



**YP Happy Hour  
Events!  
Page 10**

**TBD – Watch your E-mail**  
*Young Professionals Happy Hour*  
Various

**June 17-21, 2019**  
*AIAA Aviation FORUM*  
Hilton Anatole, Dallas, TX  
[Information](#)

**July 13-20, 2019**  
*Apollopalooza*  
Wings Over the Rockies, Denver, CO  
[Information](#)

**TRAJECTORIES 2019**  
*September 6, 2019 5:00 pm*  
Golden, CO

## Note from the Chair

Dr. Rusty Powel, *Millennium Engineering and Integration Company*

As my time as Chair for the Rocky Mountain Section (RMS) comes to a close, I'd like to welcome Dr. Merri Sanchez as our new incoming Chair. She brings a wealth of experience and connections within AIAA and industry. I'd like to thank each member of the Council for their tremendous support of the RMS through outstanding programs and events, focused on supporting the aerospace industry. These activities are great opportunities to network with aerospace colleagues and give back to the industry and our communities. If you would like to help support these events or have ideas for future events, I encourage you to contact any member of the Council. We welcome your inputs and feedback to make your AIAA membership a valuable endeavor. I wish you the best and a great summer!

Rusty

## In this Newsletter

<u>Topic</u>	<u>Page</u>
Note from the Chair.....	1
AIAA Rocky Mountain Section Honors and Awards Dinner.....	3
AIAA Announces Its Class of 2019 Fellows and Honorary Fellows .....	7
Colorado and Wyoming Science Fairs.....	9
Young Professional Happy Hour Events – Look for Announcements! .....	10
Rocky Mountain Section Membership Update.....	10
Essay Contest Concludes .....	13
Election Results .....	14
Essay – First Place 8 <sup>th</sup> Grade .....	15
Essay – First Place 7 <sup>th</sup> Grade .....	17

## SECTION OFFICERS

### Elected

Section Chairman	Dr. Rusty Powell
Chairman Elect	Dr. Merri Sanchez
Secretary	Kevin Mortensen
Treasurer	Dr. Taylor Lilly
Vice Chairman – North CO	John Marcantonio
Vice Chairman – South CO	Dr. Todd Nathaniel
Vice Chairman – MT	Erik Eliassen
Vice Chairman – WY	Mark Kettles

### Committees

Fellow-At-Large	Gene Dionne
Member-At-Large	Pamela Burke
Education and STEM	John Marcantonio
Honors and Awards	Stacey DeFore
Membership	Marshall Lee
Newsletter Editor	Adrian Nagle
Public Policy	Tracy Copp
Programs	Chris Zeller
Technical Committee Liaison	John Reed
Webmaster	John Grace
Young Professionals	Alexandra Dukes

## We Need You!!

If you are interested in increasing your participation in AIAA Rocky Mountain Section, we need your help with positions in any of the committees. If you have an interest, please contact: Kevin Mortensen – [kevin.mortensen@baesystems.com](mailto:kevin.mortensen@baesystems.com)

### What's in your file drawer?

During personal travel, I visited the Purdue University exhibit March, 2019: “Apollo in the Archives: Selections from the Neil A. Armstrong Papers”. It was interesting to view personal artifacts and see Neil Armstrong’s hand-written notes from mission notes to personal correspondence and file tabs. We all have interests we like to keep organized (trips, lists, notes, etc.). On page 12, I included an image of Armstrong’s file tabs and highlighted the AIAA file tab. So what’s in your file drawer?

## AIAA Rocky Mountain Section Honors and Awards Dinner

Stacey DeFore, *Teledyne*



Under a majestic Colorado blue sky, the AIAA Rocky Mountain Section recognized our 2019 Honors and Awards winners and acknowledged our incoming Fellows and Associate Fellows. Former Chair, Rusty Powell welcomed 92 guests at the Lone Tree Arts Center on Friday, April 19, 2019.

The evenings' program opened with a welcome and thank you from past section Chair, Rusty Powell. The annual Honors and Awards Dinner provides a forum to acknowledge the council, committee chairs and members for their contributions and commitment throughout the year.

Section awards include K12 Educator of the Year, College Educator of the Year, Young



Engineer of the Year and Engineer of the Year. Online nominations were submitted to this year's Honors and Awards Nomination Committee and awardees selected from an amazing array of nominees. Congratulations to all of our nominees for their well-deserved recognition from AIAA.

Congratulations to Jami Sunkel! Ms. Jami Sunkel was recognized as the American Institute of Aeronautics and Astronautics (AIAA) Rocky Mountain Section Educator of the Year (K-12), 2018-2019. Ms. Sunkel was selected for her dedication to teaching the next generation of explorers, scientists and engineers.

As a passionate educator and NASA-certified Master Science teacher holding Masters' degrees in both curriculum instruction and Educational Leadership, she co-founded OneOrbit, an education and leadership organization with Dr. Leroy Chiao, International Space Station (ISS) Commander.

### SECTION AWARDS





Jami expanded beyond traditional education outreach and professional development and works with students, teachers, to inspire entire communities

with the excitement of space exploration and positive leadership messages. Her curriculum focuses on real life challenges - intrinsic motivation, multiculturalism, innovation, complacency and bullying. The program 'Succeed Like an Astronaut' has been delivered to schools, universities and summer camps all over the United States, China, Taiwan, Hong Kong and Australia reaching approximately 30,000 students worldwide.

