

28th Annual Young Astronaut Day – Successful Return

The 28th Annual Young Astronaut Day (YAD) event was held on November 5th, 2022 at Cleveland State University (CSU). After a two-year hiatus, the Section's long-standing STEM outreach event successfully returned with participation from twenty-seven teams comprising over 165 students and nearly 60 parents/teachers. The students ranged from 1st grade to 12th grade. NASA Senior Research Engineer Diane Linne (recently retired from Glenn Research Center) provided an inspiring keynote address, in which she recapped her decorated career and taught some valuable lessons, both academic and non-academic. Diane highlighted her recent work considering the establishment of sustainable human presence on the Moon and Mars through the generation and use of resources from indigenous materials, which includes building the infrastructure to refine and distribute fuel locally. Diane punctuated her talk by providing opportunities for the students to engage and participate in numerous demonstrations.

Following the keynote speech, the students competed in engineering challenges inspired by this year's theme, "Moon to Mars". The students participated in 3 different grade categories: Pilots (1st–4th grade), Mission Specialists (5th–8th grade), and Commanders (9th–12th grade). The Pilots' activities were: *Remote Sensing* (led by David Friedlander), *Rockets Away* (led by Jonathan

Davis), and *Solar Shield* (led by Kathy Tacina). The Mission Specialists' activities were: *Space Communication and Navigation* (led by Lindsay Yesenko), *Gaining Traction* (led by Jerry Voltz), and *Red Rover, Red Rover, Send Perseverance on Over* (led by Herb Schilling and Brooke Weborg). The Commanders' activity was *Let It Glide* (led by Chris Pestak). A highlight of the event was the interactive demonstration by the Hathaway Brown "Fighting Unicorns" robotics team, which allowed the students to control a roving robot as it moved throughout the hallway.

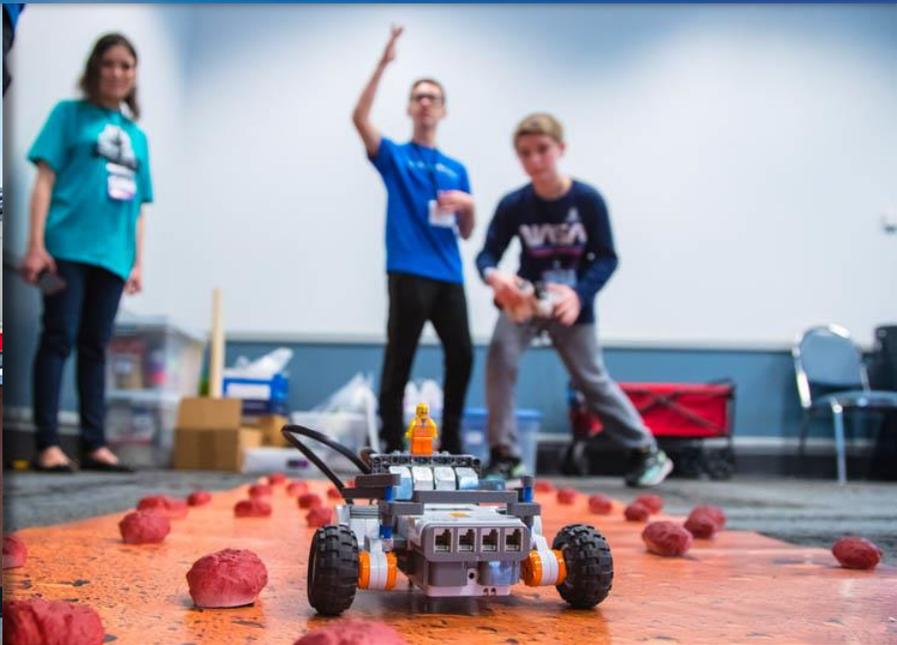
The event was a great success due to the efforts of over 50 volunteers including many regional engineers, students from local Universities, and the "Fighting Unicorns". Collaboration with the CSU Washkewicz College of Engineering was also key to the success of the event. Special thanks is extended to the YAD planning and organizing committee including Ashlie Flegel, Jonathan Kratz, Emily Armbrust, Amber Waid, and Edmond Wong, as well as the previously-mentioned activity leads. Additional photos of the event may be found posted at:

[Photo Gallery: Young Astronaut Day 2022](#)

(Text: Jonathan Kratz; Editing: Edmond Wong; Photos: Edmond Wong, Peter Struk, and Halle Buescher)



NASA Senior Research Engineer Diane Linne with 165 1st–12th grade students and 60 teachers/parents at the 28th Young Astronaut Day held on Nov. 5, 2022.



