



# THE NATIONAL SPACE GRANT COLLEGE & FELLOWSHIP PROGRAM

## **FISCAL YEAR 2020 ANNUAL PERFORMANCE REPORT (APR)**

FUNDING SOURCE:  
OFFICE OF STEM ENGAGEMENT  
SPACE GRANT

MANAGING ORGANIZATION:  
NASA HEADQUARTERS OFFICE OF STEM ENGAGEMENT

PROJECT MANAGER:  
DR. RAJIV DORESWARMY  
[RAJIV.DORESWAMY@NASA.GOV](mailto:RAJIV.DORESWAMY@NASA.GOV)

DEPUTY PROJECT MANAGER:  
DR. ERICA J. ALSTON  
[ERICA.J.ALSTON@NASA.GOV](mailto:ERICA.J.ALSTON@NASA.GOV)

MONTANA SPACE GRANT CONSORTIUM LEAD INSTITUTION:  
MONTANA STATE UNIVERSITY

MONTANA SPACE GRANT DIRECTOR:  
ANGELA DES JARDINS  
[ANGELA.DESJARDINS@MONTANA.EDU](mailto:ANGELA.DESJARDINS@MONTANA.EDU)

**ACTIVITY DESCRIPTION:** (100 – 250 words)

The Montana Space Grant Consortium (MSGC) works to strengthen education in Montana in fields related to the aeronautical and space sciences and engineering and NASA STEM Engagement priorities. To accomplish this overarching goal, we offer a set of student and faculty opportunities geared toward hands-on projects and other effective engagement styles. MSGC's motto is "*Inspire - Imagine - Innovate*".

Academic Affiliates of MSGC consist of all the colleges and universities in the state that offer at least one STEM degree. Seven of our 23 current academic affiliates are Tribal Colleges. Other Consortium partners include aerospace industry businesses, non-profit organizations, and museums. MSGC works with these Affiliates and partners, and through the government and public outreach, to promote an active STEM base in the state.

Long-standing core MSGC elements include Internships, Graduate Fellowships, High Altitude Ballooning projects, Student Satellite projects, Unmanned Aerial Systems projects, Undergraduate Research programs, a STEM Professional Skills Symposium, the Space Public Outreach Team, and Faculty Fellowships. In this new award period, MSGC will continue to offer these effective core programs. After intense discussion with our Affiliates and staff, we no longer offer Scholarships, Education Enhancement Grants, or Research Initiation Grants, as we have for the past 28 years. Montana NASA EPSCoR will still offer research Initiation Grants. Instead, we have added three new elements: Research Activation Awards, Introductory Workshops, and NASA Center Travel awards. Our programs align directly with the Federal and NASA goals as well and Montana STEM education needs.

**ACTIVITY GOALS:** (Bulleted list)

**Strategic Goals**

- (1) Develop and connect interdisciplinary aerospace **education** programs that will build and enhance opportunities for involvement in space-based science, technology, engineering and math (**STEM**) in Montana.
- (2) Strive to build a Montana **aerospace workforce**, integrating women, under-represented minorities and persons with disabilities.
- (3) **Network** Montana colleges, universities, aerospace industries, and government with national aerospace programs in government and industry, especially NASA centers and other Space Grant Consortia.
- (4) Expand and enhance aeronautics and **NASA-related research** activity in Montana colleges and universities.

## SMART Objectives

### *SMART Objectives overview*

Typically, the first part of our SMART objectives is our process objective – stating what we will do. The second part gives our diversity goals; if we have offered the project in the past, we reference our past diversity numbers. Following this, we give the outcome objectives. We focus our outcome objectives on metrics we can directly influence. Unless indicated with “every year” we calculate each of our outcome objective metrics as a summary over the whole FY 2020-2024 grant period. Therefore, the deadline for these metrics is the end of the grant period.

### MSGC’s Internship SMART Objectives are to:

Competitively award interdisciplinary, hands-on, meaningful summer internships for Montana students to participate in NASA Center and local summer projects; increase the percentage of underrepresented awardees from 6% to 12% and female awardees from 32% to 50%; maintain 100% every year who present their work and/or submit a paper; have at least 90% of interns indicate that the experience positively impacted their workforce preparation significantly; maintain at least 90% of interns continue on to STEM employment or STEM advanced education.