Jami, supported the first ever virtual reality "Make A Wish" for a young man whose wish was to go to Saturn in a big red rocket. She developed a custom astronaut training program for young Zayden and Astronaut Chiao to go to Saturn and meet an alien. Jami's passion for education is truly contagious.

This year's Educator of the Year was awarded to Captain David Cunningham, USAFA for Capt. David Cunningham is recognized as the American Institute of Aeronautics and Astronautics (AIAA) Rocky

Mountain Section Educator of the Year (College), 2018-2019. Capt. Cunningham was selected based on his dedicated service to cadets and students in and out of the classroom. Cunningham initiated a hybrid-rocket research program at the U.S. Air Force Academy after a decade hiatus. David organized a team of eight undergraduate students to design, build, and test a hybrid rocket engine collection of combustion data in cooperation with NASA JPL.

The team successfully converted a tabletop hybrid rocket demonstration into a fully



instrumented testbed to support instrumentation and flow metering. David led all aspects of the project, including mechanical design and fabrication,

software design and automation, and data analysis. He also developed a capability to perform high-speed imagery of the combustion chamber. This provides researchers with the ability to analyze combustion, flame structures, and turbulent structures in order to estimate flow velocity and combustion enthalpy.

David also led a four-person team in the rebuild of the FalconSAT-6 flight battery, which had reached its useful lifetime after a three-year launch



delay. His team successfully rebuilt the battery and integrated it into FalconSAT-6. The satellite launched in December 2018 and the battery is performing well on-orbit.

Additionally, David mentored 15 senior undergraduate students in all aspects of spacecraft design including low-thrust trajectory design; ADCS component design, integration, and test; propulsion systems; launch ops; and the space radiation environment as part of their capstone



course. David taught over 300 cadets in two undergraduate courses, Introduction to Astronautics and Rocket Propulsion. As the course director for Rocket Propulsion, he led an overhaul of the lab component of the Rockets course to increase hands-on test experience for cadets. Congratulations to Captain David Cunningham!

Bradley Cheetham was recognized as the American Institute of Aeronautics and Astronautics (AIAA) Rocky Mountain Section Young Engineer of the Year, 2018-2019. Cheetham was selected for his leadership and engineering mission design support of NASA Goddard spaceflight missions and

trajectory validation for Earth-Moon transfer and operations of NASA ARTEMIS missions. As Chief Executive Officer and Founder of Advanced Space, Cheetham has emerged as a leader in the future of cislunar spaceflight control and planning, answering the call of Space Policy Directive 1 to return humans to the lunar surface by 2024.

In addition to his engineering prowess, Cheetham is a researcher and Instructor at



the University of Colorado Boulder with continued support of industry organizations like Students for the Exploration and Development of Space SEDS where he serves on the Board of Directors and Trustees and the Future Space Leaders Foundation. Congratulations to Bradley Cheetham, 2019 Young Engineer of the Year!

The 2018-2019 American Institute of Aeronautics and Astronautics (AIAA) Rocky Mountain Section Engineer of the Year, was awarded to Dr. Carolyn Overmyer. Overmyer was selected for her extraordinary execution as the Lockheed

Martin Certified Product Engineer (CPR) and Deputy Program Manager for the Orion Service Module. Ms. Overmyer lead the successful delivery and integration of the European Service Module (ESM) for Orion's Exploration Mission-1 (EM-1). EM-1 is critical to NASA's future deep space exploration endeavors taking humans further into space than any other time in our history. Carolyn and her team were tasked with the extremely challenging technical and management task of integrating this major and critical portion of the overall Orion Program from the European Space Agency and their prime contractor Airbus.

Carolyn has provided the overall leadership of the most complex and extensive development of human-rated flight mechanisms and pyrotechnic devices in the history of the manned space program. For the past 5 years, she has expertly managed a team of over 75 managers and engineers across 4 different ORION exploration test vehicles involving 3 different NASA center customers to enable the successful delivery of more than 175 first-time development Mechanisms. Each of her team's hardware end-items were delivered on or ahead of program need.

Carolyn's recent accomplishments and contributions to America's human space flight program are extraordinary and will directly help to enable humanity's near-term return to exploration beyond low earth orbit. Congratulations to Carolyn Overmyer, Engineer of the Year!

Continuing through the evenings' program we transitioned to our exciting joint keynote presentation, "The Hubble Adventure"

With the Hubble Space Telescope celebrating its 29th birthday it seemed fitting for this year's Keynote to be delivered from not one but two incredible speakers. Jim Crocker and Dr. John Grunsfeld teamed up to tell us the story of the "THE HUBBLE ADVENTURE"!

The Hubble Space Telescope story has been a fascinating study in public policy, engineering, ethics, and science. The Hubble is perhaps the most productive scientific instrument ever created by humans.

Who better than to tell this story than Dr. John Grunsfeld, an American physicist and a former NASA astronaut. A veteran of five Space Shuttle flights including STS -125 Hubble servicing mission and served as NASA Chief Scientist. Jim Crocker Retired Vice President and General Manager Lockheed Martin Space Systems.

The evening concluded with a question and answers session with the audience and networking and cocktail reception to close another successful Honors and Awards Dinner. As the year progresses please be thinking about colleagues you would like to nominate for their contributions for our 2019-2020 Rocky Mountain Section Honors and Awards.

Special thank you to all who supported the evening's celebration!