AIAA Northern Ohio Section Annual Awards Picnic

By Chris Pestak, Honors and Awards Chair

On September 1st, 2022, the AIAA Northern Ohio Section (NOS) held its annual awards picnic at the Wallace Lake Canopy at Mill Stream Run Reservation. More than 60 attendees had the opportunity to spend time socializing on a beautiful summer evening and enjoying a great picnic dinner catered by Famous Dave's Bar-B-Que.

Also in attendance were student winners from the 2022 AIAA NOS Young Aerospace Visionaries Contest (YAVC), along with their families, who were invited as a part of their award for winning the contest. NOS STEM K-12 Outreach Chair Jonathan Kratz, who conceptualized, coordinated, and implemented YAVC, recognized each of the student winners. The students' enthusiasm for aerospace was a delight to witness.

The festive event was a good way to cap off the previous program year by recognizing section awards and member accomplishments, and to kick off the AIAA NOS events for the upcoming year.



Mike Heil (NOS Public Policy Chair) and Paul Penko (NOS Treasurer).



Student winners of the 2022 AIAA NOS Young Aerospace Visionaries Contest.

Front row: Shanaya Pandey, Anneke van de Krol, Kenley Schafer, Teddy Ballard, Blake Oney, Easton Clark, Brennan Lepene

Back row: Jonathan Kratz (AIAA NOS STEM K-12 Outreach Chair), Emerson Krauss, Caroline Lu, Nicolas Shang



Promoting STEM through Special Awards Sponsorship at Local Science Fairs for 2022

By Jonathan Kratz, STEM K-12 Outreach Chair

In March 2022, the AIAA Northern Ohio Section (NOS) continued its support of the Northwest District II Science Day (NWDSD) and the Northeastern Ohio Science and Engineering Fair (NEOSEF) by sponsoring special cash awards for the best aerospace-related projects. Each year, members of the section graciously volunteer their time to judge at both events. The projects were evaluated on creativity, use and execution of a sound scientific approach, relevancy to aerospace, demonstrated understanding of the topic, and student-independence in completing the project. Projects were grouped into judging categories based on the grade level of the students. Due to continued concerns over the COVID-19 pandemic, both science fairs were held virtually. The students presented their projects both through a pre-recorded video format and a written report.

	Water (θr)	Mineral Oil (θr)	Glycerin (θr)
Trial 1	29°	29°	28°
Trial 2	32°	28°	28°
Trial 3	32°	29°	28°
Trial 4	32°	28°	28°
Trial 5	32°	29°	28°
Average	31.4°	28.6°	28°
Index of Refraction		1.36	1.48 1.51

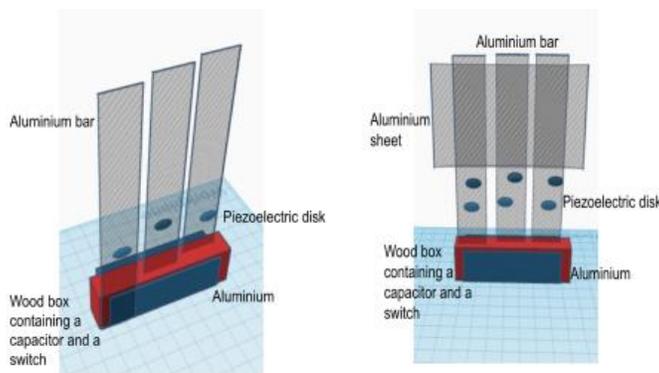
Example of the results from Jacob Rolda’s project on the refraction of light through different mediums. Trial results show the refraction angle

NEOSEF is open to all students in grades 7-12 within Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, and Summit counties. The judges included NASA Glenn Research Center (GRC) employees Jonathan Kratz, Ashlie Flegel, Cynthia Calhoun, George Thomas, Wensheng Huang, and Bryan Palaszewski, and retiree John Adamczyk. A list of projects provided by the NEOSEF organizers was used to do an initial down-select of the projects based on relevancy to aerospace. Thirty-five projects were considered for awards, grouped into two categories: 7th – 8th grade (20 projects), and 9th – 12th grade (15 projects). A 1st place winner and 2 runners-up were selected for each category for a total of six prizes totaling \$200.



