



## North Dakota Space Grant Consortium (NDSGC)

Proposal Title: North Dakota Space Grant Consortium FY 2016-2017 Augmentation Proposal

Lead Institution: University of North Dakota

Dr. Santhosh Seelan  
Director, North Dakota Space Grant Consortium  
University of North Dakota  
Department of Space Studies  
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Grand Forks, ND 58202-9008  
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Email: [seelan@space.edu](mailto:seelan@space.edu)

Sign: 

## Consortium Affiliate Concurrence

### 1. Bismarck State College

I am sending an email of concurrence to the Space Grant Proposal for the next 2 years of augmentation funding for Year (2015-2018).

The NDSGC goals

1. NASA Internships, Fellowships, and Scholarships (NIFS)
2. Higher Education
3. Research Infrastructure
4. Pre-college
5. Informal Education

are very vital to students and faculty in our state of North Dakota.

Since the last time we wrote the proposal we have hired a North Dakota Space Grant Consortium coordinator and she is doing a fabulous job. Plans are underway to establish a Community College and Tribal College Fellowship Bridge Program to increase our engagement with our native community.

Our Space Grant coordinator Marissa Saad and Deputy Director Caitlin Nolby have continued doing In-service workshops. We hope to expand pre-service and In-service workshops across the state.

The Consortium has also increased support for High altitude Ballooning (in which Bismarck State College has been involved in). The expansion of under-graduate research with faculty mentorship is well underway among our affiliate colleges. I wholeheartedly concur with our proposal.

Sincerely,  
Tony Musumba, Ph.D.  
Associate Professor of Physics  
Bismarck State College  
Affiliate Member of NDSGC

*Tony Musumba, Ph.D.  
Associate Professor of Physics  
Bismarck State College  
Jack Science Center 301E  
1500 Edwards Avenue  
PO Box 5587  
Bismarck, ND 58506  
Tel 701-224-5506  
[Tony.Musumba.Mwene@bismarckstate.edu](mailto:Tony.Musumba.Mwene@bismarckstate.edu)*

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## 2. Cankdeska Cikana Community College

Good morning, our institution concurs with and fully supports the NASA Space Grant program. The internships, scholarships and research opportunities have been an excellent resources for our students to take advantage of.

-Dixie

Dixie Omen  
Financial Aid Director  
PO Box 269  
Fort Totten, ND 58335  
Ph:701-766-1374  
Fax: 701-766-1344  
[Dixie.omen@littlehoop.edu](mailto:Dixie.omen@littlehoop.edu)



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## 3. Dakota College at Bottineau

Dr. Seelan,



I am pleased to submit the following letter of support for augmentation funding for the North Dakota Space Grant Consortium (NDSGC).

As the Associate Dean for Academic Affairs at Dakota College at Bottineau (DCB), a two-year college affiliate of the NDSGC, I have witnessed first-hand the benefits of the NDSCG's undergraduate scholarship program to students at DCB. This scholarship program has generated opportunities which have fostered innovation, promoted STEM activities and experiences, and encouraged DCB students to complete programs leading to careers aligned with NASA's mission. These scholarships have resulted in increased retention and persistence to graduation for many of DCB's students.

You should be commended for the vision and innovation that went into developing the goals and priorities of the three-year strategic plan. In addition to the traditional programs which have fostered a spirit of collaboration among North Dakota's K-12 schools and post-secondary institutions, I am excited about the new initiatives you have proposed. Such initiatives will lead to a greater statewide effort to educate students, teachers, and the general public on NASA's mission and goals. In addition, these new initiative will contribute to a well-educated and highly

skilled workforce that will lead to additional STEM careers and promote economic development in North Dakota.

I wholeheartedly support the goals and priorities of the NDSGC's three-year plan. If I can be of any further assistance to you regarding your proposal, please feel free to contact me by phone at (701) 228-5457 or email at [larry.brooks@dakotacollege.edu](mailto:larry.brooks@dakotacollege.edu).

Sincerely,

Larry Brooks  
Associate Dean for Academic Affairs  
Dakota College at Bottineau

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#### 4. Dickinson State University

Dickinson State University fully supports the North Dakota Space Grant Consortium's request for augmentation funding for the next two years. The NDSGC provides extremely valuable opportunities to students throughout the state of North Dakota.

Sincerely,  
Corinne E. Brevik, Ph.D.  
Dept. of Natural Sciences  
Dickinson State University

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Dr. Corinne E. Brevik  
Dept. of Natural Sciences  
Dickinson State University  
291 Campus Drive  
Dickinson, ND 58601

Office: (701) 483-2575  
Fax: (701) 483-0526

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#### 5. Gateway to Science Center

To Whom it May Concern,  
I am fully in support of the North Dakota Space Grant proposal for supplemental funding for the next 2 years of funding (2016-2018).

Best regards,

Beth Demke  
Executive Director  
Gateway to Science  
1810 Schafer Street, Suite 1

Bismarck, ND 58501-1218  
701.258.1975 (office)  
701.220.8356 (cell)

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#### 6. Lake Region State College

Lake Region State College strongly supports the Space Grant proposal. We serve a large number of first generation, low income and minority students. Funding from the NDSGC encourages our students to excel in the STEM programs by giving them opportunity for scholarships and internships. NDSGC fellowships are an important part of our science, math and technology programs. We appreciate the support NDSGC gives our institution.

Katie Nettell  
Financial Aid Director  
Lake Region State College  
1801 N College Dr  
Devils Lake ND 58301  
701-662-1517

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#### 7. Mayville State University

Mayville State STEM Education looks forward to continued collaboration with the ND Space Grant Consortium.

Sarah Sletten  
Assistant Professor of Biology  
STEM Coordinator  
NDSTA President

Mayville State University  
Mayville, ND

Caitlin,

Mayville State University is glad to support the NASA proposal for continued and augmented funding. We look forward to continued collaboration with the Consortium.

Bob Miess  
330 Third Street NE  
Mayville, ND 58257  
[robert.miess@mayvillestate.edu](mailto:robert.miess@mayvillestate.edu)  
701-788-4885

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## 8. Minot State University

On behalf of Minot State University, I wish to express our support for funding of the North Dakota Space Grant Consortium proposal. The consortium has provided wonderful opportunities for our undergraduate students to participate in research projects and to receive scholarships that allow them to participate more fully in academics rather than focusing on funding their educations. The consortium has also provided valuable resources and personnel for K-12 teachers through its programs and also in conjunction with graduate courses offered on our campus. Continued funding for the consortium and its programs will benefit K-12 students, undergraduate students, educators and the communities they serve. It is imperative to continue funding for the North Dakota Space Grant Consortium.

Thank you for your great work on this program.

Laurie Weber  
Minot State University  
Financial Aid Director  
500 University Ave W  
Minot, ND 58707  
701-858-3875

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## 9. North Dakota Heritage Center

I would like to offer my agreement and support to the effort being undertaken by the North Dakota Space Grant Consortium on behalf of its many partners as they look to extend awareness of NASA funded education, and undertake to further connections and outreach related to it here in North Dakota. An important augmentation to the existing program is the potential to increase the reach and number of teacher pre-service and in-service workshops to provide additional content and further open possibilities and awareness of upcoming opportunities for learning and involvement with and about NASA.

