

NATIONAL CAPITAL SECTION'S REGIONAL STEM/SCIENCE FAIR SUPPORT

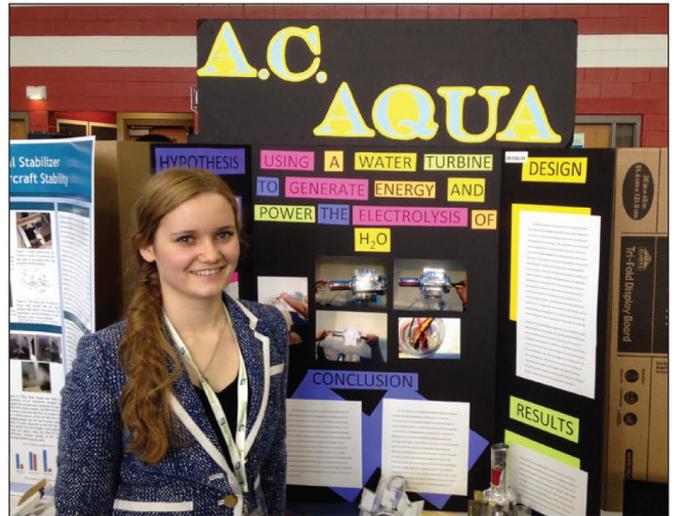
Susan Bardenhagen, AIAA Educator Associate; NCS Co-Coordinator of Regional STEM/Science Fair Judging Teams

From 1 March to 5 April, eight teams of 29 judges examined and sorted nearly 3000 projects at regional STEM/Science & Engineering Fairs, interviewed nearly 300 students from grades 6–12, and awarded 40 honors. In addition to the Washington, DC, STEM Fair, three were held in Maryland, and four in northern Virginia. Three of the 40 awards were given to team projects where the judges observed excellent collaboration and well-prepared presentations. The projects selected for consideration were drawn from nearly every one of the 17 possible categories with finalists chosen from Behavioral Science, Chemistry, Computer Science, Environmental Management, and Mathematical Science, as well as the expected Earth & Space Science, Energy & Transportation, Engineering (both Materials & Bioengineering and Electrical & Mechanical), and Physics & Astronomy.

In teams of three to five, the AIAA member judges included engineers and engineering graduate students from the University of Maryland. Being able to preview students' abstracts or titles prior to the events greatly supported the judges' efforts. In one fair the team had three hours to preview the projects before students were present and in another the team had to view, cull, interview, and select in just four hours. Dr. Joseph Gruber reflected, "It's always inspiring to attend these events and see that our future is in capable hands and this year was no exception with a difficult decision by the judges to select the top three winners. Using our various backgrounds however, we were able to adequately interview the students and analyze the projects they put forth and select the awardees along with providing honorable mentions to students who also presented outstanding projects."

In Physics & Astronomy, one student used 3-D printing to generate a series of wind tunnel models to determine "the effect of chord length of an airfoil on lift over drag ratio." A senior investigated the feasibility of a sacrificial plate equipped with an array of neodymium magnets for absorbing impacts from simulated metallic space debris. A model rocket enthusiast mixed and casted his own propellant grains using various bore designs and testing them in a homemade test stand, while a third-place student employed a phased approach using open-source model rocket design and simulation software confirming his hypothesis that an ogive nose cone shape achieved the best performance.

A Behavioral Sciences project related pilot performance to current trends in the delivery method of iPad displays. Employing a biologically-inspired approach involving vortex generation, a



first-place student analyzed the downstroke phase of slow flight in bats. And the investigation of whether hydroponic plants used to clean water in a space habitat could be modified for increased oxygen production under reduced levels of ultraviolet light, resulting in lower energy consumption, earned a second place from AIAA and in her Environmental Management category.

In one of the two Chemistry projects, a team developed an innovative and portable spectrophotometer; the other examined how different types of acid reacting with baking soda would work for a bottle rocket—the judging team was impressed with the student's persistence and continuous trials.

In Earth & Space Science, a student's interest in amateur radio motivated him to pursue a backyard satellite tracking study; his persistence led him to a better understanding of frequency amplitude decay of aging satellites, while his curiosity gave him a comprehensive view of Doppler effect. Another student's interest in electronics enabled him to build a microwave transmitter system to generate power wirelessly!

Coincidentally, two students whose projects were in the Energy & Transportation category visited the AIAA booth at the USA Science & Engineering Festival on 27 April. One had been awarded third place for "The Effect of Orientation on the Power a Pinwheel Generates," where she found a simple, but effective apparatus to determine the power generated by a pinwheel as a function of incident airstream angle. The first-place awardee hypothesized that the wing tip that carried the vortex the farthest away from the wing tip would make the smallest vortex, and plans to use his prize money for next year's Science Fair.

"Mars 2.0 or Bust" presented an Engineering project on the various factors affecting a lander designed to "fly" in a Martian atmosphere. "What was more evident from the quality of her project was the level of commitment she has to further mastery of aerospace engineering," commented her judging team. After attending the AIAA-cosponsored "Humans to Mars Summit," 22–24 April, and making connections with the high-powered speakers, she made her decision to pursue engineering at MIT.

The winners were invited to attend the 5 June awards banquet to share their projects and receive their monetary awards, an AIAA student membership, and have an opportunity to participate in a three-day experiential learning visit to NASA Goddard's Space Flight Center facilities, laboratories, and clean room. Awardees will lunch with an astronaut, engage with a Nobel Laureate, and explore the Mission Lifecycle through active participation in the same critical phases used by NASA. Depending on the launch schedule, their experience may also include a day trip to visit the Wallops Flight Facility.