## **AIAA Announces Its Class of 2019 Fellows and Honorary Fellows**

Gene Dionne, *USAF COL (Ret.) and LM VP (Ret.)*

The American Institute of Aeronautics and Astronautics (AIAA) has selected its Class of 2019 AIAA Fellows and Honorary Fellows. The induction ceremony for the new Fellows and Honorary Fellows took place on 14 May, 2019 and they were introduced on 15 May at the AIAA Aerospace Spotlight Awards Gala at the Ronald Reagan Building and International Trade Center in Washington, D.C.

“The 50th anniversary of the lunar landing is a fitting backdrop for this year’s class of Honorary Fellows and Fellows,” said John Langford, AIAA president. “While we always celebrate what—and who—came before us, as aerospace professionals we are always looking ahead to the next challenge. Because of the dedication, leadership and vision of these new inductees, the aerospace industry is moving forward by leaps and bounds. AIAA offers our sincere admiration for their hard work and congratulates the members of the 2019 Class on their achievements.”

An AIAA/RMS Council colleague recently sent me this: “If I read the resume of a full Fellow I’ll just wind up wondering what I’ve done with my life.....that’s why I’m focusing on Associate Fellows!” and I totally understand that after having reviewed the backgrounds and nomination packages of these two Professors and now AIAA

Fellows: Dr. Hanspeter Schaub of the University of Colorado and Dr. Thomas Yechout of the U.S. Air Force Academy.

Dr. Schaub’s citation reads “For exemplary contributions to the aerospace profession in the fields of attitude dynamics and control, astrodynamics of charged spacecraft, spacecraft formation flying, and aerospace education.” He is in the Glenn L. Murphy Chair of Engineering and is a full Professor in the Aerospace Engineering Sciences Department at CU - Boulder, where he has developed an internationally recognized research program on complex spacecraft dynamics and control, spacecraft formation and proximity flying, space debris remediation and charged astrodynamics. He is known internationally for his AIAA Educational Series textbook “Analytical Mechanics of Space Systems” for which he won the AIAA Summerfield Book Award in 2013 and he has published several other books. He is the Editor-in-Chief of the AIAA Journal of Spacecraft and Rockets and is also the Associate Editor of the IEEE Transactions of Aerospace and Electronic Systems. Dr. Schaub was also elected to be a Fellow in the American Astronautical Society (AAS) in 2014. His list of published technical papers, presentations, professional articles and awarded grants run to many tens of pages. Born and raised in Switzerland, Dr. Schaub was awarded all three of his Aerospace Engineering degrees from Texas A&M University. He has been at the University of Colorado since 2007 and before that was an Assistant Professor at Virginia Tech.

Dr. Yechout's citation reads "For significant contributions to the body of knowledge of air vehicle performance and the mentoring of hundreds of future USAF technical leaders."

He is a full Professor in the Department of Aeronautical Engineering and has been on the faculty of the Air Force Academy for a total of 33 years, the past 22 years as a civilian professor. Since 1995 Dr. Yechout has been the Flight Mechanics Discipline Director and Principal Research Investigator over 40+ funded research projects at the AF Academy resulting in over 200 technical publications. He is the author of the bestselling "Introduction to Aircraft Flight Mechanics", a textbook used many universities and also authored the very successful "Longitudinal Dynamic Stability, in Encyclopedia of Aerospace Engineering." He has been an often requested consultant for NASA programs such as: Orion Crew Capsule, NASA's Langley Flight Dynamics

Review Panel Chairman, SpaceX's Dragon 2 Certification, Columbia Accident Investigation, and the X-38 Orbital Space Plane, etc. Another major impact he has had has been the positive influence on hundreds of USAFA students as their instructor, research advisor, mentor on AIAA student paper competitions. His students have won more of these competitions at the section, region and national/international level than any other professor by an order of magnitude. Dr. Yechout completed a successful military career as a LTC in 1993 where he had been Director of Operations Analysis at AF Space Command, an Assoc. Professor at USAFA, and had a number of assignments in flight testing and aircraft program offices. His undergraduate degree was from the University of Minnesota, graduate degrees from USC and Central Michigan University and PhD from University of Kansas.

## Wyoming Science Fair

Contact: Erin Stoesz

### AIAA Judges for this event:

Dr. Michael Stoellinger (University of Wyoming Prof), David Tobin (Graduate Student), Gideon Baldwin (Graduate Student)

### Wyoming State Science Fair Winners (place, Title, category, student):

#### Junior Division

1st - Luke Louderback, Gilchrist Elementary, **"Move Over EV3"**

2nd - Blade Hibbert, Big Piney Middle School, **"Engineering a Solar Collector to Thaw Frozen Stock Tanks in Extreme Temperatures -30C to -10C"**

#### Senior Division

1st - Joshua Arulsamy, Laramie High School, **"Click and Go: Object Detection Through Alternate Color Spaces and Deep Neural Networks"**

2nd - Markie Whitney, Newcastle High School, **"Solar Panels: Too Cool!"**

## Colorado Science Fair

### AIAA Judges for this event:

Eric Johnson, Mike Nance, Raymond Kolibaba, Seth Thompson, Reed James, Brett Booen, Sean Zeeck

### Colorado State Science Fair Winners (place, Title, category, student):

#### Junior Division

1st – Levi Archambault, The Classical Academy, **"This Will Blow You Away"**

2nd – Maddox Shull, Eagle County Charter Academy, **"Breaking Bridges"**

#### Senior Division

1st – Matthew Anderson, Cherry Creek High School, **"Reduction of Aircraft Noise Via Landing Gear Surface Controls"**

2nd – Sarah Tang, Fairview High School, **"Ground-Based Followups of TESS Exoplanet Candidates"**

## Colorado and Wyoming Science Fairs

Mark Kettles, *Dish Network*

The Colorado and Wyoming science fairs occurred last month. The regular science fair judges from AIAA Rocky Mountain Section were not able to make the Wyoming Science Fair due to the weather. They coordinated with Dr. Michael Stoellinger of the University of Wyoming and 2 of his University of Wyoming graduate students, David Tobin and Gideon Baldwin, who were able to stand in in our absence as our AIAA RMS Judges for this event.