As the lead educator for the State Historical Society of North Dakota, please know we support North Dakota Space Grant Consortium as together we strive to develop and expand the North Dakota workforce's knowledge of STEM based fields, encourage opportunities for women and minority students, and assist them as they engage in their futures. We will continue in our effort to assist making the citizens of North Dakota and the visitors to the State Museum in the North Dakota Heritage Center aware of NASA supported projects that are being undertaken in North Dakota.

***Erik Holland***  
Curator of Education  
State Historical Society of North Dakota  
North Dakota Heritage Center  
612 East Boulevard Avenue

Bismarck, North Dakota 58505-0830  
(701) 328-2792  
(701) 516-6847 c

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11. North Dakota State College of Science

Dear Space Grant Augmentation Committee:

This e-mail will serve as North Dakota State College of Science's concurrence with the 2016 augmentation proposal submitted by North Dakota Space Grant.

Shannon King  
NDSCS Affiliate Representative to ND Space Grant

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12. North Dakota State University

I support the Space Grant proposal.

Dan

Daniel L. Ewert, Ph.D.  
Professor, Electrical Engineering  
North Dakota State University  
Phone: 701-231-7619

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13. Nueta Hidatsa Sahnish College

Hey Caitlin, Santhosh, and Marissa,  
Affirmative!!

It is with great enthusiasm that I offer our (NHS College's) support for your proposal for a supplement to your excellent Space Grant Program! Our Students, Faculty, and College hope to continue to benefit from your program.

If possible, yes, please change our name in all places to Nueta Hidatsa Sahnish College.  
If no time, so be it.

Good!! Luck!

KH  
Dr. Kerry E. Hartman  
Academic Dean  
Chair Sciences

Nueta Hidatsa Sahnish College  
220 8th Ave. N. New Town, ND. 58763  
[khartm@nhsc.edu](mailto:khartm@nhsc.edu)  
701-627-4738 x8053

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#### 14. Sitting Bull College

Sitting Bull College continues to provide our support (as outlined in our 2015-16 letter of support below) to the ND Space Grant proposal.

Thank you for providing the much-needed NASA internships, research fellowships, scholarships, team competitions in robotics, as well as pre-service and in-service teacher workshops that are provided to SBC's students and local instructors through this wonderful program.

Donna M. Seaboy  
Financial Aid Director

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#### 15. Turtle Mountain Community College

Hi Caitlin,

Yes I am in concurrence.

Thanks, Wanda

Wanda Laducer  
Dean of Students

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#### 16. United Tribes Technical College

I concur.

Jeremy

Jeremy Guinn  
[jguinn@uttc.edu](mailto:jguinn@uttc.edu)

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17. University of North Dakota

I am in full support of the North Dakota Space Grant Consortium Augmentation Proposal.



Santhosh K. Seelan, Ph.D.  
Chester Fritz Distinguished Professor  
Chair, Department of Space Studies  
Director, ND Space Grant & ND NASA EPSCoR  
University of North Dakota  
Clifford Hall 532, 4149 University Avenue Stop 9008  
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Web address: [www.space.edu](http://www.space.edu)

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18. Valley City State University

Caitlin – I strongly concur with my past letter of support for your Space Grant proposal for augmentation!

Andre

Andre DeLorme, Ph.D.  
Chair of Science Department  
Valley City State University  
101 SW College St.  
Valley City, ND 58072  
701-845-7573

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19. Williston State College

I approve.

Lance Olson  
Williston State College

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## Proposal Executive Abstract

Under the 2015-18 NASA grant (NNX15AJ15H), the North Dakota Space Grant Consortium (NDSGC) was awarded \$430,000 for 2015-16, \$300,000 for 2016-17 and \$300,000 for 2017-18. The project as proposed under the original grant for the year 2015-16 has been successfully completed and the annual report has been submitted to NASA. In response to the announcement number NNH16ZHA002C this proposal seeks an augmentation grant of \$270,000 for 2016-17 and another \$270,000 for the year 2017-18. The Consortium is emerging with a new set of priorities and goals designed to infuse North Dakota with the knowledge, excitement, discovery, and challenge that is embodied by NASA and the all-encompassing realm of space science and exploration. As described in the three year new strategic plan that coincided with this grant cycle, NDSGC is guided by the national Space Grant mission statement, NASA Office of Education outcomes, and the Consortium's own mission statement, which is as follows:

*The North Dakota NASA Space Grant Consortium fulfills the Space Grant mission by involving North Dakota students, faculty, and K-12 teachers and students in multi-institutional, collaborative, NASA-relevant research and education projects, while also educating the North Dakota citizenry about NASA, its purpose, and its missions. Our activities will demonstrably increase the qualified STEM and technical workforce that is necessary to accomplish NASA's goals while also contributing to the general education and welfare of the North Dakota populace.*

In concurrence with the mission statement, the NDSGC has five major goals: 1) Support undergraduate/graduate student STEM experiences that will lead to enhancement of the NASA and technical workforce, 2) Nurture and grow specific Research Focus Areas (RFAs) that will develop multi-institutional, collaborative research to develop expertise in several NASA-relevant research disciplines, 3) Expand K-12 educator competence in space sciences to provide them the necessary tools to conduct investigations in the classroom, 4) Distribute scholarships and fellowships to North Dakota undergraduate and graduate students in STEM fields with an emphasis on female and American Indian and other underrepresented minority student support, and 5) Conduct public service projects that engage and educate the North Dakota citizenry of NASA's mission and activities.

To accomplish these goals, the NDSGC will continue implementation of existing successful projects as well as support innovative strategies in STEM engagement. Sample objectives as related to the aforementioned goals include: 1) Fund student experiences in NASA-relevant research, team competitions, and conference travel 2) Encourage collaboration between UND/NDSU and non-research institution affiliates in NASA- and ND-relevant areas, 3) Conduct in-service and pre-service educator workshops focused on the Next Generation Science Standards and NASA resources, 4) Implement Fellowship Bridge Program for Tribal College and Community College students in North Dakota, and 5) Engage the North Dakota populace in NDSGC-organized community projects like statewide competitions in high-altitude ballooning or K-12 student space camps. Accomplishing these new goals and objectives will be a major undertaking, but the Consortium will work to provide the time and effort to make a real difference in bringing more expansive NASA opportunities to the students, faculty, and citizens of North Dakota.

## Overarching Themes in Each Programmatic Element

### *Diversity:*

The NDSGC aims to maintain levels of involvement of females and underrepresented minorities in STEM as representative of the ND population within all programmatic elements. When compared to the national average, there is a significant population of American Indians enrolled in ND degree-granting institutions as of year 2011<sup>1</sup> (5.3%). Females and underrepresented minorities in STEM are highly encouraged to apply for the scholarships, fellowships, NASA internships, and positions in other programmatic elements as well.

The NDSGC places a significant focus on American Indian students, especially through the American Indian Scholarship. Tribal College affiliates are strongly encouraged to submit RFA proposals and participate in both high altitude ballooning (HAB) and Human Space Flight Laboratory (HSFL) activities, as well as underrepresented and female faculty at other non-research affiliate institutions. The NDSGC will increase Tribal community involvement in HAB endeavors at the college and pre-college levels, starting with classroom visits to catalyze student interest. The NDSGC also addresses diversity needs through the Pearl I. Young and Lillian Goettler Scholarships, designed to encourage female student continuation in a STEM field.

