



Flight Opportunities

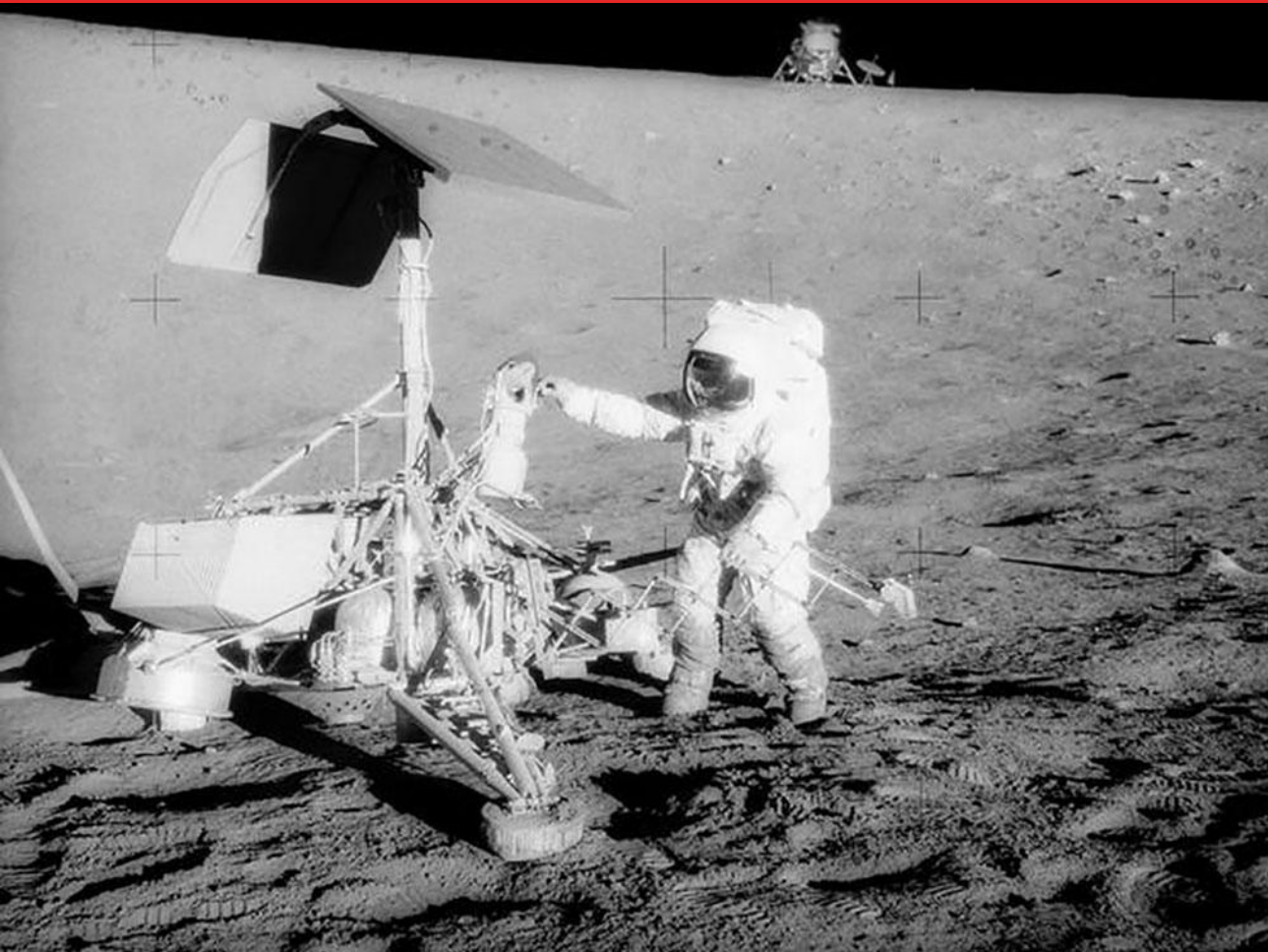
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Enjoy!

