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NASA Berkeley Summer Scholars gather at Ames to celebrate the birthday of Jordan Kam (center)

Welcoming Berkeley Summer Scholars to Ames By Sharon Teitelbaum, Ames Public Affairs Office

School may be out for the summer but that doesn't mean an end to learning. This year, NASA's Ames Research Center in Silicon Valley, California, in cooperation with the University of California, Berkeley, launched the NASA Berkeley Summer Scholars Program, designed specifically for students enrolled in the Berkeley Aerospace Engineering Program founded in 2022.

Building on the established Ames-Berkeley collaboration that's developing the new Berkeley Space Center at NASA Research Park, the summer scholars program benefits the center and the university. The Berkeley Aerospace Engineering students receive hands-on, real-world learning that cannot be provided in the classroom. According to Sid Sun, the summer scholars program coordinator at Ames, the initiative is also a boon for NASA by helping to establish a pipeline of talent in aerospace engineering.

The Nuts and Bolts of the Program

Sun worked closely with Professor Panos Papadopoulos, the Director of the Aerospace Engineering Program at Berkeley, to design the 15-student program for rising juniors. With only 38 students total, almost half of the cohort are currently interns at the center. The existing Summer Intern Program at Ames managed by NASA's Office of STEM Engagement provided a helpful infrastructure for this new effort. In February, the internship coordinators sought out projects across the center interested in hosting the students across the center's core competencies. The coordinators closely matched those projects to the interests and talents of each student. In addition, each student has at least one dedicated mentor, and often several, who are accomplished in their research domains to guide

their professional growth and development throughout the summer.

Taking Flight this Summer

Students have an easy commute – with the majority of them living on campus at the Ames Lodge during the program which runs from early June to early August. They typically work a 9 to 5 day while also leveraging all the center has to offer. They participate in seminars and activities with other interns from the broader summer program managed by NASA. They also learn from each other by taking advantage of the breadth of their teams' projects and hosting each other on tours of their facilities.

Meet a Summer Scholar

Jordan Kam, a student in the Berkeley Summer Scholars Program and an inaugural member of the Berkeley Aerospace Engineering Program is currently an intern at Ames. This summer he is assigned to the Advanced Aeronautics Mobility program where he works on strategic deconfliction to prevent collisions in the increasingly crowded airspace. He focuses on drones under 50 pounds that might be used to deliver packages. He has enjoyed meeting and working with new colleagues at Ames and exploring all that the center offers.

With summer at the half-way mark, the summer scholars can still look forward to new discoveries. As they move toward the waning days of August, they will value the time spent increasing their aerospace engineering knowledge, but it's the experiences and relationships they will long remember. This internship program is one way NASA is helping to prepare and inspire the next generation of engineers, scientists, and beyond.

CMU Class Builds Satellite Bound for Earth's Orbit By Marylee Williams

It's spring on the Carnegie Mellon University campus, and students divided into teams focused on communications, guidance navigation and control (GNC), and vision have their heads together trying to simulate how a satellite collects and transmits usable images. Across the room, their peers on the avionics team have laid out rows of circuit boards and are explaining how they can push updates to the satellite when it's in space. The room is buzzing, but it stops for the mechanical team, which has reached a critical juncture. They need pieces of fishing line to break.

Ashley Kline, a master's student in mechanical engineering, throws her arms up in celebration when the translucent strings snap and solar panels unfold from the sides of the cube satellite. It needs power when it's in space to accomplish its mission: keeping track of itself in orbit.

All this excitement erupted during demonstration day for CMU's Spacecraft Design-Build-Fly Lab course, which brings together students from the College of Engineering, Mellon College of Science and the School of Computer Science for two semesters to design and build a small satellite that will launch into space next year. Zac Manchester, an assistant professor in the Robotics Institute (RI), and Brandon Lucia, a professor in the Electrical and Computer Engineering Department (ECE), led the class.

"I would have loved to have this class as a student," Manchester said. Small satellites, known as nanosatellites, can be useful for agriculture, disaster response or scientific research. But to use these devices, researchers need to know where they are in orbit, which can be an expensive and imprecise undertaking. Kyle McCleary, an ECE Ph.D. student and teaching assistant for this class, has been researching the use of visual sensing and machine learning algorithms to improve orbit determination on these small satellites. In the course, McCleary and about 30 students put this research into practice.