This emphasis on diversity is in direct alignment with Objective 4 of the America COMPETES Reauthorization Act, “Better Serve Groups Historically Under-represented in STEM Fields.” Goal 3 of the NASA Office of Education LOB in Institutional Engagement, Diversity, is also addressed through funding provided to students and faculty at the Tribal Colleges and through each of the NDSGC programs.

### *NASA Goals Alignment:*

The NDSGC will only fund internships that are experiential and mentor- and task-centric, fellowships that are focused on innovation and research that will contribute to NASA’s goals, and scholarships for students who are studying a STEM discipline as defined by the National Science Foundation STEM Classification.<sup>2</sup> NDSGC fellowships, Community College and Tribal College Bridge Program fellowships, internships, and GRAs awarded align with the NASA STEM Engagement LOB in providing “STEM Experiential Learning Opportunities” and support NASA Education priorities through hands-on student experiences and summer opportunities for secondary students on college campuses. NDSGC NIFS also meet the following Objectives under NASA Education Outcomes: 1.2.

The NASA student competitions align well with NASA’s Objective 2.4, in that involvement requires collaborative efforts between agencies. Under NASA Strategic Goal 3, Objective 3.1 is met in supporting both the graduate research assistantships and NASA student competitions. The annual in-service teacher workshop and the SFF program meet the element of STEM instruction improvement of Objective 4 of the America COMPETES Reauthorization Act. The hands-on learning that occurs with each NASA student competition, travel grants, course improvements made under the SFF, pre-service workshops, and participation in the *STEM Ambassadors*

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<sup>1</sup> [http://nces.ed.gov/programs/digest/d12/tables/dt12\\_265.asp](http://nces.ed.gov/programs/digest/d12/tables/dt12_265.asp)

<sup>2</sup> [https://www.lsamp.org/help/help\\_stem\\_cip\\_2010.cfm](https://www.lsamp.org/help/help_stem_cip_2010.cfm)

*Program* also “Enhance [the] STEM Experience of Undergraduate Students.”<sup>3</sup> The SFF and the NASA student competitions each align with the enhancement of STEM experiences for undergraduate students as well. NDSGC higher education programs meet the following Objectives under NASA Education Outcomes: 1.2., 1.3, 1.4, 2.1, 2.2, 2.3.

The RFA program aligns with Objective 2.2 under NASA Strategic Goals, as RFA 3) specifically addresses the need to “advance knowledge of Earth as a system.” In addition, research that focuses on environmental change is not only NASA-relevant, but uniquely relevant to ND with the recent oil boom in the Western half of the state. Objectives 1.4, 1.5, 1.6, and 1.7 are addressed through each of the NDSGC RFAs in solar physics, solar system evolution (asteroid research), universe evolution (astronomy), and innovative space technologies. Objective 3.1 is addressed through RFA projects, HAB, and the HSFL, as these experiences are aiding NASA to “attract and advance a highly skilled, competent, and diverse workforce.” Under Objective 4 of the America COMPETES Reauthorization Act, all Research Infrastructure programs address the enhancement of the STEM experience for undergraduate students, better serve groups historically underrepresented in STEM fields, and aid in designing graduate education for tomorrow’s STEM workforce, as faculty mentors are involved in each program. Hands-on student experiences, real-life problem solving, and an enhanced capacity of institutions to support innovative research infrastructure activities are all listed in the NASA Education Priorities under the NASA Office of Education LOB, and the NDSGC Research Infrastructure programs align with these goals. NDSGC research infrastructure programs meet the following Objectives under NASA Education Outcomes: 1.1, 1.2, 1.3, 1.5.

NDSGC pre-college programs align with NASA Objective 2.4, in providing students with authentic first-hand learning opportunities. Classroom visits, HAB initiatives, and NSBC all incorporate curricular support for teachers to encourage continued participation in these programs, as stated in NASA Objective 2.3. In alignment with NASA’s STEM Engagement LOB, the NDSGC pre-college programs provide both STEM Experiential Learning Opportunities and STEM challenges. These programs also reflect NASA Education Priorities of providing students with real-life problem solving and engaging middle school teachers in hands-on curriculum enhancement. In so doing, the NDSGC is working to attract a highly skilled, competent, and diverse workforce, as stated in NASA’s Strategic Goals, Objective 3.1. NDSGC higher education programs meet the following Objectives under NASA Education Outcomes: 2.1, 2.3, 2.4.

The NDSGC informal education programming increases and sustains youth and public engagement in STEM, just as Objective 4 of the America COMPETES Reauthorization Act states. Goal 5 under the NASA Office of Education LOB focuses on network/community. This is being addressed through collaborations with the ever-growing ND STEM Network, of which the NDSGC is a member. Under the STEM Engagement LOB, public education events are designed for learners of all ages with the aim of sparking interest in STEM at a young age. NDSGC higher education programs meet the following Objectives under NASA Education Outcomes: 2.4, 3.1, 3.3.

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<sup>3</sup> Section 1.5.1 America COMPETES Reauthorization Act, Space Grant Training Grant 2015-2018, NNH15ZHA003N

*Metrics and Project Evaluation:*

All students who receive funding of at least \$2500 are longitudinally tracked through the National Space Grant Foundation, an assessment that can aid in determining program impact, as students continue in STEM studies or NASA-relevant careers. Fellowship, GRAs, and internship recipients are required to submit a summary report of their research progress or results and an essay on the overall experience upon completion of their projects. A trend in the number of student applications received for NIFS funding opportunities each semester will also be an indicator of program success.

NASA student competition teams are required to submit a final report following participation in that year's competition, which will document team activities, the number of student and faculty participants, any resulting publications, and plans for future years. All recipients of summer faculty fellowships are required to submit a report on the assessment of the impact of their course redesign or research project at their institution. The impact of teacher workshops is assessed through participant evaluations and future participation in NDSGC programs.

At the conclusion of a Research Focus Area project, PIs are required to submit a progress report documenting their activities and accomplishments, along with their plans for continuing research development. Students involved in HSFL and HAB activities are required to submit reports detailing their involvement in the program, and proposals must be submitted each fiscal year for continued NDSGC funding.

FIRST Robotics teams' success will be evaluated on competition performance and required to turn in annual reports for continued funding. Students and teachers involved in HAB and NSBC will fill out evaluations throughout their involvement in the programs and these will be used not only to assess the impact of the program, but to continually improve the student experience. This same model will be followed for student participation in space camps and classroom visits.

Participants in informal education events will fill out surveys regarding their experiences to gauge program impact as well as make improvements for future iterations. The increasing number of requests for Aerospace Tours or of NDSGC participation in community events will also be used as an indicator of program success. The total number of participants will be recorded at each event to further assess the impact of the NDSGC on the community.