Flights



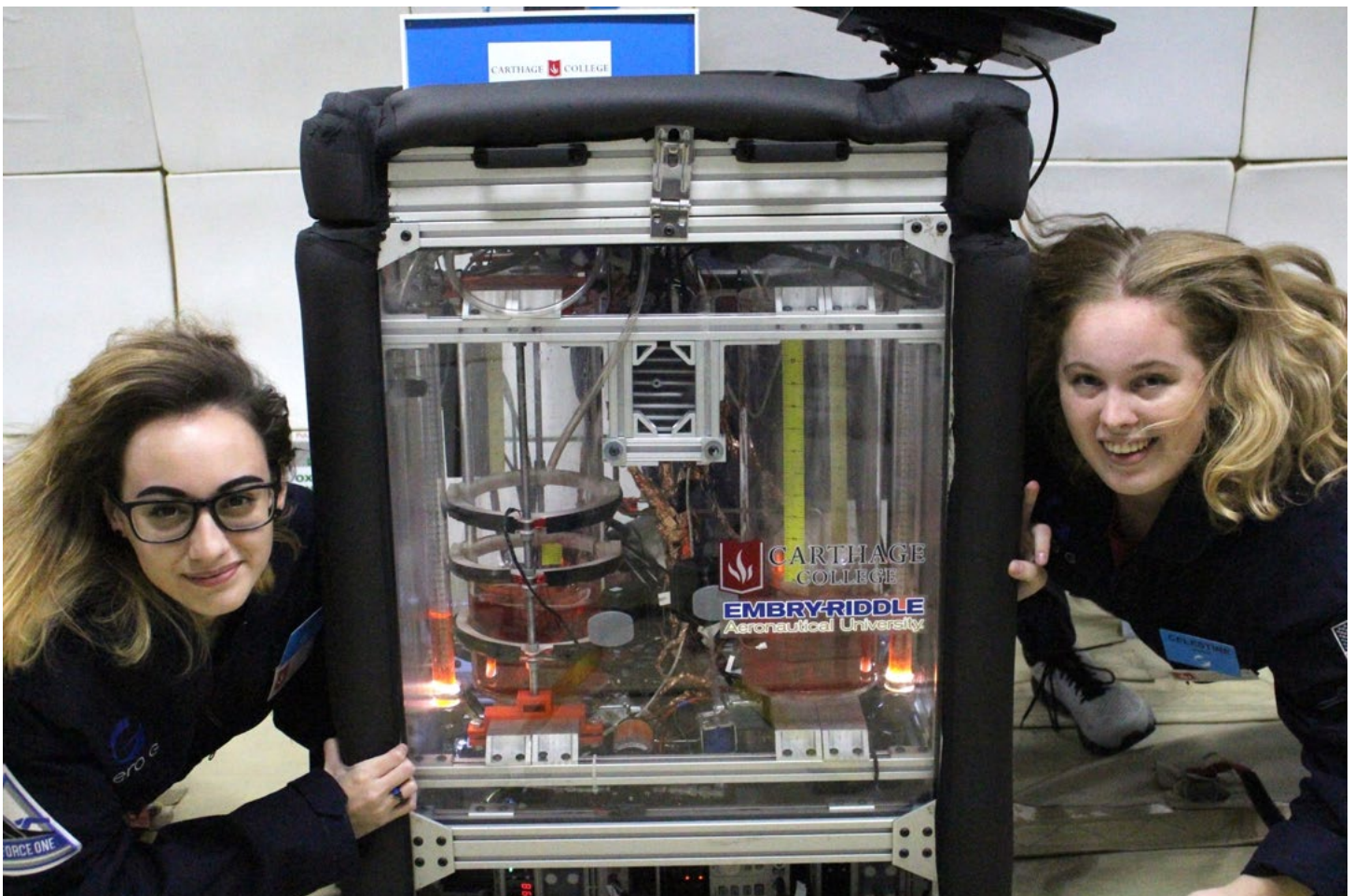
NASA's Surveyor III spacecraft (in the foreground), which landed on the Moon in 1967, was dramatically sandblasted by the ejecta from the landing of Apollo 12 (shown in the distance) in 1969. The Ejecta STORM sensor aims to precisely measure lunar dust storms created by rocket plumes in order to help aid predictive modeling and mitigation plans for future missions. Credits: NASACredits: Blue Origin

Addressing the Perils and Promise of Dust on the Moon

Lunar dust-related technologies were tested on Masten Space Systems' Xodiac vertical takeoff and vertical landing vehicle during five flights Nov. 12-19 in Mojave, California with support from Flight Opportunities.