Mark Kettles, is privileged to support and coordinate the state science fair judges over the past few years which has been inspirational, educational and eye opening for him. Every year we have a strong

supportive team of judges that represents every level of experience in the aerospace, aeronautics, and astronautics industries along with an integration of defense ranging from CEO/President, Systems Engineers, Mechanical Engineers, Hardware Engineers, Graduate Professors and more. Many of these judges represent over 30 years in each of their respective areas of focus and support of AIAA related disciplines. The value behind their interactions with these budding engineers and scientists truly lives on a tier beyond measure. Each year, our AIAA RMS judges bring encouragement, clarity, and enthusiasm that will most certainly carry over to a future work force supporting an exciting future that will literally take us to Mars and beyond.

Mike Nance is appreciative and is thankful to be included. Mike found it very interesting. Would enjoy doing it next year.

## Young Professional Happy Hour Events – Look for Announcements!

Cordero Orona, *Lockheed Martin*

The happy hour events hosted by Young Professionals are meant to bring together industry professionals and local AIAA members. They are open to any AIAA member and we prefer to bring a better presence to Colorado Springs. At the last happy hour, R Gilbert (Gil) Moore attended. Gil was awarded the AIAA Distinguished Service Award in 1981 and the NASA Agency Honor Award in 1982. He was able to share great experience and knowledge of



his accomplished career in the aerospace industry. We hope to have more event such as this one to encourage AIAA members to come together for a great time, network and share experiences.

Please contact the Young Professional committee chair, Alexandra (Alex) Dukes at [dukes.alexandra@gmail.com](mailto:dukes.alexandra@gmail.com).

## Rocky Mountain Section Membership Update

Marshall Lee, *Sypris Electronics, LLC*

Our Section activity parallels what is present in Colorado's aerospace community, which is the second largest aerospace economy in the country. In fact, Rocky Mountain Section only is second in professional memberships to the National Capital Section in DC. During this program-year our membership is on the rise again. Most importantly, Professional numbers are gaining where we are at our record number of 874 here at the end of May.

Why do we have such a robust section? Certainly being immersed in a thriving aerospace economy helps, but the real point to note is that our members are

### Top 6 Professional Membership Sections (as of April 30, 2019):

1. 1598 – National Capital
2. 866 – Rocky Mountain
3. 833 – Pacific Northwest
4. 820 – Los Angeles-Las Vegas
5. 809 – San Francisco
6. 800 – Greater Huntsville

extremely active and evolved with our programs.

With your help, we have had a multitude of programs in 2018-2019:

- **Speaker Series** - Reaction Engines, Lockheed Martin Mars Insight, SNC Dream Chaser, Dr. Zubrin – A Case for Mars, Annual Technical Symposium (Keynote: ULA's Tory Bruno)
- **Membership Events** - TRAJECTORIES 2018 w/ Mine Aerospace Interest Group,

LM Mars Insight & GPS III Launch Celebrations, ULA Launch Celebration

- **STEM & Education Events** - 4th Annual CU Aerospace & STEM Summit, Colorado & Wyoming Science Fairs, “Good Vibrations” at GESTEM, daily student workshops for Apollopalooza at Wings over the Rockies, “From the Moon to Mars” Student Essay Contest, Dream Big
- **Policy Committee Events** - Colorado Aerospace Day at the Capitol, Congressional Visits Day
- **Young Professionals Events** - Nerd Nights, Movie Night – “Hidden Figures”, Happy Hour at the Airplane Restaurant
- **Honors & Awards Banquet** - Hubble Space Telescope

### Rocky Mountain Section by the Numbers (as of May 27, 2019)

Grade	Count
Associate Fellows	164
Associate Members	7
Educator Associate	196
e-Members	32
Fellows	34
Honorary Fellows	2
Members	224
Senior Members	411
Students	288
<b>Total</b>	<b>1358</b>
Professionals	874
Students	288
Educator Associates	196

Being involved with a professional associate is critically important for advancing your

career. It’s all about connecting with like-minded folks. Rocky Mountain Section is here to support you and provide those key opportunities of advancing your membership grade, venues for presenting papers, meeting industry experts, and demonstrating your talents through committee participation.

Our Membership Committee has recognized that AIAA membership in the prominent local Aerospace Companies was not to the level of involvement, as one would expect. As such, we developed an engagement program to elevate the value of AIAA within these aerospace enterprises. To date, we have held events at Lockheed Martin and United Launch Alliance to celebrate recent successes such as LM’s Mars Insight spacecraft landing and the first successful launch of GPS III. At ULA we celebrated their extremely successful track of rocket launches without a single failure.

At these membership events, RMS Council members have portrayed the value of being part of a professional aerospace association and why it matters. Future events are being planned at other large, notable companies in our Front Range area.

Fundamentally, we want to grow our Professional membership numbers. We see real opportunity with our Young Professional community. Currently, our Professionals only have about 14% (~124) identified as Young Professionals. Since our 35 and younger members are the future, our strategy for growth will focus on engagement with Young Professionals.