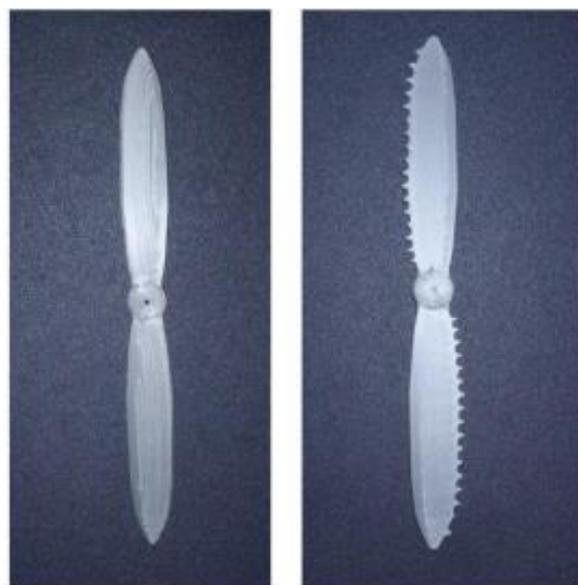
Picture of the construction of a rudimentary galvanic cell as performed by Jasjeez Singh.

The selected prize winners for the 7th – 8th grade category were Jacob Rolda (1st place), Amaan Siddiqi, and Owen Conway (runners up). Jacob designed and carried out an experiment to investigate how light is refracted through different mediums. He tested mineral oil, water, and glycerol. Jacob related the medium density to the refraction of the light through the medium. Jacob followed a sound scientific method and demonstrated a good understanding of the topic. The topic has relevance to aerospace through optic measurement techniques such as Schlieren photography as well as the bending of radio frequency signals that enter Earth’s atmosphere. Amaan created an electromechanical transducer that converts sound energy into electrical potential. Amaan leveraged piezoelectric disks attached to aluminum plates to convert kinetic energy from pressure waves into electricity. This project was well executed and dealt with ideas that could have aerospace applications, particularly concerning hybrid electric propulsion. Owen made two water filter straws, one with activated carbon and the other with sand. The judges thought the project could be relevant to filtering water on distant planets.



The selected prize winners for the 9th – 12th grade category includes Justice Arai (1st place), Alexander Kmeto, and Alexander Devine (runners up). Justice designed and 3-D printed a bio-inspired propeller blade design. He observed how quietly owls fly, in part due to the fringed trailing edge of their wings. This inspired a

Schematic of the experimental apparatus used by Amaan Siddiqi in his investigation of an electromechanical transducer



Owl-inspired propeller design by Justice Arai

propeller blade with a fringed trailing edge. Justice demonstrated a modest decrease in noise compared to a propeller blade without a fringed trailing edge. Alexander K. theorized the potential to increase strength and reduce weight in wing structures by using hexagon supports. He 3-D printed numerous wings and tested their strength. Alexander D. set out to create a more cost-effective solar cell than silicon solar cells by using a combination of different conductive glass slides, semiconductors, dyes, and dye times. While the experiments could not identify a more cost effective solution than silicon solar cells, the project was still impressive and relatively comprehensive.

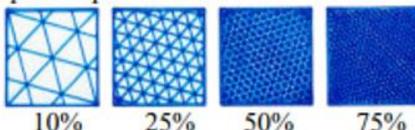
NWSDS is open to students in grades 5-12 within Defiance, Fulton, Henry, Lucas, Ottawa, Sandusky, Williams, and Wood counties. The volunteer judges included Jonathan Kratz and David Friedlander from the NASA Glenn Research Center. A total of 18 projects were considered for awards by age group: 5th-8th grade (8 projects), and 9th-12th grade (10 projects). One 1st place awardee and 2 runner-up awardees were selected for each category for a total of six prizes totaling \$200.