### MSGC’s Graduate Fellowship SMART Objectives are to:

Competitively award \$9,000 (plus tuition and some fees) one-semester competitive fellowships to deserving graduate students whose work is directly related to current NASA research; increase the percentage of underrepresented awardees to 10% and female awardees from 46% to 50%; have at least 90% of fellows indicate that the support positively impacted their graduate education; maintain at least 90% of fellows continue on to STEM employment or STEM advanced education.

### MSGC’s Faculty Fellowships SMART Objectives are to:

Competitively award fellowships for Montana faculty members to create access to NASA-related training and/or professional development opportunities; maintain at least 50% of the awards at Tribal and Community Colleges; maintain at least 40% female awardees; maintain the number of Montana Faculty Fellows who mentor MSGC undergraduate research students at 75% or more; have at least 90% of fellows indicate that the award increased their research or professional capabilities.

### MSGC’s Apprenticeship SMART Objectives are to:

Competitively award Apprenticeship stipends to Montana undergraduate students involved in *major* NASA-related research projects; increase the percentage of underrepresented awardees from 8% to 12% and female awardees from 24% to 50%; maintain 100% every year who present their work and/or submit a paper; have at least 90% of apprentices indicate that the experience positively impacted their workforce preparation significantly; maintain at least 90% of apprentices continue on to STEM employment or STEM advanced education.

### MSGC’s Awards for Research in Engineering and Science (ARES) SMART Objectives are to:

Competitively award stipends to undergraduate students for STEM research; maintain at least 1/3 active Academic Affiliate Institutions participating; increase the percentage of underrepresented awardees from 10% to 12% and maintain at least 50% female awardees; maintain 100% of students presenting their work; have at least 90% of awardees indicate that the experience positively impacted their workforce preparation; have at least 80% of recipients indicate an increased likelihood to continue to a STEM career.

MSGC's hands-on student projects SMART Objectives are to:

Create interdisciplinary hands-on opportunities for Montana students to participate in NASA-related design, build, test, fly, and data analyze projects such as scientific high altitude ballooning with BOREALIS, small satellites with the Space Science and Engineering Lab (SSEL), and unmanned aerial vehicles with the Autonomous Aerial Systems Office (AASO); maintain participation of at least five Affiliate Institutions with at least one being a Tribal College; maintain high levels of rigor such that the participants are sought after for higher-level opportunities – maintain at least 75% of major awardees continue on to *aerospace science or engineering* employment or advanced education.

MSGC's Space Public Outreach Team (SPOT) SMART Objectives are to:

Through the efforts of the SPOT graduate managers and undergraduate presenters, engage 5% or more of the Montana K-12 educators and students (~300 and 7,000 respectively) each year on NASA-related science and engineering, opportunities, and careers; increase the percentage of underrepresented presenters from 6% to 12% and female presenters from 43% to 50%; have at least 75% of presenters indicate that they improved their speaking and leaderships abilities; for significant (time) presenters, maintain at least 90% who continue on to STEM employment or STEM advanced education; maintain at least 97% presenter-perceived positive reaction to presentations every year; maintain at least 80% of educators each year who indicate they will use SPOT-provided NASA materials in their classroom instruction.

MSGC's Introductory Workshop SMART Objectives are to:

Annually hold workshops to introduce undergraduates to NASA-related science and engineering content and careers; include at least 12% underrepresented and 50% female participants; have at least 75% of workshop participants indicate an increased interest in STEM careers.

MSGC's NASA Center Travel SMART Objectives are to:

Competitively award trips to students for meaningful engagement at NASA Centers; include at least 12% underrepresented and 50% female awardees; have at least 75% of Center travel participants indicate an increased interest in NASA careers.

MSGC's STEM Student Professional Skills Symposium SMART Objectives are to:

Hold an annual STEM Student Professional Skills Symposium for all students involved in MSGC programs as well as potential participants; maintain at least 100 student and faculty participants each year from at least 50% of active institutions; maintain at least a 95% participant agreement that the Symposium was beneficial every year.

MSGC’s Research Activation Grant SMART Objectives are to:

Competitively award Research Activation seed grants that help faculty members at Montana’s small institutions (all but MSU and UM) start NASA-related research projects; make awards to at least 20% Tribal Colleges and at least 40% female PIs; have at least 80% of PIs indicate an increased likelihood of proposing to higher-level research funding.