Students were divided into five teams: communications, avionics, mechanical, GNC and vision. This structure reflects the subsystem teams one would see at NASA or other space exploration companies.

The communications team was responsible for radio commands sent to and from the satellite while in space. The satellite's antenna, made from a bright yellow measuring tape, delivers images and measurements to the teams to help them determine where the satellite is located. The team also built a ground station that's been receiving information from the cube satellites Manchester launched in early March.

Carnegie Mellon University

Rohan Raavi, a senior in ECE, was on the avionics team. He joked that he tried not to think too much about this satellite going to space because of the pressure. But he said he loved the class.

"It shows you how much more there is to learn and how much room there is for advancement in this area of science and engineering," Raavi said. "The space industry has been focusing a lot on reliability because they don't want to risk failure, meaning there's a lot of room for progress and improvement, like what we are doing in this course."

The avionics team designed the satellite's circuit boards and the software needed to execute commands. Their work needed to get to space, which is where the mechanical team came in. They ensured everything was built correctly to fit into the rocket and that the satellite switched on and deployed its solar panels when the device got to space.

When Manchester came to CMU, he and Lucia teamed up to launch this course. He said telling the students this satellite was going to space gave the students a sense of seriousness, knowing this project would end up in Earth's orbit contributing to new research.

The students in this class started from a mission concept, Lucia explained.

"These students are so impressive. These are mission requirements that professional engineers fail to accomplish, but they've created something that's ready to fly," he said.

The GNC and vision teams collaborated closely on the mission's main objective determining where the satellite is in orbit. Six cameras mounted to the satellite capture images of Earth and identify landmarks. The GNC team ensures that the vision team can make accurate measurements by slowing and controlling the satellite's rotation. Electricity flows

through coiled wires in the satellite, turning it into a magnet that interacts with Earth's magnetic field. Using clever algorithms, GNC can adjust the amount of current in these coils to control the satellite's rotation.

Once the satellite is correctly oriented to take images, the vision team uses cameras and machine learning to handle the final step: determining the satellite's location. Images of Earth pass through a region of interest (ROI) classifier, which identifies predefined locations of interest in these images. Something easily identifiable like an inland lake. The team then uses this data to determine the satellite's position and velocity.

Haochen Zhang, a master's student in RI, was on the vision team. She explained this was the first course she's taken where the whole class worked on one project from beginning to end.

"I got to work on something that I'm interested in, vision, and I got to experience and learn about other people's specialties while watching this mission come together," Zhang said.

When the demo day ended, everyone gathered for a team photo, filling in around a table that held their satellite. Lucia and Manchester said they intend to keep this class going. The mission concept for the next offering will use processors developed by CMU spin-out, Efficient Computer, a company Lucia co-founded to develop chips that will provide the satellites with the capability to do on-board computing on sensor data with unprecedented efficiency.



Source: College of Engineering YouTube video Spaceflight Design -Build-Fly Course

March Events at Moffett Field Museum Launch New "Lunch and Learn" Series

arch Events at Moffett Field Museum: A Month of Learning and Engagement March was a remarkable month at the Moffett Field Museum, filled with enriching activities that captivated NASA and USGS enthusiasts alike. Our events blended historical insight with technical expertise, drawing in a diverse crowd eager to learn and engage.

Launch of the "Lunch and Learn" Series

We proudly launched our new "Lunch and Learn" noontime brown bag speaker series with a highly anticipated talk on the Hexagon satellite space reconnaissance program and Sunnyvale's iconic "Blue Cube." On Wednesday, March 27th, attendees gathered to hear Rick Deutsch, USAF Captain (1972-79), share his extensive knowledge and personal experiences. Rick captivated the audience with his detailed account of the Hexagon program, its sophisticated technology, and its critical role in gathering intelligence during the Cold War. He also discussed the operations at Sunnyvale's "Blue Cube," highlighting its importance in monitoring and controlling reconnaissance satellites. The session was interactive, with Rick answering numerous questions, and attendees appreciated the provision of sodas and water, making it a comfortable and enjoyable lunchtime gathering.