*Budget Assessment:*

The NDSGC will conduct quarterly meetings to assess spending in all programmatic elements and evaluate current budget levels to ensure timely spending. The NDSGC will encourage all faculty mentors of student teams to report materials and travel spending immediately upon competition performance. The NDSGC will encourage all PIs of RFAs to spend funds within the proposed project period. The NDSGC will encourage teacher mentors of all NSBC teams to report materials and travel spending immediately following the annual competition. Affiliate institutions will be encouraged to continue to utilize scholarship funding each academic year.

## **Programmatic Elements**

### ***Primary Space Grant Programmatic Elements***

#### **A. NASA Internships, Fellowships, and Scholarships (NIFS):**

The NDSGC provides funding for both undergraduate and graduate students to complete NASA internships and research fellowships as well as apply for scholarship funding. Undergraduate and graduate students at NDSGC affiliate institutions are eligible to apply for scholarship funding in one of four categories: 1) Lillian Goettler Scholarship, 2) Pearl I. Young Scholarship, 3) American Indian Scholarship, or 4) Undergraduate Scholarship. The \$2500 Lillian Goettler Scholarship was established to honor a distinguished North Dakota State University (NDSU) professor in Mechanical Engineering and is competitively awarded to a female student at NDSU in a STEM field each year. The \$2500 Pearl I. Young Scholarship was established to honor a University of North Dakota (UND) alumna who went on to become the first female physicist at NASA and is competitively awarded to a female student at UND in a STEM field each year. Five \$2500 American Indian Scholarships are each awarded to an American Indian student attending one of the five Tribal Colleges in North Dakota who is to continue his or her four-year degree in STEM at either UND or NDSU. Undergraduate scholarships are competitively awarded to students attending one of the NDSGC non-research affiliate institutions.

The NDSGC is committed to continue support for NASA student internships. Internships are competitively awarded as the NDSGC reviews all applications on the NASA One Stop Shopping Initiative (OSSI) website, and funding decisions are then shared with respective NASA centers and mentors. The competitiveness and inclusive nature of NASA internship opportunities is determined by NASA.

Applications for fellowships, the Lillian Goettler Scholarship, and the Pearl I. Young Scholarship are required to include an essay describing project goals, methodology, and NASA relevance, a resume, and a letter of recommendation from the proposed faculty mentor under whom the student will complete his or her research, in addition to meeting NASA standards for direct student funding. Starting in FY16, fellowship recipients will also be required to conduct 10 hours of NASA-relevant outreach in an effort to enhance the NDSGC's pre-college and informal education goals. Undergraduate scholarship applications must include a letter of recommendation from a faculty member in addition to meeting NASA standards for direct student funding in their applications. Undergraduate scholarship awardees are determined by the affiliate institutions' STEM departments and financial aid offices. Applicants are recruited through on-campus career fairs, visits to college classrooms, flyers, social media postings, email listservs, and affiliate representatives.

The Community College and Tribal College Bridge Program offers fellowship opportunities to students beginning in the summer of 2016. This program is open to students transferring from ND affiliate two-year colleges to UND or NDSU to complete a NASA-relevant summer research project under the advisement of UND or NDSU faculty prior to enrollment. The application and selection process for these awards are the same as the NDSGC fellowship program, yet affiliate

representatives at Tribal College and Community College Faculty will be consulted for potential participating students.

*SMART Goals:* The NDSGC will use the augmentation grant to partially and/or fully fund an additional 6 (8 total) NASA internships, 5 (9 total) fellowships, and 75 (225 total) undergraduate scholarships in FY16 and 17. In Alignment with the total fall enrollment in degree-granting postsecondary institutions in ND in 2012, the NDSGC will provide a minimum of 51% of NIFS funding to females in STEM annually.<sup>4</sup> The NDSGC will provide a minimum of 10.5% of NIFS funding annually to underrepresented minorities in STEM in alignment with the 2011 enrollment percentage in ND higher education institutions.<sup>5</sup>

#### B. Higher Education:

The NDSGC will continue to fund Graduate Research Assistantships for students to conduct NASA-relevant, space-related research. One of these GRA appointments will be designated for the student lead of North Dakota's participation in the 2017 Total Solar Eclipse High Altitude Ballooning Project. Starting in FY16, GRAs will also be required to conduct 10 hours of NASA-relevant outreach in an effort to enhance the NDSGC's pre-college and informal education goals.

The NDSGC will participate in the 2017 Total Solar Eclipse High Altitude Ballooning Project. The goal of this project is to inspire students everywhere, as well as the general public, through high altitude balloon launches carrying a common imaging payload to capture the eclipse from the stratosphere across the United States. The North Dakota Atmospheric and Educational Student Initiated Research (AESIR) Ballooning Team will travel to Rexburg, ID for the launch of the common payload on August 21, 2017. The NDSGC will send a college student team to the July 2016 workshop for training on the design and construction of the common payload. Participation in this project will allow college students hands-on engineering experience in a once-in-a-lifetime opportunity to conduct scientific experiments.

The NDSGC will continue to support the participation of student teams in national competitions organized by NASA and other industries who work toward the achievement of NASA goals. Teams include: High-Altitude Student Platform (HASP), NASA Robotics Mining Competition, NASA Student Launch Competition, AIAA Design/Build/Fly Competition, AIAA CanSat, and the NASA Rover Challenge. The NDSGC commits to continued funding of these programs with continued success and effective faculty mentorship, as demonstrated by a required yearly funding proposal for the NDSGC by each team. With the augmentation funding, the NDSGC will encourage and support more teams from other institutions in ND to compete in these competitions, and challenges with NASA-relevant goals.

The NDSGC will continue to award Summer Faculty Fellowships (SFF), open to faculty members at all affiliate institutions who wish to revise or create a college-level course that is NASA-, STEM-, or space-relevant. Research in these same fields that supports improved STEM education for students at that faculty member's institution is also permissible.

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<sup>4</sup> [http://nces.ed.gov/programs/digest/d13/tables/dt13\\_304.30.asp?current=yes](http://nces.ed.gov/programs/digest/d13/tables/dt13_304.30.asp?current=yes)

<sup>5</sup> [http://nces.ed.gov/programs/digest/d12/tables/dt12\\_265.asp](http://nces.ed.gov/programs/digest/d12/tables/dt12_265.asp)

The NDSGC will provide travel grants to students at affiliate institutions completing NASA-relevant STEM research to present research findings at conferences, an excellent networking opportunity for continuing to further education or a STEM career. There is a rolling application period, as conferences occur year-round. Students must submit to the NDSGC an accepted abstract notification, an essay describing the projected benefit of conference attendance to the student, and a letter of recommendation from a faculty mentor on the research project.

The NDSGC will continue to conduct pre-service workshops at all affiliate colleges. Each of these workshops will incorporate engaging NASA content for all K-12 levels. The NDSGC will continue to implement an annual in-service teacher workshop titled, "NASA in the Classroom." Each iteration includes new NASA-relevant hands-on investigations and NGSS alignment. With the augmentation grant, the NDSGC will commit to the support of up to 20 teachers to attend each workshop, and will conduct the workshop at a different location each year to encourage affiliate participation and attendance by teachers living in rural communities in ND. Educators will be eligible to receive one professional development credit through UND for completion of the workshop.