Rocky Mountain Section by the Numbers (as of May 27, 2019)

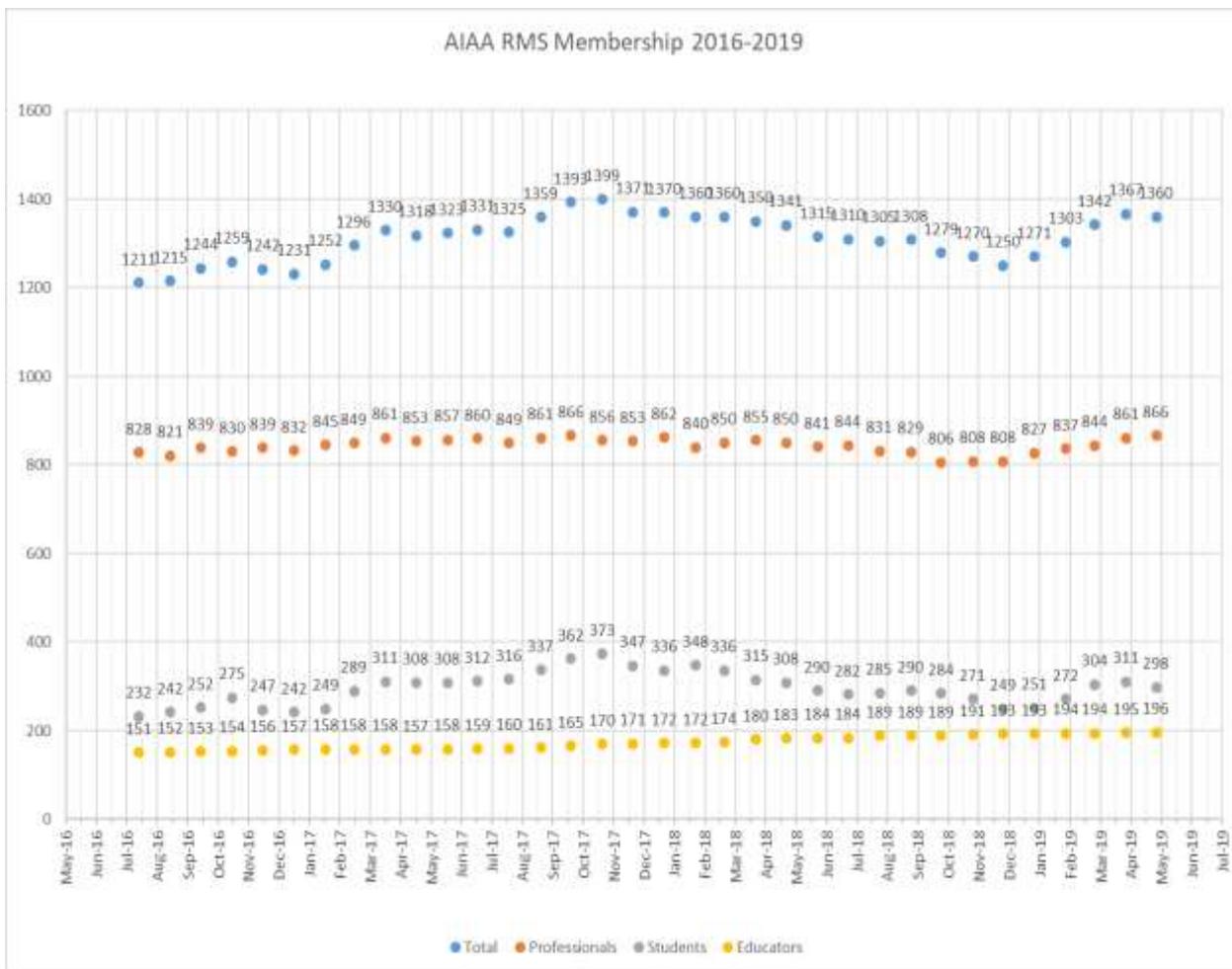
Starting in 2019, AIAA National rolled out e-Membership as an entry level membership where new aerospace participants could join for a 1-year Free Trial Membership as a Professional. For more information, point your non-AIAA colleagues to <https://www.aiaa.org/emember/>.

Some the elements of Membership's strategy will include more events such as Enterprise Celebrations, collaborations with Universities (ex. TRAJECTORIES at Colorado School of Mines), Young Professional Ambassadors at Section Companies, greater

involvement with our Student Chapters, and simply more support of our Young Professionals committee activities such as Nerd Nights, Happy Hours, and Movie Night.

Together, let us grow our numbers to bring even more opportunity to our Rocky Mountain Aerospace Community!

If you are interested in being involved with Membership, please contact Marshall Lee, Membership Chair at (813) 503-7122 or [marshall.lee@sypris.com](mailto:marshall.lee@sypris.com).



## Essay Contest Concludes

Sue Janssen, *United Launch Alliance (Ret.)*

Anticipating the celebration of the 50th anniversary of the first landing on the moon, AIAA RMS Educational Outreach sponsored a contest to encourage middle school students to learn about manned missions to the Moon and Mars. Seventh and eighth grade students from Colorado, Wyoming and Montana were invited to submit an original essay about the similarities and differences of Moon and Mars manned missions. A broad topic to be researched and addressed in under 1500 words!