Successful Used Book Sale

Earlier in the month, on Saturday, March 9th, the museum hosted a used book sale that turned out to be a great success. The sale featured an extensive collection of historical and technical documentation, including a plethora of NASA publications. Visitors had the opportunity to browse and purchase rare and valuable books, deepening their understanding of aerospace history and technology. The event attract-

ed a wide range of attendees, from avid readers and history buffs to technical professionals and students, providing a unique opportunity to acquire valuable resources.

Looking Ahead: Future Events

The positive response to both events has energized us to plan more exciting and educational activities for the future. The "Lunch and Learn" series will continue, bringing in experts from various fields to share their insights. We are also planning more sales and exhibitions featuring unique items from our archives. Stay tuned for announcements about upcoming events. Your participation and support are crucial to our mission of preserving and sharing the rich history of aerospace and scientific exploration.

We extend our sincere gratitude to everyone who attended and supported our March events. Your enthusiasm and involvement make it possible for us to continue offering these valuable programs. Special thanks to Rick Deutsch for his captivating presentation and to all the volunteers and staff who helped make these events a success.

MOFFETT FIELD MUSEUM BROWN BAG LUNCH AND LEARN





\$10 AT THE DOOR INCLUDES ADMISSION TO THE MUSEUM



Congratulations on Ames Heat Shield Support of Commercial Space Re-entry

What an exciting week for NASA and the space industry. On Wednesday, Feb. 21, small California space company Varda Space Industries of El Segundo achieved the first re-entry of products made aboard its in-space manufacturing platform – and they did it using a heat shield produced right here at Ames.

Ames leads the agency in designing, developing, and testing thermal protection systems, and this work goes back many decades. Today, we stand ready to support the growing commercial space industry into the future.

In 1951, it was Ames engineer Harvey Allen who showed that a blunt-shaped capsule helps deflect the heat of atmospheric entry. Fast forward to the last few years, and our expert work on entry systems has helped protect pieces of a 4.5-billion-year-old asteroid and future astronauts who will travel in the Orion crew capsule.

In 2023, under a Space Act Agreement, Ames delivered to Varda a heat shield made of the C-PICA thermal protection material – short for Conformal Phenolic Impregnated Carbon Ablator – invented by our own teams. Yesterday's historic landing made it the first ablative heat shield built on the streets of Ames to see a known successful re-entry.

And our work enabling the growth of commercial space doesn't stop there.

Through technology transfer of the C-PICA production process, Ames teams will help Varda establish its own heat shield production, to fully and quickly enter the space market. Later this year, heat shield technology from Ames will make possible the first flight of Inversion Space of Torrance, California, demonstrating space-based cargo transport, and the first private mission to Venus, with Rocket Lab USA of Long Beach, California.

Our doors stand open to companies seeking our expertise in the complex and critical step of atmospheric entry, as our teams fulfill NA-SA's role in fostering the American market-place and building our country's economic prosperity.

My congratulations and gratitude to the teams of the Entry Systems and Technology Division!



Dr. Eugene Tu
Center Director





RMV's Bob Vermillion, Guest Speaker for 2024 CubeSat Developer Workshop

ince March 2024 over a 3-month period, Bob Vermillion, CEO and Founder, RMV Technology Group LLC, a NASA Industry Partner, has been a road warrior from the West Coast to the East Coast twice – first for NASA, then for the US Army.

For the 2024 NASA Quality Leadership Forum (QLF), Bob Vermillion was nominated to be a Guest Speaker by Joe Gaines, NASA MSFC Space Mission Assurance (SMA). A critical first discovery was made during COVID in a very thought-provoking white paper by Vermillion. At that time, HVAC systems were shut down and an unknown risk to flight hardware was realized by Vermillion in combination with low RH and the use of

antistats in the ESD Protected Area (EPA). Vermillion's independent research has led to a solution that will benefit not only the Agency, but also Academia, the DoD and support contractors that handle ESD sensitive devices (ESDS) during packaging, handling, storage, transport and assembly.