MSGC’s Student/Educator Travel Grant SMART Objectives are to:

Provide opportunities for Montana undergraduates and educators to travel for NASA-related conferences, workshops, internships, or other training; maintain at least 12% underrepresented and 50% female awardees; have at least 95% awardees indicate the travel was worthwhile.

MSGC’s Informal Engagement SMART Objectives are to:

Seek, wherever possible, to foster programs that reach across the artificial boundaries of “precollege,” “general public,” or “higher education;” continue to participate at least three times per year, on a volunteer basis, in outreach programs such as Astronomy and Aerospace Day; continue to participate, on a volunteer basis, on Montana STEM advisory boards.

MSGC’s Consortium Management SMART Objectives are to:

Annually hold meaningful Affiliates’ Meetings; maintain at least 75% Representative attendance from active Affiliates; maintain at least 90% satisfaction with the meeting each year; conduct MSGC staff visits to at least five Affiliate Campuses each year; have at least one MSGC staff member attend every Space Grant National and Western Regional meeting.

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**ACTIVITY CONTRIBUTIONS TO PERFORMANCE GOALS (PG)  
AND SUCCESS CRITERIA**

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**List appropriate FY 2020 PGs and Success Criteria and write a brief description of the project activity’s contribution to each.**

**PG 3.3.3: Provide opportunities for students to engage with NASA’s aeronautics, space, and science people, content, and facilities in support of a diverse future NASA and aerospace industry workforce.**

**PG 3.3.3 Success Criteria:** Meet or exceed the national average in two of the four categories of student diversity for NASA STEM enrollees in internships, fellowships, or other student engagement opportunities. Diversity Categories: (1) students across all institutional categories and levels (as defined by the U.S. Department of Education), (2) racially or ethnically underrepresented students (Hispanics and Latinos, African Americans, American Indians, Alaska Native, Native Hawaiians and Pacific Islanders), (3) women, and (4) persons with disabilities at percentages that meet or exceed national averages for science and engineering

enrollees, as determined by the most recent, publicly available data from the U.S. Department of Education's National Center for Education Statistics.

***Response to PG 3.3.3 and/or PG 3.3.3 Success Criteria goes here:***

Despite much searching, we cannot find any published numbers for the higher education national averages for underrepresented students, women, or persons with disabilities. Below we report our numbers with respect to our SMART Objective metrics as stated in our proposal.

(1) We support students across all institutional categories and levels, namely undergraduates at community colleges (including seven Tribal Colleges), four-year colleges, and universities, as well as graduate students at universities. Therefore, we **meet** this category.

(2) The percentage of underrepresented minority students across our Internships, Fellowships and Undergraduate Research categories is 14.5%, which **exceeds** our SMART objectives of 12%.

(3) The percentage of women across our Internships, Fellowships and Undergraduate Research categories is 44%, which is somewhat less than our SMART objective of 50%. We constantly work to achieve this goal but it is difficult when the percentage of enrolled women in many of the majors we focus on is not more than 25%. In some project categories, we do exceed our objective for 50% women, like our Awards for Research in Engineering and Science undergraduate research category.

(4) The percentage of persons with disabilities across our Internships, Fellowships and Undergraduate Research categories is 1%. We have not set metrics for persons with disabilities.

**PG 3.3.4: Enhance the effectiveness of education investments using performance assessment and evaluation-driven processes.**

**PG 3.3.4 Success Criteria:** Discuss how the Consortium has or plans to implement evaluation-driven processes to assess the overall impact of the Consortium and its activities.

***Response to PG 3.3.4 and/or PG 3.3.4 Success Criteria goes here:***

We have significantly increased our performance assessment and evaluation-driven processes in the first year of this new award. First, we have brought on a professional evaluator who is helping MSGC create official evaluation frameworks, a hybrid logic model and theory of change. We anticipate that this official document will be fully in place by the end of our first grant year - April 2021. At this stage, our evaluator is also helping us improve our evidence-based student award selection rubrics and methods. Second, we are participating in one of the two Space Grant Evaluation Awards - the small states group led by Alaska Space Grant. In this activity, we are both learning how to evaluate our effectiveness and participating in actual evaluation of our programs. Finally, we continue to constantly evaluate all our programs for effectiveness.