The selected prize winners for the 5th – 8th grade category were Liam Anderson (1st place), Joseph Williams, and Deemah Alhmod (runners up). Liam investigated the flight of a glider with various wing shapes. Joseph investigated how the diameter of a baseball bat affects the distance that a struck ball will travel. While not directly related to aerospace, it was a good application of physics and the principles applied are fundamental to aerospace. Deemah’s project dealt with heat transfer and insulation. While the target application was for insulating homes, the topic of heat transfer is applicable to various aerospace applications.

The selected prize winners for the 9th – 12th grade category were Jasjeev Singh (1st place), Alice Lentz, and Elise Denk (runners up). Jasjeev presented an impressive project on the use of iron dust from the surface of Mars to make batteries that will store energy on the red planet. Alice investigated the use of algae cultures to promote oxygen production with application to extraterrestrial environments. Elise 3-D printed and tested a prosthetic hinge and investigated how infill type and layer height impacted its structural integrity.



Figure 2: Wing in CAD; less opaque parts represent the fill



Example of different infills



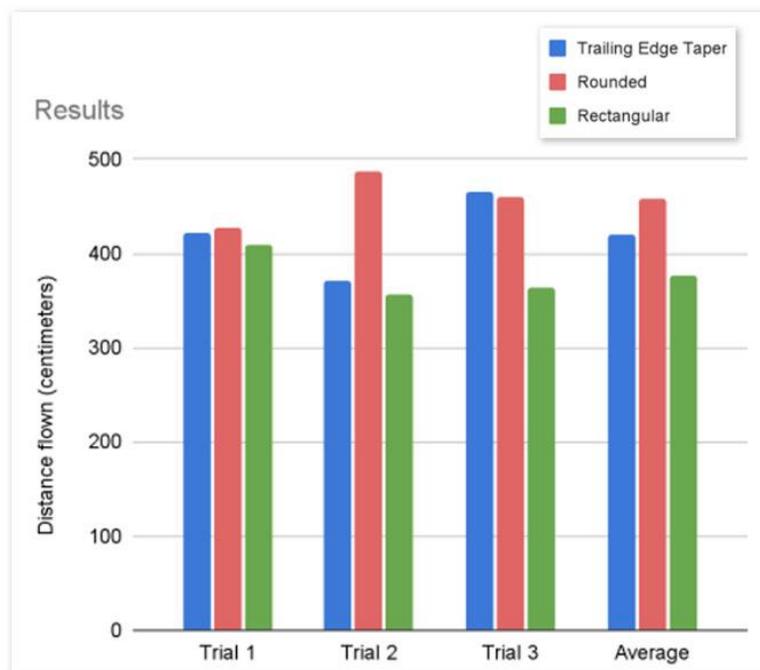
Wing mounted in weight table

The judges would like to encourage every student to work hard and embrace their creativity, imagination, and interest when it come to their education. As members of the AIAA NOS and active or retired employees within the aerospace community, we have an admitted bias toward STEM, particularly as it applies to aerospace. As such, we encourage students to consider aerospace as a future career field. Judging for the AIAA NOS sponsored awards is a rewarding way to give back to the community, re-juvenate our passion for STEM, and encourage the next generation of engineers and scientists. We plan to continue our involvement in local science fairs and hope to enlist your help in the future.

Illustrations from Alexander Kmetko’s project on hexagon wing supports



Alice Lentz’s test apparatus for studying how algae affected the amount of airborne carbon dioxide and oxygen in a sealed environment.