The University of Central Florida flew its laser-based **Ejecta-STORM** sensor, which aims to gather data to help inform mitigation strategies for potential sandblasting damage caused by rocket plumes. Honeybee Robotics built upon [previous Xodiac testing](#) of its **PlanetVac** regolith sample collection device. This time researchers tested the technology's capability to not only collect a regolith sample, but also to transfer it to a container located near the top of the lander. In addition, the team hoped to **gain insight** into how particle scouring may impact regolith collection and to test the device's ability to handle the plume's thermal environment. The testing aimed to provide further risk reduction in advance of future missions, including an upcoming lunar mission as part of NASA's **Commercial Lunar Payload Services** initiative.

Learn more about these technologies and the goals of the recent flight testing in the [full NASA web feature](#).



With support from Flight Opportunities, Carthage College and its partner Embry-Riddle Aeronautical University are testing a new method of suppressing propellant slosh by using magnetic forces. Students Taylor Peterson (left) and Celestine Ananda are shown here with the flight experiment on a parabolic flight with ZERO-G Corporation in November 2019. Credits: Carthage College

Flights Advance SLOSH Control Technology — and Student Career Prospects

The Flight Opportunities-supported payloads aboard Zero Gravity Corporation's G-FORCE ONE parabolic flights this month include Carthage College's **Magneto-Active SLOSH Control System**, which aims to help control propellant slosh in cylindrical tanks using magnetic forces.

Prior to the current flight campaign, Flight Opportunities funded testing of the technology on parabolic flights in November 2019. The iterative flights are enabling principal investigator (PI) Kevin Crosby and his team of student researchers to advance from manual control of the system on early flights to using hardware and software to run their experiment for the current campaign.

The flights have also proven to be a valuable pathway to further research and careers for Carthage College students and the team's undergraduate collaborators at Embry-Riddle Aeronautical University.

"Being able to learn about space science research while experiencing microgravity itself solidified my desire to pursue a research career in this field," said Celestine Ananda, a Carthage College recent graduate with several suborbital flights on her resume. "I'm starting a Ph.D. program in aerospace engineering this fall, largely due to my research experience funded through the Flight Opportunities program."

To learn more about this technology and others flying on G-FORCE ONE, read the [full NASA web feature](#). To read more about PI Kevin Crosby's work leading student teams and preparing them for aerospace careers, see the PI Spotlight below.

News

Announcing the Flight Opportunities Community Learning Initiative

The new Flight Opportunities Community Learning initiative is an effort to capture, organize, and communicate the lessons and experiences of suborbital researchers. We aim to create opportunities for the community to hear from subject matter experts on best practices for preparing for suborbital flight tests as well as to connect informally with fellow researchers, flight providers, and program staff to share information.

The Community of Practice Webinar Series is the first program for this effort. Our first session will be a conversation with long-time Flight Opportunities researcher Dr. Steven Collicott, who will share knowledge from his extensive flight testing experience. We hope you will join us as we exchange ideas on optimizing the experiences of current and prospective program participants.

Inaugural Flight Opportunities Community of Practice Webinar
A Conversation with Dr. Steven Collicott
January 6, 2021
10 a.m. PST

Webinars will take place on the **first Wednesday of every month at 10 a.m. PT**. Details for participating are forthcoming, but mark your calendars now!



Video Footage Captures Regolith Collection Technology on Rocket-Powered Flight

Southwest Research Institute (SwRI) recorded **captivating video footage** of its Flight Opportunities-supported **Box-of-Rocks Experiment II** on the October 13, 2020 launch and landing of Blue Origin's New Shepard rocket-powered system. The technology is designed to use magnetic forces to collect regolith from the surface of asteroids. It successfully collected about 30 grams of simulated regolith during the flight test.

Do you have interesting photos or video footage to share from recent flight testing? Please get in touch to share them, and we may feature them in an upcoming issue.

