Affected by the Number of Satellites Used?," looked at the optimal number of satellites used by a receiver, in terms of minimal distance error from known positions.

Prince George's Area Science Fair

The final AIAA NCS-area judging was conducted at the Prince George's County Science Fair held on Saturday March 24th, at the Prince George's Community College and included from Prince George's, Calvert and St Mary's Counties. The judges were Ron Muller (Perot Systems), Tom Marino (Naval Surface Warfare Center) and Charles Divine (consultant).



First Place was awarded to Julie Walker from Leonardtown High School for her project titled "Oops I Made a M.E.S." She developed containers using large diameter PVC pipe in which she was able to reproduce some of the conditions of the Mars environment – low pressure and low (dry ice) temperatures. These containers could be used to test components destined for a Mars experiment.



Second place was awarded to Brandyn Phillips from St. Vincent Pallotti High School for his project titled "Aw, Chute!" He launched many model rockets and tested various parachute configurations for their effectiveness in returning the spent rocket to the ground.



Third place was awarded to Zev Gurman from Eleanor Roosevelt High School for his project, "The Dark Secret of Dark Matter." He evaluated some anomalous data from one of the instruments on the Gamma Ray

Observatory that some scientists thought could be an indication of dark matter.

Honorable Mention Awards were given to two Junior Division students that both attended the Jericho Christian Academy. One Honorable Mention was given to Peter Boswell for his project titled "Rocket Works." He tested two different model rockets to see which performed better. The second Honorable Mention was given to Charles Henry for his project "Does a Shorter Delay Equal A Longer Distance?" He strapped model rockets to two wheeled cars and measured the distance traveled for different propellant charges.

Plans for Next Year

In 2008, we hope to continue our science fair judging, but we won't be able to do this without continued corporate and volunteer support. If you are interested in getting more involved in National Capital Section educational outreach programs, please contact Mike Hirschberg, the Pre-College Education Chair at 571-218-4417 or aiaancs.sciencefair@comcast.net.

Note that even if your child isn't one of our science fair winners, they can still have an out-of-this-world experience at Space Camp or Aviation Challenge. Visit their website at <http://www.spacecamp.com> or call 1-800-63-SPACE (800-637-7223). When registering, please use code "AIAA07". This helps underwrite the cost of the scholarships.