**PG 3.3.5: Provide opportunities for students to contribute to NASA's aeronautics, space, and science missions and work in exploration and discovery.**

**PG 3.3.5 Success Criteria:** Number of paper presentations and peer-reviewed research publications (and beginning in FY2021 to include student proposed solutions and products) resulting from STEM engagement investments. (Target number is 1,300)

***Response to PG 3.3.5 and/or PG 3.3.5 Success Criteria goes here:***

Publications, presentations, and publicly available reports that involve MTSGC students by Mission Directorate (29 total):

**ARMD (1)**

Brandon Hunt, Charles Rawlins, Bryce Hill, 2021. “An Analysis of Blade Deicing Techniques for Multi-Rotor UAV Propellers” IEEE, 978-1-7281-7436-5/21.

**HEOMD (1)**

Montana State University news article about a student built satellite, sent to space on February 20, 2021: <https://www.montana.edu/news/20881/satellite-designed-and-built-by-msu-students-set-for-saturday-launch>

**SMD (22)**

To be published soon on the NASA STEM social media pages: a feature article about our 2020 Eclipse Ballooning project, which brought teams from four Space Grant Consortia to study the December 2020 total solar eclipse in Chile.

Rudi Lien, Abstract ID: 753837; Title: Modeling Fracture Hazards at Europa for Cryobot Tunneling and Communication; Paper No: P052-06; Virtual Poster Session AGU 2020; Session P052: In Situ Science and Instrumentation for the Exploration of Europa and Ocean Worlds II

Seth Kimbrell, Amy Reines, Zach Schutte, Jenny Greene, Marla Geha (2020), The Diverse Morphologies and Structures of Dwarf Galaxies Hosting Optically-Selected Active Massive Black Holes, submitted, The Astrophysical Journal

Woody H, Spangrude C, Fowler J, Moss G (2020), Background Characterization of the Atmosphere When Looking for Eclipse-induced Gravity Waves, P050-05, presented at 2020 Fall Meeting, AGU, Online Everywhere, CA, 1-17 Dec.

Moss G, Fowler J, Spangrude C., Woody H (2020), Using the WRF-ARW Model to Visualize and Predict Atmospheric Parameters During an Eclipse, A215-0009, presented at 2020 Fall Meeting, AGU, Online Everywhere, CA, 1-17 Dec.

Goldberg B, Gonzalez-Rocha J, Naylor J, Fowler J (2020), Wind Determination Using a Rigid-Body Model of Quadrotor Motion, A012-0015, presented at 2020 Fall Meeting, AGU, Online Everywhere, CA, 1-17 Dec.

Spangrude C, Fowler J, Bernards M, Des Jardins A, Jacob J, Bailey S, Smith S (2020), Student Involvement in Collaborative Scientific Research: A Case Study from Atmospheric Gravity Wave Radiosonde Field Campaigns, ED041-09, presented at 2020 Fall Meeting, AGU, Online Everywhere, CA, 1-17 Dec.

Colligan T, Fowler J, Godfrey J, Spangrude C, 2020. "Stratospheric Internal Gravity Waves Induced by the Total Solar Eclipse of July 2, 2019" Sci Rep 10, 19428 (2020).

Robinett, R. and K. Ostovar. 2020. In-stream Barriers and Riverine Turtles. Murdock Conference presentation.

Robinett, R and K. Ostovar. 2021. Upcoming March 2020 NCUR talk. Effects of a Low-Head Dam on a Sympatric Population of Turtles.

Saarel, L. and K. Ostovar 2021. Upcoming Feb talk at the Montana Wildlife Society Conference Spiny Softshell Turtle Nesting Habitat Availability in the Yellowstone and Bighorn Rivers

Ostovar, K. October 2020. Native Turtles of Montana. Presented to MT Audubon Education Center Master Naturalist Class.

Ostovar, K., R. Robinett, L. Saarel, A Valdez. September 2020. Turtles of Montana Workshop. Talks and MSGC workshop at Rocky Mountain College.

Ostovar. K, January 2021. Wildlife as Bioindicators of Water Quality. Presented to Yellowstone Conservation District.