The announcement was sent to RMS members with a request to forward the flyer to middle school students and educators. Eight AIAA RMS members reviewed the entries and selected the winning essays: Barrett McCann, Mark Smith, Clark Mikkelsen, John Kettling, Katie

Schneider, Sally Hanley, Sibylle Walter, and Adrian Nagle. The criteria included originality of ideas presented, soundness of logic used to develop ideas, realism of ideas presented, and quality of composition, clarity of expression and grammar and spelling. Judges enjoyed the experience. John said "...each essay when combined together make for a formidable scholarly document..." Indeed! The points made by the authors were different, insightful and interesting.

The winning authors were presented with a certificate and a monetary award. Also, the winning essays will be on display at Wings Over the Rockies Air and Space Museum at Apollopalooza on 20 July!

Enjoy reading the top essays on the following pages!

## Election Results:

Chair – Dr. Marri Sanchez

Vice Chair (formerly Chair-Elect): Tracy Copp

Vice Chair -Southern: Dr. Todd Nathaniel

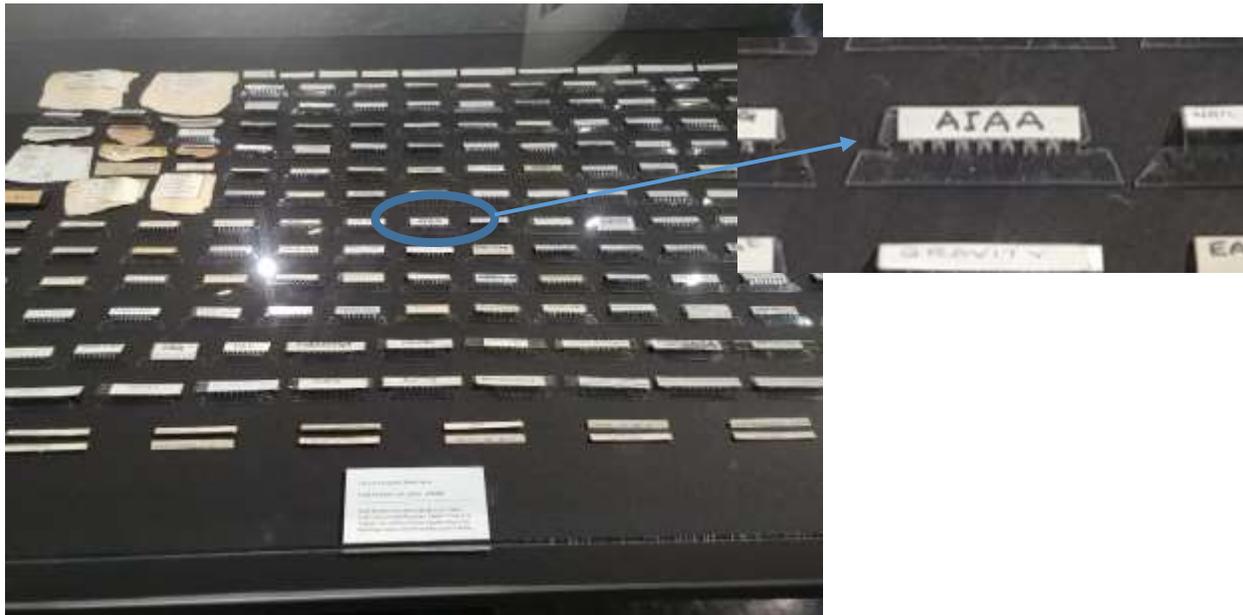
Vice Chair Northern: John Marcantonio

Vice Chair- Montana: Erik Eliassen

Vice Chair-Wyoming: Mark Kettles

Secretary: Kevin Mortensen

Treasurer: Dr. Taylor Lilly



**What's in your file drawer?** Neil Armstrong File Tabs with "AIAA" on display in "Apollo in the Archives: Selections from the Neil A. Armstrong Papers" exhibit at Purdue University. (Adrian Nagle, *Ball Aerospace*)

## First Place 8th Grade

Student: Bradley Beyers

Teacher: Victoria Rogers

School: Cherry Hills Christian Middle School in Highlands Ranch

### Mars and Lunar Exploration Missions

On July 20th, 1969 the Apollo 11 landed on the Moon carrying astronauts Buzz Aldrin and Neil Armstrong. These two men went down in history as being the first people to land on the Moon. They also showed that interplanetary or planet to Moon travel was possible. Seven more manned missions went to the Moon along with many rover and lander missions. Then all progress seemed to slow down. And it's not really a big topic of discussion. Why is that? NASA has been the main contributor to lunar exploration and they stopped to work on the Space Shuttle development. At the same time the Soviet Union collapsed along with the dreams of visiting the Moon. Instead of visiting the Moon, Mars took over as the top priority. Currently, many companies are developing landers, probes and rovers that can go to Mars resulting in many missions making it to Mars with the next goal to send man to Mars.

In 1969 the Gemini Program ended. This program was the "Giant Leap" that would send man to the Moon. The Apollo Program began in 1961 and changed the world forever. Seven Apollo missions landed on the Moon. Apollo missions 1, 7, 8, 9, and 10 all went to the Moon as scout missions but didn't land. These missions were very important and helped NASA learn about the Moon and prepared us to send man to land on the Moon. Man landing on the Moon was very risky but NASA had a goal to land man on the Moon by the end of the decade. On July 16th, 1969 at 9:32 a.m., 600 million people watched the rocket Saturn V launch carrying astronauts Michael Collins, Buzz Aldrin, and Neil Armstrong to the Moon. About 3 days later the Apollo 11 lander nicknamed "Eagle" landed on the Moon. Neil Armstrong stepped out and as the very first man to land on the Moon said the famous words, "Houston, Tranquility base here. The Eagle has landed." Nineteen minutes later, Aldrin exited and together they would spend about a day on the Moon before taking off to head home. Another 3 days later and the crew splashed down in the Atlantic Ocean making the voyage a success. America celebrated the successful first voyage to the Moon, NASA sent seven more missions but only six successfully landed on the Moon. After the successful landings on the Moon the Apollo program would shut down in 1975. (NASA Apollo).