For the Cal Poly CubeSat Developers Workshop, San Luis Obispo (April 24, 2024), Vermillion's white paper focused on requirements that need implementation for Small Satellite platforms during launch and deployment. Due to the extreme sensitivity of today's ESD sensitive microprocessor driven devices <±50 volts, CubeSat builds are now at a much higher risk of failure during assembly without the proper safeguards plus ESD Shakedown testing simulating for low Relative Humidity (RH) in Space and other extreme environments.

Invited presenters also included NASA Ames Research Center (Small Spacecraft Technology Program/Small Spacecraft Systems Virtual Institute), NASA Kennedy Space Center (KSC), the US Naval Academy, US Coast Guard Academy, US Air Force Academy, Cal Poly San Luis Obispo, Cal Poly Pomo-



na, University of Colorado, Morehead State University and other educational institutions, plus space system companies from the Bay Area and Southern California to South Africa, Taiwan and South Korea.

For the Annual 2024 NIPHLE Training Conference held at the US Army Picatinny Arsenal for the past couple of years, Bob Vermillion, NASA ESD Technical Authority, was specially invited by the DLA in which the course "Safe Handling Practices to Mitigate Risk of ESD Sensitive Circuit Card Assemblies for Removal, Replacement and Shipping by use of a grounded Field Service Kit on USAF flight lines, Helicopters, Naval Vessels, Armored Vehicles, UAV and Missile Systems in an Interactive Hands-on Format™" was presented on May 7, 2024. An ESD Awareness Certificate was presented to each participant. Almost 100 US Army civil servants and contractors from Picatinny Arsenal, Edgewood CDC, Aberdeen Proving Ground, DCMA and DLA received edu-

cational credit for the 2-hour course on behalf of the RMV Training Directorate under the leadership of Bob Vermillion and RMV Technology Group LLC in cooperation with NIPHLE.

RMV courses are intended for Project Managers, Supervisors, Avionics and Quality Engineers, lab technicians, repair depots and Facility Operations for those that package, handle, store, transport and kit EEE sensitive parts for land, air, sea and space in compliance with NASA Standard 8739.6B, Section 7, related Military ESD Control Standards and ANSI/ESD Standards that adhere to low RH and environmental conditions outside the ESD Protected Area (EPA) from Santa Ana Winds in low RH to tropical and arctic environments.

Since 2009, in support of NASA, RMV is now the largest and most advanced ESD Materials and Product Qualification Testing Laboratory on an Agency site.

RMV Technology Group LLC in partnership with Exemplar Global, a 3rd party certification body and member of the American Society of Quality (ASQ) family of companies, is the internationally accredited iNARTE® Training Center for NASA and the DoD to better protect the Warfighter.

For more information on the next On-Site iN-ARTE® Space & Defense ESD Program Monitor Training Course (July 16-18, 2024), please contact Renee Mitchell at 650-964-4792, email renee@esdrmv.com or visit www.esdaerospacetraining.org.

We always welcome your inquiries by phone or email on training programs, consulting or R&D support for independent 3rd party ESD qualification to meet current demands for more cost effective and reliable solutions as required by Space & Defense.



Carnegie Mellon University



Carnegie Mellon Rocket Command Competes in NASA Event By Kirsten Heuring

Tanner Aikens and his Carnegie Mellon Rocket Command teammates woke before sunrise on April 13 to traipse through a muddy field toward a launch site near NASA's Marshall Space Flight Center in Huntsville, Alabama.

They carried a rocket and its 5-pound payload designed for NASA's Student Launch competition, a research challenge that provides cost-effective research and development to support the Space Launch System and Artemis missions.

Carnegie Mellon Rocket Command's countdown began nine months before liftoff the launch was the culmination of planning, prototyping, constructing and testing. The team sent initial reports and designs to NASA in the fall of 2023.

"They wanted to know everything that crossed our minds when we were deciding whether to make the rocket fins 11 inches long or 10 inches long," said Aikens, former president of CMRC and a recent graduate in mechanical engineering. "You need to justify every design decision you make along the way."

Aikens served as team captain, and work was divided among subteams that focused on mechanical structures, mechanical design, avionics and payload.