The NDSGC will continue to support funding for students at all affiliate institutions in the *STEM Ambassador Program*. These students are paid hourly to participate in NDSGC informal education and pre-college events. Students selected to participate in this program must meet the minimum requirements for direct NASA funding and will be required to submit an essay and letter of recommendation from a faculty member to apply. Students must be majoring in a STEM field or in Education with an emphasis in a STEM field.

*SMART Goals:* The NDSGC will use the augmentation grant to fund one additional ½ time and one ¼ time (two ½ time and two ¼ time Graduate Research Assistantships total) in FY16 and 17 in the UND Space Studies Department. The NDSGC will place a significant emphasis on increasing affiliate involvement in the college level NASA competitions. With the augmentation funding, the NDSGC will provide 2 additional summer faculty fellowships (4 total) for FY16 and 17. Each academic year, the NDSGC will conduct pre-service workshops that impact a minimum of 200 education students from affiliate colleges. The augmentation grant will allow the NDSGC to resume the annual in-service teacher workshop conducted in FY15. The NDSGC commits to funding an additional 8 *STEM Ambassadors* (10 total) in FY16 and 17. The NDSGC will also award an additional 2 student travel grants (5 total) in FY16 and 17, and at least one will be awarded to a student at a non-research affiliate institution.

### C. Research Infrastructure:

In collaboration with North Dakota NASA Experimental Program to Stimulate Competitive Research (EPSCoR), the NDSGC will continue placing an emphasis on non-research affiliate institution research projects. In 2010, five Research Focus Areas (RFAs) were selected that reflected both NASA-needs and the needs of North Dakota. The five RFAs are: 1) astronomical/planetary science research, 2) planetary space suit research, 3) Earth sciences research, 4) materials sciences research, and 5) small satellite design, development, and construction. Solicitations will be sent out each spring to all affiliate colleges requesting proposal narratives and budget summaries describing the proposed research projects. The



NDSGC will evaluate the proposals on intrinsic scientific/technical merit, budget reasonableness, NASA-relevance, ND relevance, inter-institutional, industry, and NASA collaborations, student involvement, and capability to evolve into a self-sustainable research program. On requirement of RFAs is that each project must include faculty and/or student involvement from a non-research affiliate institution.

The NDSGC will continue to fund the UND Human Space Flight Laboratory (HSFL), contingent upon continued success in research and faculty mentorship. This includes the Spacesuit Laboratory, Spacecraft Simulators, Lunar/Mars Analog Habitat, and Pressurized Electric Rover. All aspects of the HSFL include student research and hands-on experiential opportunities for both graduate and undergraduate students. This program has expanded partnerships with multiple NASA centers in research collaborations in recent years and gives students unique opportunities not offered at any other university.

The NDSGC has a growing high-altitude ballooning (HAB) program and the hands-on opportunities that result in college student research is integral to the importance of continued support from the NDSGC. Students are trained in tracking, launch, and chase procedures after designing and building their own payloads. With the augmentation funding, expansion of the program will continue to include students and faculty at affiliate institutions with the goal of these new teams conducting independent launches.

*SMART Goals:* With the augmentation funding, the NDSGC will encourage more non-research institution affiliate involvement in RFAs. The NDSGC aims to award at least one RFA each in FY16 and 17 led by a non-research affiliate institution. The augmentation funding will allow the NDSGC will expand involvement in the HSFL research projects through inclusion of a more interdisciplinary team of student researchers, from both UND and affiliate colleges, with the goal of having at least one new ND affiliate institution committed to involvement in FY16 and 17.

### ***Secondary Space Grant Programmatic Elements***

#### **A. Precollege:**

The NDSGC supports high school team participation in the annual *For Inspiration and Recognition of Science and Technology (FIRST) Robotics Competition*.<sup>6</sup> This competition challenges students to design and build their own robot to creatively complete a specific set of tasks at regional competitions. The FIRST Robotics competition consistently attracts the interest and help of student families and community members and these individuals become mentors to the students as a part of their participation in the competition. Two ND teams won regional championships and qualified for the World Championship in FY15. With augmentation funding, the NDSGC will continue to support these teams to improve their designs each year.

The NDSGC funds high-altitude ballooning (HAB) endeavors with a focus on middle school and high school teams. College students and faculty members have served as mentors to 8<sup>th</sup> grade students for entire grade-wide “Mega-launches” (four total as of FY15). The NDSGC also supports the Near-Space Balloon Competition (NSBC), in which middle and high school teams

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<sup>6</sup> <http://www.firstinspires.org/robotics/frc>

design, build, and fly their own science and engineering payloads aboard a high-altitude balloon launched by the college-level mentors. Both of these initiatives follow a NASA Project Life Cycle methodology of proposals and design reviews to give students a unique hands-on experience in a STEM field. NSBC regularly attracts the attention and involvement of local communities as well, as this statewide competition with NASA goals is an exciting opportunity for many rural North Dakota students. With the augmentation funding, the NDSGC will present at the NDSTA and NDCTM meetings, encouraging teachers of science and mathematics to mentor more teams to participate in FY16 and 17.

In FY16 and 17, the NDSGC will implementation a week-long “Space Camp” for upper elementary and middle school students. This camp will include Aerospace labs tours, NASA-relevant and hands-on investigations, and small-scale STEM competitions, embedded in an overall team mission over the duration of the camp. If successful, the program will expand to include a high school level opportunity, and a camp focused solely on K-12 female students.

The NDSGC will continue to conduct classroom visits to all K-12 levels. This includes presentations of NASA unique content and hands-on STEM investigations. Augmentation funding will allow the increased presence of the NDSGC Deputy Director, Coordinator, and STEM Ambassadors in rural and Tribal communities.

*SMART Goals:* Through the augmentation grant, the projected number of participants in NDSGC pre-college programs for FY16 and 17 is 400. With the augmentation funding, the NDSGC will fully or partially fund 2 additional teams’ participation in FIRST Robotics (3 teams total). Each academic year, the NDSGC will support one HAB grade-wide launch, with the goal of expanding this to a school district beyond the lead institution community in FY16, with an emphasis placed on Tribal Community involvement. The NDSGC will conduct its own Space Camps in FY16 and 17, with a focus on grades 3-8. The NDSGC will implement a Space Camp for Girls, and a Space Camp focused on research opportunities for grades 9-12, both in FY17. The NDSGC will continue to conduct statewide classroom visits with the goal of involving at least one school in a Tribal Community, and increasing the number of visits to rural communities as well.

#### B. Informal Education:

The NDSGC will continue to provide and support opportunities for the North Dakota populace to participate in NASA-relevant and STEM activities that not only increase awareness of NASA missions and goals, but also inspire the future generation of STEM professionals. This will be done through participation in community-, locally-, and regionally-organized events, as well as NDSGC-led engagement activities.

The NDSGC will conduct tours of the UND Aerospace labs, including the HSFL, as requested by K-12 schools, afterschool clubs, *Nurturing American Tribal Undergraduate Research and Education (NATURE)* students, prospective college students, and other special interest groups. These are interactive tours where attendees command spacecraft simulators and get a behind-the-scenes look at authentic NASA research conducted at UND. These tours may also include trips to the UND Observatory, to use the telescopes and equipment for observations. The NDSGC will

continue involvement in events organized through the Dakota Science Center, NDSGC affiliates, libraries and museums, and the ND STEM Network, which include various education and public outreach activities throughout the year.