### Mission to Mars Details

Next, NASA would focus on the Space Shuttle and deep space exploration. During this time, NASA launched the Mariners program that flew probes past Mars to gather more data about the planet. Mariner 4 was the first probe to get a close view of Mars during a flyby. Mariners 6 and 7 followed and were able to get data to help analyze the Martian atmosphere. (NASA

MARS). Later, Mariner 9 would flyby Mars and obtain photo maps covering 100% of the surface, data that was crucial in future missions.

The next few milestones included when NASA sent the Viking 1 and 2 missions to successfully land on the surface of Mars. NASA also sent the Mars global surveyor probe to study Mars's weather patterns and then NASA began launching landers and rovers. The Viking landers were the first, followed by the Pathfinder and its accompanying rover, the Sojourner. This pair uncovered Mars's chemical composition. Then the twin rovers Opportunity and Spirit landed, these Rovers were on opposite sides of the planet to study the differences on each side of the planet. Spirit roamed for 6 years before we lost contact and Opportunity roamed for 15 years before we lost contact in 2019. Soon after the Mars Phoenix lander launched to explore Mars's polar regions to check if they were habitable previously.

The exploration missions to the Moon and to Mars seem different but they were actually similar. Both missions had successes and failures. For example, the Mars Climate Orbiter failed when the probe crashed into Mars due to loss of English translation into metric units (NASA Climate). Another example is the Apollo 13 failure when the mission failed 55 hours into the mission. An oxygen tank ruptured causing the crew to evacuate to the command module and return home safely. (NASA Apollo 13). Overcoming these odds, the programs like NASA and Space X looked danger in the face and went for it anyway. By launching probes to Mars and the Moon they showed the world that space exploration is still going strong. The unmanned exploration of Mars was pretty similar to the unmanned exploration of the Moon. They both started long ago when people would sit and watch the night sky wondering what was up there. Great Scientists during the Roman Empire would study the stars and major discoveries would come during the Renaissance period when scientists used telescopes to reveal images of the universe. Constant improvement of telescopes led us to today where we are able to send things and people to these foreign places. Rovers, probes, landers, scientific instruments reveal hidden data of the Moon and planets. We live in an exciting time where people dream of going to other planets and it may become a reality very soon. NASA is focused on building the SLS to send people to Mars. (NASA MARS)

Even though the missions to explore the Moon and the Mars have similarities there are a few differences. Humans have been to the Moon but not to Mars. The surface exploration of Mars has been much more extensive than exploration of the Moon and Mars exploration has to be launched at a certain time or we might miss the journey because it would take too long. The time period that Mars launches occur are called transfer windows. Very few corporations have made it to the Moon but even less corporations have made it to Mars. NASA primarily sends the exploration missions to Mars but corporations all over the world have successfully launched things to the Moon. The surface of these two bodies is very different so the exploration of these places will be different. The distance between Earth and the Moon is way closer than the Earth is to Mars so exploration of the surface of Mars is harder than the exploration of the Moon. (NASA MARS).

So these missions have had some pretty complicated histories. Exploration of these places have some similarities but also some differences. The Moon has had way more extensive scientific research done whereas Mars has had way more extensive surface research done. In conclusion the Moon and Mars are on the horizon of future space exploration. The world has seen man land on the Moon, but when will we see man land on Mars? I hope to see it in my lifetime.

## Source Citations

1. [https://www.nasa.gov/mission\\_pages/apollo/missions/index.html](https://www.nasa.gov/mission_pages/apollo/missions/index.html)
2. [https://www.nasa.gov/mission\\_pages/mars/main/index.html](https://www.nasa.gov/mission_pages/mars/main/index.html)
3. [https://www.nasa.gov/mission\\_pages/apollo/missions/apollo13.html](https://www.nasa.gov/mission_pages/apollo/missions/apollo13.html)
4. <https://mars.nasa.gov/msp98/news/mco991110.html>

## First Place 7th Grade

Student: Lucas Anderson

Teacher: Jennifer Richardson

School: Eagleview Middle School

After their great accomplishments with the Apollo missions, NASA has had its sights set on exploring Mars, first with robots and soon with humans. However, there are new challenges that come with this new mission, some in contrast to those faced in the Apollo missions. The Apollo missions were focused on landing on the moon, a closer and easier to reach target than Mars. Second, the moon is safe from dangers never encountered by humans in space. Third, Mars has an entirely different environment than anywhere humans have set foot before.

The moon is very close to Earth. According to the article, "How Far is the Moon" by Tim Sharp, "At perigee — its closest approach — the moon comes as close as 225,623 miles (363,104 kilometers). At apogee — the farthest away it gets — the moon is 252,088 miles (405,696 km) from Earth." The moon also orbits the earth, so it will always be near our planet. Mars, on the other hand, orbits the sun, causing radically varying distances from Earth. In the article, "Mars in our night sky," the author states, "Mars Close Approach happens about every 26 months ... Since Mars and Earth are at their closest, it's generally the best time to go to Mars." This means that we only have a narrow window in which to get to the red planet before it goes out of reach for another 2 years. Also, even when it is at its closest to Earth it is farther away than we've ever sent humans. In the article, "Mars in our night sky," the author states "The minimum distance from the Earth to Mars is about 33.9 million miles (54.6 million kilometers)." That is over 130 times farther than Neil Armstrong traveled.