Results from Liam Anderson’s investigation on the impact of wing shape on glider performance

Northeastern Ohio Science and Engineering Fair (NEOSEF) Prize Winners

Prize	Name	School	Project
1 st place, \$50	Jacob Rolda, 7-8 th Grade	St. Mary of the Falls (Olmsted Falls)	How Do Different Mediums Affect How Light Is Refracted?
1 st place, \$50	Justice Arai, 9 th -12 th Grade	University School – College Prep (Chagrin Falls)	Developing Propellers with a Fringed Trailing-Edge Inspired by Owl Flight to Reduce Noise
Runner-up, \$25	Amaan Siddiqi, 7-8 th Grade	Lake Ridge Academy (North Ridgeville)	Creating an Electromechanical Transducer
Runner-up, \$25	Owen Conway, 7-8 th Grade	Lake Ridge Academy (North Ridgeville)	Making A D.I.Y. Water Filter Straw
Runner-up, \$25	Alexander Kmetko, 9 th -12 th Grade	University School – College Prep (Chagrin Falls)	Testing Hexagon Supports on an Airfoil to Make it Lighter
Runner-up, \$25	Alexander Devine, 9 th -12 th Grade	University School – College Prep (Chagrin Falls)	Fruit Dye and Sunscreen to Solar Power: Testing Graphene as a Replacement for Indium-Tin Oxide in Dye-Sensitized Solar Cells

Northwest District II Science Day (NWSDS) Prize Winners

Prize	Name	School	Project
1 st place, \$50	Liam Anderson, 5th-8th Grade	St. Rose (Perrysburg)	Winging It: Investigating Glider Wing Shapes
1 st place, \$50	Jasjeev Singh, 9th-12th Grade	Sylvania Southview High School (Sylvania)	A Novel Approach to Martian Electricity Generation Utilizing a Rust-Iron Battery
Runner-up, \$25	Joseph Williams, 5th-8th Grade	Hilltop High School (West Unity)	How the Diameter of a Baseball Bat Affects the Distance Traveled
Runner-up, \$25	Deemah Alhmod, 5th-8th Grade	Toledo Islamic Academy (Sylvania)	To Keep It Warm
Runner-up, \$25	Alice Lentz, 9th-12th Grade	Put-In-Bay high School (Put-In-Bay)	The Potential Applications of Algae Cultures for Oxygen Production in Extraterrestrial Environments
Runner-up, \$25	Elise Denk, 9th-12th Grade	Ottawa Hills High School (Ottawa Hills)	The Impact of Infill Type and Layer Height on a 3D Printed PLA Hinge



Figure 2. 5th–6th Grade winners from Monroeville Elementary School. Left to Right: Kenley Schafer, Blake Oney, Teddy Ballard, and Easton Clark.

permanent and sustainable human presence on the Moon with all of the comforts we have on Earth. The Moon will be a unique and fun tourist destination as long as we can make it affordable. Her project was impressive, especially considering her age. Aleah West placed 2nd for her vision involving a gradual expansion of exploration and human presence throughout our solar system and eventually other galaxies. Aleah’s vision included thoughts about ensuring shelter, food, and water. Anneke van de Krol placed 3rd with her description of a day on the Moon. She described the sensation of the reduced gravity, the fun of a space pool and a low gravity jump park, as well as various beautiful sites one would see from the Moon. The two honorable mentions were Maya Bell and Lexington Wurst. Maya created a very neat three-dimensional display to accompany her essay that described her vision for a visit to the Moon. She pointed out the desire for faster transportation to the moon and the need to establish an organized means of transporting people and giving them a place to stay and food/water to consume, along with activities/excursions to entertain them. Lexington described vacationing and even living on Mars. His vision included houses that enable us to live in space and our adaptation needed to handle the challenges of these new environments.

The 5-6 grade category was dominated largely by students at Monroeville Elementary. A picture of the winners from Monroeville Elementary is shown in Fig. 2. This includes the 1st place winner Teddy Ballard, the 2nd place winner Kenley Schafer, the 3rd place winner Easton Clark, and an honorable mention Blake Oney. The other

honorable mention was Brennan Lepene from Brady Middle School. Teddy’s depiction of the future of UAM is shown in Fig. 3. He describes electric takeoff and landing (eVTOL) aircraft that will deliver people and cargo to supplement ground transportation. A fairly comprehensive vision was set forth that includes a variety of different eVTOL aircraft, safety features such as collision detection and mitigation for vehicles and buildings, and infrastructure needs in the way of vertiports and charging stations. Kenley envisioned a safe, quiet, and sleek eVTOL aircraft called the Overair Butterfly. Easton envisioned a future with drones that can be used to deliver medical supplies and services. Blake’s vision focused primarily on sensor and control technology along with safety aspects of UAM. Blake envisioned sensors for navigation, weather, and collision detection. He also addressed cybersecurity concerns and included redundant systems for safety. Brennan

described a future with flying cars to fill many applications from day-to-day personal transportation to police and fire department applications. He also designed an eco-friendly UAM aircraft with antigravity technology.