*SMART Goals:* The projected number of participants in NDSGC pre-college programs for FY16 and 17 1000. UND's inflatable planetarium will continue to be utilized in future community outreach events. With the augmentation funding, the NDSGC will participate in an informal education event hosted by a Tribal College affiliate or held in a Tribal Community in FY16 and 17 to encourage STEM and NASA involvement of American Indian students and their families and to encourage participation in subsequent years. The NDSGC will conduct more informal education events in FY16 and 17 than were held earlier through the connections made with the ND STEM Network.

### **Consortium Operations**

The NDSGC Director is responsible for budget creation, research infrastructure programming, strategic planning, annual report submission, student funding selections (NIFS) and developing partnerships around the state that advance the Space Grant mission. The Deputy Director will assist in Director duties, as well as be responsible for program development, implementation, and assessment; maintaining working relationships with the affiliates, state, and local agencies; higher education programming; increasing the social media presence of the NDSGC; conducting pre-service and in-service teacher workshops; and APD and OEPM writing. The Coordinator will assist in Deputy Director duties as well as be responsible for informal education programming, pre-college programming, expanding the NDSGC affiliate network, organizing the Annual Affiliates Meeting, compiling data for the NDSGC annual newsletter: *The Aurora*, and taking queries from students, faculty, and the general public.

Budget assistance comes from a finance manager within UND's School of Aerospace. A graphic design artist also at the lead institution in the Department of Space Studies, aids in the design and creation of educational materials used in pre-college and informal education programming, as well as the layout for the NDSGC's annual newsletter, *The Aurora*.

#### *Collaborations and Partnerships Outside of the Consortium:*

The NDSGC holds a partnership with the North Dakota Teacher Center Network (NDTCN), whose mission is to "assist practicing teachers, education students and other educational personnel in professional knowledge and skill development to improve the learning of students."<sup>7</sup> The NDCTN keeps the NDSGC informed of educator professional development opportunities, and aids the NDSGC in disseminating STEM and NASA opportunities that are relevant to ND educators. The NDSGC has formed strong connections with the North Dakota Science Teachers Association (NDSTA) and the North Dakota Council of Teachers of Mathematics (NDCTM) through sessions conducted at their conferences. The NDSGC sees value in continued involvement with the NDTCN as students at K-12 levels are beginning their journey in the STEM pipeline, and will eventually graduate to NDSGC activities in higher education.

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<sup>7</sup> <http://www2.edutech.nodak.edu/tcn/>

The NDSGC is a member of the ND STEM Network, headquartered at Valley City State University, an NDSGC affiliate institution. The main goals of the ND STEM Network are to, “Pursue policies and funding to support STEM education,” and to, “Increase high school graduation rates and increase the number of those graduates that are prepared to pursue STEM degrees, certifications, and careers.”<sup>8</sup> This is in direct alignment with the SMART goals of the NDSGC. This partnership has connected the NDSGC to other organizations in the state who collaborate with the consortium on pre-college and informal education projects.

The NDSGC maintains strong positive relationships with the state and local legislators in securing match funding for the consortium. Because of this, the NDSGC understands that attendance at legislative biennial meetings must be maintained, as well as working relationships with legislators to ensure the continued support of the state and local governments of NDSGC programming.

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<sup>8</sup> <http://ndstem.vcsu.edu/>

**North Dakota Space Grant Consortium -- FY 2016 Budget - Augmentation**  
**Period of Performance: 04/23/16-04/22/17**

<b>Description</b>	<b>NASA MM</b>	<b>MATCH MM</b>	<b>NASA BUDGET</b>	<b>MATCH BUDGET</b>	<b>TOTAL BUDGET</b>
<b>FACULTY:</b>					
Seelan, Santhosh (Director)	0.00	0.00	\$0	\$0	\$0
Hardersen, Paul	0.00	0.33	\$0	\$3,100	\$3,100
Casler, James	0.00	0.33	\$0	\$3,572	\$3,572
Fevig, Ron	0.00	0.67	\$0	\$5,971	\$5,971
Rygalov, Vadim	0.00	0.33	\$0	\$3,027	\$3,027
Dodge, Michael	0.00	0.25	\$0	\$2,003	\$2,003
Gaffey, Michael	0.00	0.33	\$0	\$3,849	\$3,849
<b>TOTAL FACULTY SALARIES</b>			<b>\$0</b>	<b>\$21,522</b>	<b>\$21,522</b>
<b>STAFF</b>					
Nolby, Caitlin	0.00	0.00	\$0	\$0	\$0
Saad, Marissa	0.00	2.72	\$0	\$9,806	\$9,806
Admin. Asst.	0.00	0.00	\$0	\$0	\$0
ASN Personnel	0.00	0.00	\$0	\$0	\$0
Graphic Artist	0.00	0.00	\$0	\$0	\$0
<b>TOTAL STAFF SALARIES</b>			<b>\$0</b>	<b>\$9,806</b>	<b>\$9,806</b>
<b>STUDENTS</b>					
Graduate Assistants	11.25	0.00	\$41,895	\$0	\$41,895
Student Assts			\$5,790	\$2,947	\$8,737
<b>TOTAL STUDENTS</b>			<b>\$47,685</b>	<b>\$2,947</b>	<b>\$50,632</b>
<b>TOTAL DIRECT SALARIES</b>			<b>\$47,684</b>	<b>\$34,274</b>	<b>\$81,959</b>
<b>FRINGE BENEFITS</b>			<b>\$4,189</b>	<b>\$10,869</b>	<b>\$15,058</b>
<b>SUBTOTAL PERSONNEL</b>			<b>\$51,874</b>	<b>\$45,143</b>	<b>\$97,017</b>
<b>OPERATING EXPENSES</b>					
Scholarships/Fellowships			\$70,000	\$30,000	\$100,000
Student Participant Interns at NASA Centers			\$30,000	\$12,000	\$42,000
Tribal College and Community College Bridge Fellowship Program			\$5,000	\$2,000	\$7,000
Graduate Tuition			\$15,000	\$0	\$15,000
Fees: Summer Faculty Fellowships			\$8,000	\$1,000	\$9,000
Longitudinal tracking			\$0	\$0	\$0
Subcontracts/Research Focus Areas			\$0	\$40,000	\$40,000
Materials and Supplies:			\$0	\$1,000	\$1,000
Informal Education			\$500	\$0	\$500
Design/Build/Fly Competition			\$1,000	\$1,000	\$2,000
High Altitude Balloon Launches			\$2,500	\$0	\$2,500
Human Spaceflight Laboratory			\$3,000	\$3,000	\$6,000
In-Service Educator Workshops			\$1,500	\$500	\$2,000
Middle School Mega-Launches			\$1,000	\$0	\$1,000
Near Space Balloon Project			\$1,000	\$500	\$1,500
Pre-Service Educator Workshops			\$5,000	\$1,000	\$6,000
Robotics Mining Competition			\$1,000	\$1,000	\$2,000
Rover Challenge			\$1,000	\$1,000	\$2,000
Eclipse			\$1,000	\$0	\$1,000
Space Camp			\$500	\$500	\$1,000
Student Launch Competition			\$1,500	\$500	\$2,000
Travel: Annual ND Mtg, National Meeting & Western Regional Mtg			\$5,000	\$5,000	\$10,000
Informal Education			\$500	\$500	\$1,000
Design/Build/Fly Competition			\$1,000	\$1,000	\$2,000
FIRST Robotics competitions Registration			\$4,000	\$3,000	\$7,000
High Altitude Balloon Launches			\$500	\$500	\$1,000
In-Service Educator Workshops			\$500	\$500	\$1,000
Middle School Mega-Launches			\$500	\$500	\$1,000
Near Space Balloon Competition travel			\$250	\$750	\$1,000
Pre-Service Educator Workshops			\$0	\$1,000	\$1,000
Robotics Mining Competition			\$2,000	\$0	\$2,000
Rover Challenge			\$2,000	\$0	\$2,000
Eclipse			\$5,120	\$0	\$5,120
Space Camp			\$0	\$0	\$0
Student Launch Competition			\$0	\$2,000	\$2,000
Student Space Participant Travel			\$500	\$500	\$1,000
Student Travel Grants/Conferences			\$500	\$500	\$1,000
<b>SUBTOTAL OPERATING EXP.</b>			<b>\$170,870</b>	<b>\$110,750</b>	<b>\$281,620</b>
<b>Total Direct Costs</b>			<b>\$222,744</b>	<b>\$155,893</b>	<b>\$378,637</b>
<b>Indirect cost expense (35.6%)</b>			<b>\$47,257</b>	<b>\$44,106</b>	<b>\$91,363</b>
<b>TOTAL BUDGET</b>			<b>\$270,000</b>	<b>\$200,000</b>	<b>\$470,000</b>