Opportunities

Established Program to Stimulate Competitive Research (EPSCoR) Suborbital Flight Opportunity

Flight Opportunities has partnered with NASA's EPSCoR program to provide access to suborbital flight tests for the EPSCoR community. Through an amendment to the existing 2021 EPSCoR International Space Station (ISS) Flight Opportunity solicitation, EPSCoR jurisdictions will be able to propose using suborbital flights to further their EPSCoR-funded research. Proposals are due by **January 7, 2021**. [Visit NSPIRES for more details.](#)

NASA SBIR/STTR 2021 Phase 1 Program Solicitation Now Open

Proposals for NASA's SBIR/STTR 2021 Phase 1 Program Solicitation are due by **January 8, 2021, at 5:00 p.m. EST**. [View the full solicitation.](#)

All applicants must submit proposals using the Proposal Submissions Electronic Handbook. Please visit sbir.nasa.gov/submissions/ to log in and access resources to help you get started.



Helping Students Learn Technical and Interpersonal Skills: PI Kevin Crosby

With a half-dozen Flight Opportunities campaigns under his belt (including one currently underway -- see Flights section above), Carthage College professor Kevin Crosby understands the value of the program. Through flight testing, he has been able to raise the technology readiness level (TRL) of his slosh control and propellant gauging technologies for spacecraft. As head of the school's Space Sciences program, Crosby blends his development of these technologies with powerful learning opportunities for his students.

We spoke with Crosby about what he has learned during his years of flight testing and how those lessons apply to both students and the research community as a whole.

How do you address some of the key challenges of suborbital flight testing?

There are a lot of unknowns and counter-intuitive forces at play in zero gravity, which requires creative problem solving and planning for contingencies. I recommend three things. First, communication is essential. My teams do daily check-ins and document exchanges. Communicate constantly with the team and expect them to communicate with you. Second, build in a 25% schedule margin to accommodate team members' other priorities. This is especially important when working with students. Finally, involve external reviewers. When someone from the outside provides feedback about the payload and experiment design, they pose questions you might not have thought of. This helps you anticipate potential failures before flight.

Tell us a bit more about how you approach preflight risk mitigation.

Well, failure can be a great learning moment, but we do try to stay constantly aware of the potential for failure. So, we clearly articulate the goals -- both our minimum success criteria and some stretch goals -- and then we plan for all the ways we might fail. We want to guess at every way there is to fail and mitigate against those. If we don't meet a goal, we want it to be because of something we couldn't have foreseen.

Are your students disappointed when things fail?

I've found that they are more resilient than most of us. Plus, they often get to fly again. That's the beauty of Flight Opportunities: You fly, come back down, adjust the hardware configuration, and try again. The stakes of suborbital tests aren't as high as orbital flights, so it's perfect for involving students. They learn valuable lessons they can't get in any other environment. It is extremely motivating to them to be at this frontier of common access to space, particularly for those with a commitment to making a career in aerospace. And many of them have. My students have gone on to work at various NASA centers and commercial space companies. One is now working on the next generation of spacesuits at NASA's Johnson Space Center.

It sounds like you focus on more than just technical skills with your students.

Yes, they learn a lot of soft skills, like team management. People skills are so important when you're working in a high-pressure environment on a tight schedule. We also provide the history and relevance of their projects. We talk about how parabolic flights translate into cost reductions and technology acceleration. We give them context for what they're doing so they understand how their work benefits NASA missions. We also teach them how to talk to the general public about the work. Outreach and being able to explain to a non-technical person what you're doing and why NASA is funding it is so important. They need to learn this skill as early as possible.

Events

Online Resources from NASA's Innovation and Opportunity Conference

Following the recent **Innovation and Opportunity Conference**, NASA's Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR) program has put together an online **resource library** to provide valuable information to those at any stage of the SBIR/STTR journey.

Mark Your Calendar for Other Upcoming Events

Fall Meeting of the American Geophysical Union (AGU) (virtual event): Dec. 1-7

TechCrunch Sessions: Space 2020 (virtual event): Dec. 16-17

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Flight Opportunities is part of NASA's Space Technology Mission Directorate.