This year's challenge required students to design a payload that would be able to deploy mid-air, safely return to the ground without a parachute and be reusable to launch the same day without repairs or modifications.

Nicolas Keck, a rising junior in electrical and computer engineering, was head of the team creating the electronic components that would measure rocket data through simulated astronauts.

"The report process is very similar to how it is in the industry," Keck said. "We were looking at different microcontrollers and making an argument of why we might want to use this microcontroller over another one. A similar design process is going to be needed for any scientific payload."

By the end of January, the team completed designs for their rocket, the Acceleration & Danger Reducing Explosively deployed Wing (A&DREW), and payload, the Airbender. The rocket was named for Andrew Carnegie and Andrew Mellon, the founders of what is now Carnegie Mellon. The payload was inspired by a glider from the TV show "Avatar: The Last Airbender" and named for the titular character who uses it.

The Airbender was unpowered and designed to eject from A&DREW. The team used a custom 3D printer created by engineering doctoral student Peter Pak to ensure the glider could be built to the exact specifications they gave NASA.

Patrick Kaczmarek, a rising sophomore in physics, was part of the mechanical structures team that built the rocket's exterior. He said that he joined the team so he could help create something that blends his interest in physics and mechanics.

"I love working with my hands, and I love seeing how things come together," Kaczmarek said. "I was hoping that everything would stay together structurally, but there was always that feeling of, 'I put so much work into this, and I really hope it ends up working out."

Eleven members of the team traveled with the final versions of the Airbender and A&DREW to Alabama for Launch Day. Seventy teams from 24 states and





Puerto Rico participated this year. Dozens of teams traveled to Alabama, and others conducted final test flights at launch fields closer to home.

As Carnegie Mellon Rocket Command's 11 a.m. window arrived, they launched the rocket. At first, everything was going to plan.

"The rocket A&DREW ascended without a hitch on the Aerotech L1150R solid fuel engine, atop a bright red flame." Aikens said. "But, shortly after reaching apogee, something was amiss. As the rocket began to descend, its parachute failed to deploy, with the rocket tumbling rapidly toward the Earth."

About 600 ft. above the ground, A&DREW's main parachute finally deployed. NASA gave the team clearance to release their glider.

It turned out to be one of the only successful payload deployments that day. NASA is assessing flight data, and official results from the competition will be released later. Teams are scored in categories such as safety, vehicle design, social media presence, and science, technology, engineering and math (STEM) engagement. CMRC won third place in the Reusable Launch Vehicle Innovative Payload category.

Members of CMRC said that the work they did was far more important than any award.

"I joined CMRC because it was such a big project that everyone worked on together. We have a representative from every college at CMU," Kaczmarek said. "There are so many different interconnected parts, and everyone made an impact."



UC Berkeley and NASA Collaborate on \$2 Billion Research Campus at Moffett Field

By Ted Triano, August 2024

C Berkeley and SKS Partners have announced the Notice of Preparation for the Berkeley Space Center, a groundbreaking project to be developed within the NASA Ames Research Center in Mountain View, Santa Clara County. This ambitious initiative represents a \$2 billion investment to create a 36-acre research campus dedicated to academic and scientific advancement in the historic heart of Moffett Field. San Francisco-based SKS Partners and UC Berkeley have formed Moffett Partners LLC to drive the development forward.

The primary objective of the Berkeley Space Center is to establish a state-of-the-art research and education hub, fostering technological innovation and supporting UC Regents' educational and research missions. The project offers two potential development scenarios: one with 1.4 million square feet and another with 2.3 million square feet of floor area. The larger plan includes nearly 2 million square feet for educational facilities, 22,000 square feet for a conference center, 126,000 square feet for student and faculty housing, and 73,000 square feet for short-term lodging. The smaller option reduces research and office space to 1.1 million square feet while maintaining the same capacity for other uses. Both plans integrate a comprehensive transportation network and landscaped open spaces. The master plan, developed by HOK and Field Operations, envisions the construction of 11 new structures. Detailed renderings released last year highlight the proposed landscaping and amenities, although architectural designs remain largely under wraps.