Birchwood School of Hawken dominated the 7-8 grade category, claiming all awards in the category. The first place winner was Nicolas Shang whose vision is depicted in Fig. 4. He provided a detailed and well rounded concept that included an aerodynamic UAM transport called “The Waterdrop” that doubles as a car.

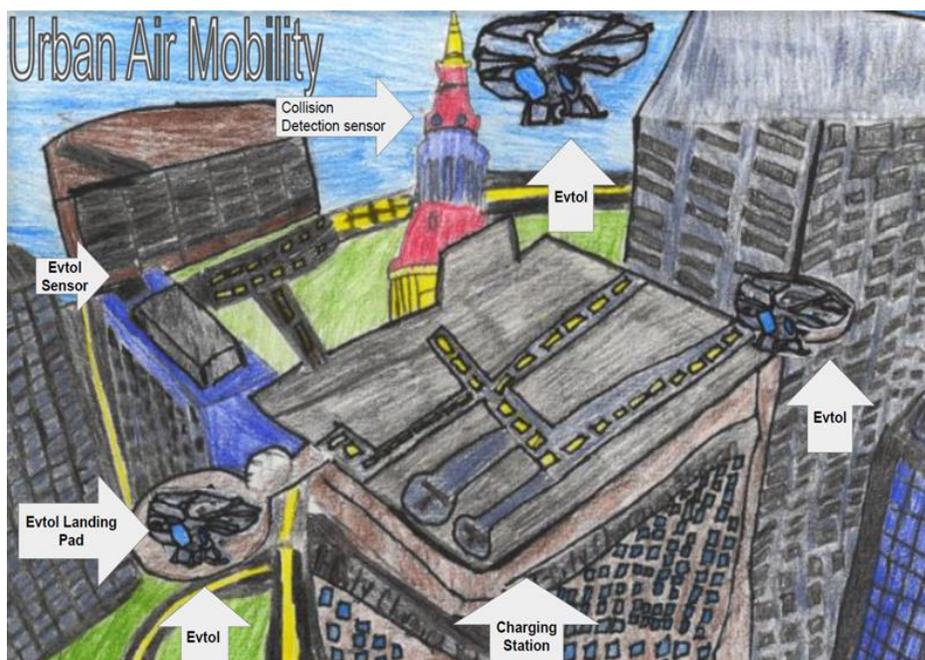


Figure 3. Teddy Ballard's vision for the future of UAM

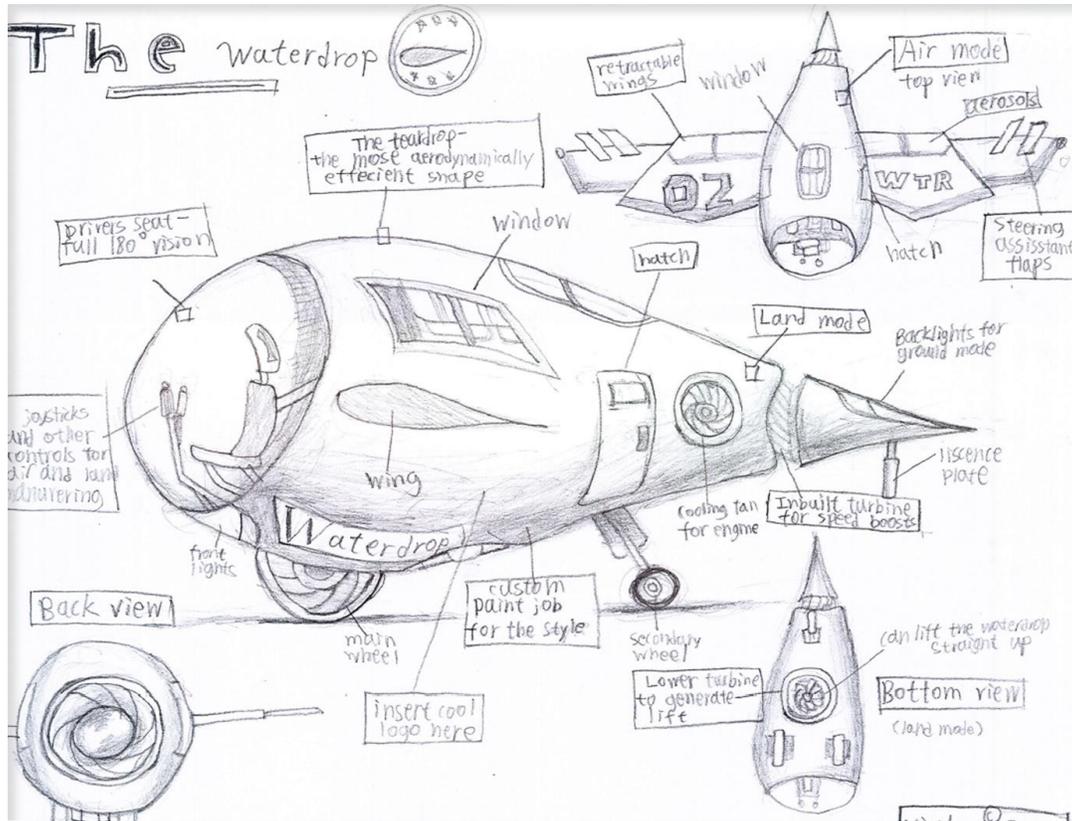


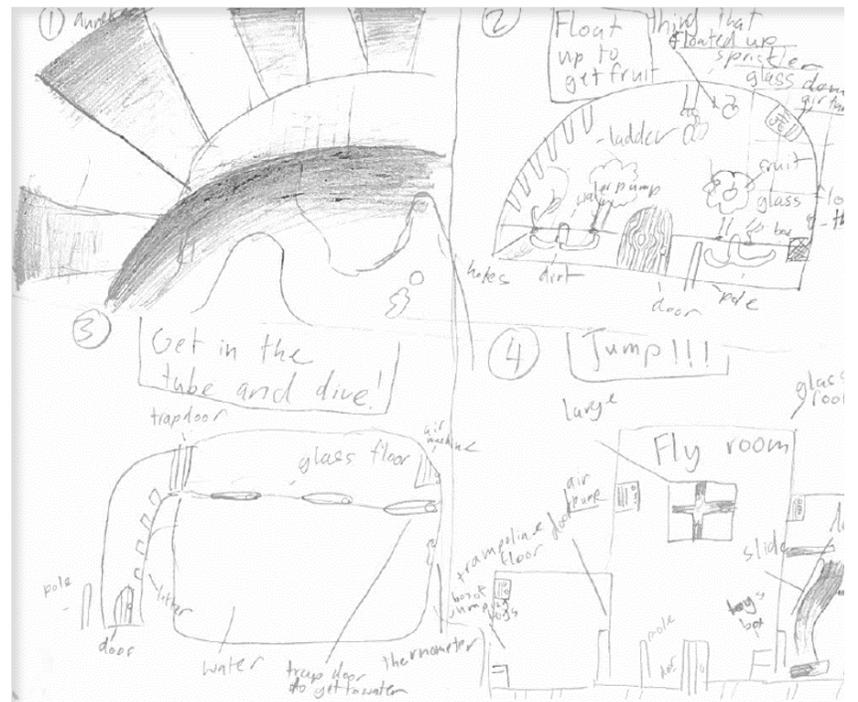
Figure 4. Nicolas Shang's vision for a UAM vehicle

Various details were considered from multiple propulsion options and artificial intelligence-aided mission planning, to the comforts and amenities offered to the passengers. Isabella Bixler received 2nd place honors. Her vision focused on a police drone application that will improve community safety. Brooke Gemechu placed 3rd with her vision of a UAM transport called the SkySpider. This hydrogen fuel cell-powered vehicle has "spider-like" legs that change shape after lift-off to act as wings. Among various other details, Brooke also considered some of the infrastructure needs demanded by UAM. Emerson Krauss and Caroline Lu received honorable mentions. Emerson envisioned a fuel efficient aircraft with long wings for gliding and improving range while also having a retractable rotor for vertical take-off and landings. Caroline envisioned a single person electric hovering heli-car.