Ostovar, et al. 2021. (3 undergraduate student co-authors) Population Structure of the Spiny Softshell Turtle (*Apalone spinifera*) in Five Montana Rivers. [Currently in final editorial review in Chelonian Conservation Biology]

Article in Rocky Mountain College Magazine: <https://www.rocky.edu/sites/default/files/fall-2019-gg-rt.pdf>

"Land locked to open ocean: Putting a pH sensor in the hands of students?" A web story by Brady Clarke, NOAA Ocean Acidification Program

Pfeifer, Jonathan and Long, David M. "Increasing Accessibility to Ocean Carbonate Research: Developing a Low Cost Instrument for Student, Professional, and Citizen Scientists," approved for presentation at the National Council of Undergraduate Research 2020

Pfeifer, Jonathan and Long, David M. "Replicating Sunlight in the Lab: Low Cost LED Lighting System for Scientific Applications Covering the Visible Spectrum," approved for presentation at the National Council of Undergraduate Research 2020

Grossman, Makayla and Long, David M. "Quantifying Calcium Carbonate Deposition by Crustose Coralline Algae" FVCC Student Research STEM Colloquium, Spring 2020

Hickethier, Micah and Long, David M. "Quantifying the Carbon Cycle in a Model Coral Reef Ecosystem" FVCC Student Research STEM Colloquium, Spring 2020

Montana State University news article about a former MSGC Graduate Fellow winning a NASA FINESST award; October 2020: <https://www.montana.edu/news/20496/nasa-grants-allow-students-to-research-processes-on-earth>

**STMD (5)**

Lance Donald Nichols et al. (2020), Waterproof Inline Flight Termination System for Ocean Bound High Altitude Balloons, presented at 2020 Fall Meeting, AGU, Online Everywhere, CA, 1-17 Dec.

Larson Dean Brandstetter et al. (2020), Ground Based Tracking System for High Altitude Weather Balloons, presented at 2020 Fall Meeting, AGU, Online Everywhere, CA, 1-17 Dec.

Wilson Vogt et al. (2020), Altitude Control System for High Altitude Helium Weather Balloons, presented at 2020 Fall Meeting, AGU, Online Everywhere, CA, 1-17 Dec.

Wilson Vogt, Abstract ID 733370; Title: Constructing Solar and Zero Pressure High Altitude Balloons, Paper No:ED004-0020, Virtual Poster Session AGU 2020, 12.07.2020, Session ED004:Undergraduate Earth, Atmospheric, Ocean, and Space Science Research and Outreach Posters.

Article about two Native American student internship experiences with 3D printers in the Aaniiih Nakoda College newsletter, September, 2020.

**NOTE: For the following categories, complete if applicable to your base award. If not applicable, indicate “Not Applicable”.**

**BASE AWARD ACCOMPLISHMENTS: (250 – 500 words)**

Our base award funds undergraduate student research opportunities that fall under three categories; entry-level research experience (Awards for Research in Engineering and Science, ARES), major research project experience under a funded apprenticeship, and summer internships. MTSGC funded 7 ARES awards (71% female, 29% minority), 19 summer apprenticeships (32% female, 16% minority, all on funds from previous grant award), 5 summer small satellite apprenticeships (20% female, 0% minority, all on funds from previous grant award), 15 AY apprenticeships (27% female, 0% minority) and 26 internships (31% female, 8% minority). Additionally, our base award funds the following programs;