North Dakota Space Grant Consortium -- FY 2017 Budget - Augmentation

Period of Performance: 4/23/17-4/22/18

Description	Program	NASA MM	MATCH MM	NASA BUDGET	MATCH BUDGET	TOTAL BUDGET
<b>FACULTY:</b>						
Seelan, Santhosh (Director)		0.00	0.00	\$0	\$0	\$0
Hardersen, Paul		0.00	0.33	\$0	\$3,193	\$3,193
Casler, James		0.00	0.33	\$0	\$3,679	\$3,679
Fevig, Ron		0.00	0.50	\$0	\$4,590	\$4,590
Rygalov, Vadim		0.00	0.33	\$0	\$3,117	\$3,117
Dodge, Michael		0.00	0.15	\$0	\$1,238	\$1,238
Gaffey, Michael		0.00	0.33	\$0	\$3,849	\$3,849
TOTAL FACULTY SALARIES				\$0	\$19,666	\$19,666
<b>STAFF</b>						
Nolby, Caitlin		0.00	0.00	\$0	\$0	\$0
Saad, Marissa		0.00	2.97	\$0	\$11,028	\$11,028
Admin. Asst.		0.00	0.00	\$0	\$0	\$0
ASN Personnel		0.00	0.00	\$0	\$0	\$0
Graphic Artist		0.00	0.00	\$0	\$0	\$0
TOTAL STAFF SALARIES				\$0	\$11,028	\$11,028
<b>STUDENTS</b>						
Graduate Assistants		11.25	0.00	\$43,152	\$0	\$43,152
Student Assts				\$4,407	\$3,587	\$7,994
TOTAL STUDENTS				\$47,559	\$3,587	\$51,146
TOTAL DIRECT SALARIES				\$47,558	\$34,281	\$81,840
FRINGE BENEFITS				\$4,315	\$10,863	\$15,178
SUBTOTAL PERSONNEL				\$51,873	\$45,144	\$97,017
<b>OPERATING EXPENSES</b>						
Scholarships/Fellowships				\$70,000	\$30,000	\$100,000
Student Participant Interns at NASA Centers				\$30,000	\$12,000	\$42,000
Tribal College and Community College Bridge Fellowship Program				\$5,000	\$2,000	\$7,000
Graduate Tuition				\$15,000	\$0	\$15,000
Fees: Summer Faculty Fell; Summer Faculty Fellowships				\$8,000	\$1,000	\$9,000
Longitudinal tracking				\$0	\$0	\$0
Subcontracts/Research Fo Research Focus Area Awards				\$0	\$40,000	\$40,000
Materials and Supplies:				\$0	\$1,000	\$1,000
Informal Education				\$500	\$0	\$500
Design/Build/Fly Competition				\$1,000	\$1,000	\$2,000
High Altitude Balloon Launches				\$2,500	\$0	\$2,500
Human Spaceflight Laboratory				\$3,000	\$3,000	\$6,000
In-Service Educator Workshops				\$1,500	\$500	\$2,000
Middle School Mega-Launches				\$1,000	\$0	\$1,000
Near Space Balloon Project				\$1,000	\$500	\$1,500
Pre-Service Educator Workshops				\$5,000	\$1,000	\$6,000
Robotics Mining Competition				\$1,000	\$1,000	\$2,000
Rover Challenge				\$1,000	\$1,000	\$2,000
Eclipse				\$1,000	\$0	\$1,000
Space Camp				\$500	\$500	\$1,000
Student Launch Competition				\$1,500	\$500	\$2,000
Travel: Annual ND Mtg, National Meeting & Western Regional Mtg				\$5,000	\$5,000	\$10,000
Informal Education				\$500	\$500	\$1,000
Design/Build/Fly Competition				\$1,000	\$1,000	\$2,000
FIRST Robotics competitions Registration				\$4,000	\$3,000	\$7,000
High Altitude Balloon Launches				\$500	\$500	\$1,000
In-Service Educator Workshops				\$500	\$500	\$1,000
Middle School Mega-Launches				\$500	\$500	\$1,000
Near Space Balloon Competition travel				\$250	\$750	\$1,000
Pre-Service Educator Workshops				\$0	\$1,000	\$1,000
Robotics Mining Competition				\$2,000	\$0	\$2,000
Rover Challenge				\$2,000	\$0	\$2,000
Eclipse				\$5,120	\$0	\$5,120
Space Camp				\$0	\$0	\$0
Student Launch Competition				\$0	\$2,000	\$2,000
Student Space Participant Travel				\$500	\$500	\$1,000
Student Travel Grants/Conferences				\$500	\$500	\$1,000
SUBTOTAL OPERATING EXP.				\$170,870	\$110,750	\$281,620
Total Direct Costs				\$222,743	\$155,894	\$378,637
Indirect cost expense (35.6%)				\$47,257	\$44,106	\$91,363
TOTAL BUDGET				\$270,000	\$200,000	\$470,000