This distance from Mars poses other challenges as well. Outside of the magnetic field of the earth, the radiation can be lethal. This was experienced by the astronauts on the Apollo missions, although the period of time in which they were exposed was shorter than that of the Mars missions. According to the article "Can we protect astronauts from radiation?" by Kristen Bobst, "an astronaut on Mars would be bombarded with as much radiation in a day as a human on Earth would experience in a year." This radiation can cause serious health problems and even death. In the article, "Space Radiation Risks," the author states, "High doses of radiation can induce profound radiation sickness and death. Lower doses of radiation induce symptoms that are much milder physiologically but that pose operational risks that may be equally serious. Both scenarios have the potential to seriously affect crew health and/or prevent the completion of mission objectives." In other words, even if the astronauts survive the radiation exposure, they can be prevented from carrying out the tasks required of them in space, defeating the purpose of the mission.

There are a few known ways to protect humans from radiation currently. The intensity of radiation and its effect on humans can be reduced by distance, time and shielding. In the solar system, distance and time can't be used to protect astronauts because the radiation source, the sun, is powerful and constant, so its radiation dominates the space environment continuously. Shielding is the only other method. Typically, we think of a shield as a solid barrier. An adequate physical barrier would be too heavy, however, to lift into space easily. On planet Earth, the magnetic field protects all of the humans on the surface from the sun's radiation, but once outside of the earth's magnetic field, astronauts would be unprotected. If we could replicate this magnetic field, we could protect astronauts on their mission to Mars.

One possible solution is to build a solar-powered, superconducting magnet that would block radiation in a similar manner to the earth's magnetic field. According to the article "Can we protect astronauts from radiation?" by Kristen Bobst, "Magnesium diboride (MgB<sub>2</sub>) could be used to create the force field. ... In theory, these cables could be attached to a spacecraft creating a superconducting magnetic "force field" that would protect astronauts on their journey." Magnesium diboride is unique in that it becomes superconductive at temperatures around that of outer space, meaning no heavy cooling system is necessary. Another aspect to this solution is to navigate the spacecraft through regions of lower radiation. However, radiation is not uniform in its intensity throughout the solar system. There are regions of high radiation and regions of low radiation. According to the article, "5 Mars Mission Radiation Shield Ideas Win NASA Challenge" by Elizabeth Howell, "Markus Novak, recent graduate from Ohio State University of Dublin, Ohio, found safe areas for travel after performing particle trajectory simulations." The spacecraft could, in theory, navigate to these safe areas and temporarily deactivate the magnet, allowing the solar panels to charge a battery for the next voyage into areas with higher-level radiation.

Another, perhaps even more difficult, challenge is living on Mars once we get there. Because we can only reach Mars once every two years, the astronauts will need to bring all of the

resources they will need to survive the full two years. Energy generation is also a problem. In the article, "Mars Solar Power," the author states, "Dust storms can be local storms, of a few days, regional storms, covering a larger area, or 'global' storms, which spread from the southern hemisphere during the southern hemisphere summer and can last for several months." This makes solar power radically less effective compounded by the fact that the extra distance between Mars and the sun also depletes the efficiency of solar panels. Astronauts may have to turn to geothermic or nuclear energy. Food also serves as a problem for any possible inhabitants of Mars. It is possible that the Martian soil may support life, so astronauts could grow food, but without testing, it hasn't been confirmed whether or not this would work. Astronauts would also need enough food and energy to get back to Earth.

In conclusion, to get humans to Mars, there are quite a few technological hurdles to overcome, many of which have been experienced to some degree in earlier space exploration, such as the Apollo Missions. Mars is a more difficult target to reach. The journey there could be quite dangerous as well. Living on the red planet could be an equally great challenge. However, we are constantly making progress, leading toward a bright future of Mars exploration.

#### Works Cited

Bobst, Kristen. "Can We Protect Astronauts from Radiation?" MNN, Mother Nature Network, 5 June 2017, [www.mnn.com/earth-matters/space/stories/can-we-protect-astronauts-radiation](http://www.mnn.com/earth-matters/space/stories/can-we-protect-astronauts-radiation).

"Mars Close Approaches." NASA, NASA, [www.mars.nasa.gov/allaboutmars/nightssky/mars-close-approach/](http://www.mars.nasa.gov/allaboutmars/nightssky/mars-close-approach/).

Mars, Kelli. "Space Radiation Risks." NASA, NASA, 19 June 2017, [www.nasa.gov/hrp/elements/radiation/risks](http://www.nasa.gov/hrp/elements/radiation/risks).

Sharp, Tim. "How Far Is the Moon?" Space.com, Space Created with Sketch. Space, 27 Oct. 2017, [www.space.com/18145-how-far-is-the-moon.html](http://www.space.com/18145-how-far-is-the-moon.html).

Landis, Geoffry A., et al. "Mars Solar Power." Ntrs.nasa.gov, Nov. 2004, <https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20040191326.pdf>.

Howell, Elizabeth. "5 Mars Mission Radiation Shield Ideas Win NASA Challenge." Space.com, Space Created with Sketch. Space, 28 May 2015, [www.space.com/29512-mars-mission-radiation-nasa-challenge.html](http://www.space.com/29512-mars-mission-radiation-nasa-challenge.html).