- Workshops to introduce Montana undergraduate students to research in science and engineering. 30 total students from 7 institutions participated in 3 workshops with 43% females and 17% minority. The topics for the workshops were remote sensing, astronomy, and unmanned aircraft systems.
- Graduate student fellowships with 75% female and 25% minority awardees.
- The Space Public Outreach Team (SPOT) provides FREE presentations about current NASA missions and research to Montana schools, youth programs, and community groups. Due to the pandemic, presentations have been moved to a remote format.
- BOREALIS program offers interdisciplinary hands-on opportunities for Montana students to design, build, fly, and analyze data from stratospheric balloon experiments. Student numbers are captured under internship and apprenticeship values above. BOREALIS serves as a central program of the Nationwide Eclipse Ballooning Project, which started in 2014, and brings together student teams from around the country to study solar eclipses with stratospheric balloon systems. Recently, the project sent four student teams to study atmospheric gravity waves in South America during the December 2020 total solar eclipse.
- Faculty Fellowships are designed to foster increased NASA-related research capabilities and activity on Montana campuses. Fellowships are intended to give Montana faculty members time to participate in training or professional development. In the 2020 - 2021 award year MTSGC funded 5 faculty fellowships, 20% female PIs, one each from Aaniiih Nakoda College (at TC), Carroll College, Flathead Valley Community College, Rocky Mountain College, and University of Montana. Rocky awardee Kayhan Ostovar says of the program “Summer research support for undergraduate students is one of the most challenging funding aspects we have at small institutions. MTSGC has been vital in facilitating the opportunity for many more students to engage in STEM related research.”
- Research Activation program is designed to help boost the likelihood of Montana small campus PIs proposing to higher-level research funding in areas that match scientific and technical problems of importance to NASA, and to involve students in the process. MTSGC funded 3 Research Activation awards, 67% female PIs, once from each Carroll College, Montana Learning Center, and Rocky Mountain College. Awardee Alyssa Hahn from Carroll College says of the program: “The MSGC Research Activation funding has allowed us to carry out a pilot study assessing the effects of microgravity on encapsulated chondrocytes to better understand the risk of developing osteoarthritis during or after spaceflight. The results of this study will be used as preliminary data for follow-on proposals to NASA that build on this work.”

**NCAS AND SPACE GRANT PILOT ACCOMPLISHMENTS (If applicable): (250 – 500 words)**

Not Applicable

**BIG Idea FY2020 ACCOMPLISHMENTS (If applicable): (250 – 500 words)**

Not Applicable

**FIRST NATIONS LAUNCH (If applicable): (250 – 500 words)**

In the most recent two First Nations Launch program award periods (overlapping in this MTSGC reporting period), several Montana Tribal Colleges participated. The first section below lists the participating schools for each year (this last year was strongly affected by COVID complications). Below the list are more details about participation from each school.

- Most recent program, awarded in November 2020:
  - Salish Kootenai College, mentored by Drew Grennell
- Awarded in November 2019:
  - Aaniiih Nakoda College, mentored by Dennis Johnson
  - Chief Dull Knife College, mentored by Jim Bertin
  - Little Big Horn College, mentored by Neva Tall Bear
  - Salish Kootenai College, mentored by Drew Grennell

**Aaniiih Nakoda College (ANC) – response from mentor Dennis Johnson**

ANC went to Rock On in the summer of 2019 and started the First Nations Launch in 2020. ANC quit the competition because the launch date weekend for the competition was moved to the weekend before our finals week and then the Covid happened after we quit. For the 2021 competition, because of Covid and not being able to work with the students one on one, we didn't even try to compete.

Constructive feedback from Dennis: "I don't know if I will have a team again unless there is a way to fund it up front. Instead of giving the award to the college you have to have your own money up front and then get it reimbursed. I think the \$3500 should be given to the college participating and then the receipts and everything can be returned if still needed."

**Chief Dull Knife College (CDKC) - Jim Bertin mentor**

CDKC entered the competition for the 2019-2020 year but ended up withdrawing. The competition launch was rescheduled and the students involved went on to other colleges, so CDKC was left without a team. However, CDKC progressed with our design and built far enough that they intend to use it in a future FNL effort, at least as an early means of getting new students involved in rockets. The new competition design would of course have to be entirely different.

**Little Big Horn College (LBHC) – Neva Tall Bear mentor**

LBHC has been out of contact.

**Salish Kootenai College (SKC) – Drew Grennell mentor**

SKC started this school year with the intention of competing in the 2021 First Nations Launch as well as wrapping up our participation in last year's competition which was cancelled due to COVID-19.

However, students were unable to commit to the remote nature of the competition and unexpected responsibilities tied to COVID-19 and quarantine policies. However, at the end of the 2020 competition, SKC's team won the Next Step Award which funded our team members to participate in the summer 2020 RockOn! event at NASA Wallops in Virginia. Unfortunately, that event was cancelled as well. The SKC team is now on the list to participate in the 2021 RockOn! event, which is completely remote. SKC is awaiting confirmation for our participation, but if everything is still a go, we should be working on that from March through the end of April 2021.