Be sure to check out the remaining pictures created by the prize-winning students on the following pages. AIAA NOS would like to thank all of the participants for your submissions. Every project was imaginative and worth consideration. We would also like to thank all of the teachers and parents that encouraged their children and students to participate in this contest. Special acknowledgement is



Aleah West's vision of space exploration and tourism



Anneke van de Krol's vision of a day on the Moon

given to a few teachers who went above and beyond to encourage students to participate: Michael Liptay from Monroeville Local School in Huron County, Michelle Bogden from Birchwood School of Hawken in Cuyahoga County, Susan Gallagher from the Hathaway Brown School in Cuyahoga County, and Ida Gorman from East Canton Middle School in Stark County.

It is our hope that this contest has ignited or strengthened the interest in STEM among our youth, particularly as it relates to the field of aerospace. The contest is an annual event with an announcement going out in early February and a submission due date in late April. For more information, visit the STEM K-12 page on our Engage website: <https://engage.aiaa.org/northernohio/stemk12>. Check the 'Young Aerospace Visionaries Contest' link. Please consider spreading the word about this contest to your kids, grandkids, nieces, nephews, friends, and local schools. If STEM is a passion of yours, consider volunteering to be a judge.



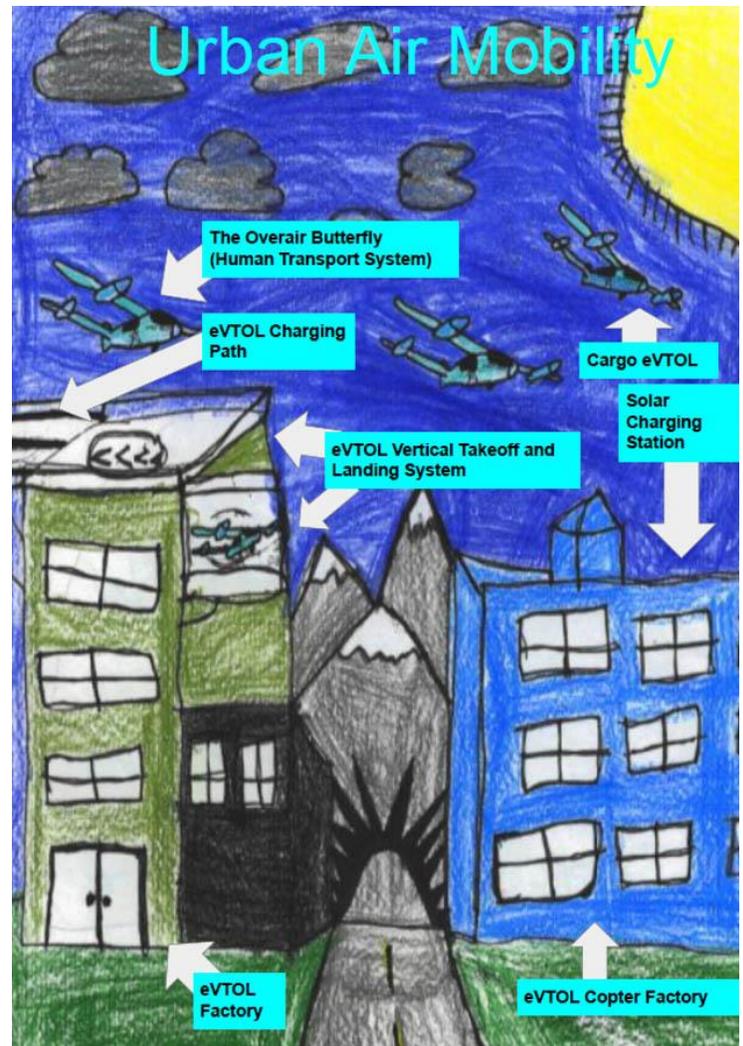
Blake Oney's vision for UAM



Maya's display of an experience on the Moon



Lexington's vision for a vacation on Mars



Kenley Schafer's vision of the future of UAM and her concept vehicle "The Overair Butterfly"

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