The NASA Ames Research Center, founded in 1939, is a renowned hub for aeronautics and exploration technology. Among its landmarks is Hangar One, one of the largest freestanding structures in the world, currently undergoing restoration by Google for its Planetary Ventures research unit. The Berkeley Space Center's site plans emphasize the central sightline of this iconic hangar, integrating it into the new campus layout. UC Berkeley and NASA have determined that a joint Environmental Impact Report/Environmental Impact Statement (EIR/EIS) will be prepared for the project. The Regents of the University of California, acting as the Lead Agency under the California Environmental Quality Act (CEQA), and NASA, acting as the Lead Agency under the National Environmental Policy Act (NEPA). Public comments are invited to shape the scope and content of these reports until July 22nd. Two online public scoping meetings will be held on July 10th and July 15th to gather input. More information is available on the UC Berkeley Capital Strategies website.

Construction is anticipated to begin by 2027. The Berkeley Space Center recently announced a partnership with the Berkeley Skydeck accelerator program to form a new Air and Space Track. In addition, the University's new aerospace engineering major remains the most in demand major within the University's College of Engineering, with acceptance rates in the low single digits among all accepted engineering students, a number of whom have started to apply for and be accepted into NASA Ames' internship program(s). The vision of creating a new innovation and entrepreneurship ecosystem at Berkeley Space Center was capped off recently with the announcement of Dean Richard Lyons, the campus' former chief innovation and entrepreneurship officer, as the University's newest Chancellor. His inauguration will be held on October 19, 2024.

For further details and updates, visit UC Berkeley Capital Strategies at https://capitalstrategies.berkeley.edu/





USGS and NASA Fireside Chats

Jonathan Stock, Director, USGS National Innovation Center On Detail to Ames Intelligent Systems

ARC and USGS are building our community at ARC with an informal monthly talk series called Fireside Chats. The goal of these talks is to introduce our challenges and capabilities to each other in plain language, and by doing so, grow a set of ARC and USGS staff who know and trust each other well enough to explore new opportunities together. Doing so will improve our ability to work seamlessly across institutional boundaries and increase our collective capability to solve national challenges by partnering complementary skills between institutions. It will also promote career development, creative problem solving and camaraderie. We invite the NASA Research Park partners to join us the first Wednesday of each

month at the Fireside area of the NASA Ames Conference Facility, Bldg. 3 for three 15-minute talks between 3:00 – 5:00 pm that will bring ARC and USGS scientists, technologists, and engineers, along with the NRP partners' innovations. We are highlighting work of broad impact and ongoing partnerships. Expect an informal setting where you can grab a couch or high-top table with snacks and a beverage and ask questions of your peers.





Members of Parliament Scottish Affairs Committee met with NASA officials on April 3, 2024.

The UC Berkeley team gives their final presentation for the Center for Information Technology Research in the Interest of Society and the Banatao Institute (CITRIS) Aviation Prize at the 2024 NASA-UC Technical Summit, "Enabling Sustainable Urban Air Mobility with Electric Vertical Take-off and Landing (eVTOL)" in the Ballroom of the NASA Ames Conference Center, Building 3, in NASA Research Park. Creator: Don Richey





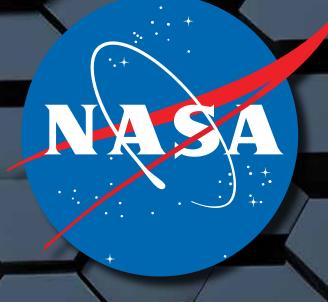
NRP staff visits Hangar One reconstruction. Left to right: Katrin Khalepary, Nazaret Galeon, Elena Serna, Cyndi Carbon-Norman, DJ Smith





Planetary Ventures (PV) has made significant progress in the remediation, structural upgrade, and reskinning of Hangar One. PV was delighted to recently host tours of the project for NASA Ames leadership and GSA leadership. The photos showcase some of the current advancements from an elevated perspective, approximately 130ft above ground level. The project is on track for completion in Q4 2025.

PV extends a heartfelt thank you to everyone who has contributed to the success of this project, including NASA, CBRE, T&T, McCarthy Builders, HDR, KPFF, and many others.



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