### **ARTEMIS STUDENT CHALLENGES (we added this category): (250 – 500 words)**

#### **Artemis Lava Tube**

Montana State University (MSU) had three summer 2020 interns that worked together in person as part of MSGC BOREALIS 2020 Summer Internship on developing the Washington Space Grant Consortium Artemis Lava Tube Challenge. The students developed a mechanical design for several different robots and tested each design. The student team developed algorithms and programs on different programming platforms for course navigation using both remote control and autonomous modes. MSU and Salish Kootenai College both have teams currently entered in the challenge which will compete on a competition course setup at MSU thru April 2021. A remote astronaut that is one of the MSU summer interns will test the robot designs on the course and provide feedback to the teams.

### **ACTIVITY IMPROVEMENTS MADE IN THE PAST YEAR:**

*(e.g. activity management, cost efficiencies) (100 – 250 words)*

We continually evaluate our programs and make improvements accordingly. Below are the improvements we put in place for this fiscal year.

- **Introductory workshops.** New for this award period, we offered student introductory workshops. The workshops are nine hours of training time, over a Friday evening and Saturday. We have already conducted three workshops this year and will offer at least one more. Each workshop has 10-12 student participants. For the first year of the grant the topics are: 1) Astronomy, held remotely in October 2020, 2) Unmanned Aerial Systems, held at the University of Montana in October 2020, 3) Remote Sensing, held at Rocky Mountain College in September 2020, and 4) High Altitude Ballooning, to be held at Montana State University in April 2021.
- **Research Activation awards.** Research Activation program is designed to help boost the likelihood of Montana small campus PIs proposing to higher-level research funding in areas that match scientific and technical problems of importance to NASA, and to involve students in the process. We convened a panel of un-conflicted Montana faculty members to review the proposals and chose three awards for funding - one from each Carroll College, Montana Learning Center, and Rocky Mountain College. Holly Basta from Rocky says of the program “This funding will open up many future undergraduate research avenues.”
- **Professional evaluation.** Information given above in “Response to PG 3.3.4”.

### **ACTIVITY PARTNERS AND ROLE OF AFFILIATES IN ACTIVITY EXECUTION:**

*Bulleted list or table. Should include a brief description of how affiliates were involved in the project activity.*

Aaniih Nakoda College: Faculty Fellowship, Research Activation, undergraduate research, Affiliates' Meeting

Blackfeet Community College: BOREALIS

Carroll College: Affiliates' Meeting, undergraduate research, Research Activation, internship, student satellites, workshop, Faculty Fellowship

Chief Dull Knife College: Affiliates' Meeting

Great Falls College - MSU: Affiliates' Meeting

Flathead Valley Community College: undergraduate research, workshop, Faculty Fellowship

Little Big Horn College: Affiliates' Meeting

Miles Community College: Affiliates' Meeting

Missoula College: Affiliates' Meeting, workshop

Montana Learning Center: Research Activation award, Affiliates' Meeting, Science Activation ROADS on Mars competition for the state of Montana

Montana State University: fellowship, BOREALIS, undergraduate research, SPOT, student satellites, Affiliates' Meeting, workshop

Montana State University-Billings: Affiliates' Meeting

Montana State University-Northern: Affiliates' Meeting

Montana Tech: undergraduate research, Affiliates' Meeting, internship, MSGC staff visit, workshop

Rocky Mountain College: undergraduate research, Faculty Fellowship, Affiliates' Meeting, internship, workshop, Research Activation,

Salish Kootenai College: Affiliates' Meeting, undergraduate research, workshop

University of Montana: fellowship, BOREALIS, undergraduate research, internship, workshop, Affiliates' Meeting, Faculty Fellowship

UM-Western: undergraduate research, Affiliates' Meeting

University of Providence: Affiliates' Meeting

**CURRENT AND PROJECTED CHALLENGES:**

*Identify any current or projected challenges in the implementation or execution of activities. Explain how the management team is working to address the challenges identified and/or how National Program Staff can assist.*

The challenges we currently face are almost all due to COVID. We are doing our best to conduct some events remotely that we normally do in person, like our Space Public Outreach Team (SPOT) program and STEM Student Professional Skills Symposium. Others, like the NASA Center travel, we will combine with the effort in our second year. The only other ongoing challenge is to recruit 50% female participants to apply to our engineering-focused programs (where higher education enrollment is 25% or less).

**REFERENCES (optional – include only if needed):**

(APA style reference list)

All publications are listed in the “Response to PG 3.3.5” section above.