North Dakota Space Grant Consortium -- FY16/FY17 Augmentation Summary

Description	NASA	Match
Seelan, Santhosh (Director)	-	-
Hardersen, Paul	-	6,293
Casler, James	-	7,251
Fevig, Ron	-	10,560
Rygalov, Vadim	-	6,144
Dodge, Michael	-	3,240
Gaffey, Michael	-	7,699
<b>TOTAL FACULTY SALARIES</b>	<b>-</b>	<b>41,188</b>
Nolby, Caitlin	-	-
Saad, Marissa	-	20,834
Admin. Asst.	-	-
ASN Personnel	-	-
Graphic Artist	-	-
<b>TOTAL STAFF SALARIES</b>	<b>-</b>	<b>20,834</b>
Graduate Assistants	85,047	-
Student Assts	10,197	6,534
<b>TOTAL STUDENTS</b>	<b>95,243</b>	<b>6,534</b>
<b>TOTAL DIRECT SALARIES</b>	<b>95,243</b>	<b>68,556</b>
<b>FRINGE BENEFITS</b>	<b>8,504</b>	<b>21,732</b>
<b>SUBTOTAL PERSONNEL</b>	<b>103,747</b>	<b>90,287</b>
<b>OPERATING EXPENSES</b>		
Scholarships/Fellowships	140,000	60,000
Student Participant Interns at NASA Centers	60,000	24,000
Tribal College and Community College Bridge Fellowship Program	10,000	4,000
Graduate Tuition	30,000	-
Fees: Summer Faculty Fellowships	16,000	2,000
Longitudinal tracking	-	-
Subcontracts/Research Focus Areas	-	80,000
Materials and Supplies:	-	2,000
Informal Education	1,000	-
Design/Build/Fly Competition	2,000	2,000
High Altitude Balloon Launches	5,000	-
Human Spaceflight Laboratory	6,000	6,000
In-Service Educator Workshops	3,000	1,000
Middle School Mega-Launches	2,000	-
Near Space Balloon Project	2,000	1,000
Pre-Service Educator Workshops	10,000	2,000
Robotics Mining Competition	2,000	2,000
Rover Challenge	2,000	2,000
Eclipse	2,000	-
Space Camp	1,000	1,000
Student Launch Competition	3,000	1,000
Travel: Annual ND Mtg, National Meeting & Western Regional Mtg	10,000	10,000
Informal Education	1,000	1,000
Design/Build/Fly Competition	2,000	2,000
FIRST Robotics competitions Registration	8,000	6,000
High Altitude Balloon Launches	1,000	1,000
In-Service Educator Workshops	1,000	1,000
Middle School Mega-Launches	1,000	1,000
Near Space Balloon Competition travel	500	1,500
Pre-Service Educator Workshops	-	2,000
Robotics Mining Competition	4,000	-
Rover Challenge	4,000	-
Eclipse	10,240	-
Space Camp	-	-
Student Launch Competition	-	4,000
Student Space Participant Travel	1,000	1,000
Student Travel Grants/Conferences	1,000	1,000
<b>SUBTOTAL OPERATING EXP.</b>	<b>341,740</b>	<b>221,500</b>
Total Direct Costs	445,487	311,787
Indirect cost expense (35.6%)	94,513	88,212
<b>TOTAL BUDGET</b>	<b>540,000</b>	<b>400,000</b>





Budget Narrative and Details

*Faculty and Staff:*

The Consortium management includes the Director, Dr. Santhosh Seelan; the Deputy Director, Caitlin Nolby; and the Coordinator, Marissa Saad. The below tables reflect a 4% increase in salaries in subsequent years.

FY16 Key Personnel Budget Breakdown - *Base*

<b>Position</b>	<b>Measurement</b>	<b>NASA Funding</b>	<b>Match Funding</b>
Santhosh Seelan, Director	Dollars	\$35,607	\$0
	Time	3 months	0
Caitlin Nolby, Deputy Director	Dollars	\$47,699	\$0
	Time	12 months	0
Marissa Saad Coordinator	Dollars	\$607	\$29,985
	Time	.18 months	9.1 months

FY16 Base Key Personnel Budget Breakdown - *Augmentation*

<b>Position</b>	<b>Measurement</b>	<b>NASA Funding</b>	<b>Match Funding</b>
Santhosh Seelan, Director	Dollars	\$0	\$0
	Time	0	0
Caitlin Nolby, Deputy Director	Dollars	\$0	\$0
	Time	0	0
Marissa Saad Coordinator	Dollars	\$0	\$12,618
	Time	0	3.5 months

FY17 Key Personnel Budget Breakdown - *Base*

<b>Position</b>	<b>Measurement</b>	<b>NASA Funding</b>	<b>Match Funding</b>
Santhosh Seelan, Director	Dollars	\$37,031	\$0
	Time	3 months	0
Caitlin Nolby, Deputy Director	Dollars	\$49,607	\$0
	Time	12 months	0
Marissa Saad Coordinator	Dollars	\$0	\$30,922
	Time	0	9.03 months

FY17 Key Personnel Budget Breakdown - *Augmentation*

<b>Position</b>	<b>Measurement</b>	<b>NASA Funding</b>	<b>Match Funding</b>
Santhosh Seelan, Director	Dollars	\$0	\$0
	Time	0	0
Caitlin Nolby, Deputy Director	Dollars	\$0	\$0
	Time	12 months	0
Marissa Saad Coordinator	Dollars	\$0	\$11,139
	Time	0	3 months

In addition to the key personnel positions listed in the previous tables, an Administrative Assistant receives 3.75 months of salary to provide administrative support for the NDSGC and a

Graphic Artist receives 4.1 months of salary for the design, development, and printing of the NDSGC newsletter, *The Aurora*, and designing pamphlets, flyers, brochures, educational resources, and other electronic and print media for NDSGC events and activities.

With the augmentation grant, six faculty from the UND Department of Space Studies will provide 1 month of salary match each in FY16 and FY17. This graduate program has a significant online presence at space.edu for both a master's degree in Space Studies and a PhD in Aerospace Sciences (each offered online and on-campus). "ASN Personnel" refers to UND Aerospace Services Network (ASN) personnel who provide 2.78 months of salary match in FY16 and FY17 augmentation budgets. These personnel provide support for space.edu online education described in the Higher Education section of this proposal and maintenance of the NDSGC website (ndspacegrant.und.edu) which houses general information about the consortium and funding applications.

*Students:*

The augmentation award will allow for one additional ½-time GRA and one ¼ time GRA each year for FY16 and FY17 (two ½ time and two ¼ time total with base funding). Funded GRAs are expected to conduct M.S. thesis research in an area within UND Space Studies. Tuition remission for GRAs is included as line item "Graduate Tuition." The student assistants are the hourly paid positions of the *STEM Ambassadors* program, described in the higher education section of the proposal.

*Fringe Benefits:*

The UND personnel fringe rate is estimated at 30% for faculty, 45% for staff and 10% for graduate assistant using historical information; actual fringe benefits will be charged to the project.

*Operating Expenses:*

Scholarships/Fellowships: These awards will be given at each of the NDSGC affiliate colleges and universities. These include the undergraduate scholarships, Pearl I. Young Scholarship, Lillian Goettler Scholarship, and American Indian Scholarships. The research fellowships are awarded to undergraduate and graduate students enrolled at an NDSGC affiliate institution each semester. These opportunities are described in more detail in the NIFS section.

Student Participant Interns at NASA Centers: This funding refers to the NASA center internships awarded to graduate and undergraduate students enrolled at an NDSGC institution of higher education. These awards are described in the NIFS section of the proposal.

Tribal College and Community College Bridge Fellowship Program: This line item includes fellowship funding designated to students transferring to NDSU or UND from one of the NDSGC affiliate Tribal or Community Colleges. This \$3500 fellowship funding is for the undergraduate student to complete research at UND or NDSU the summer prior to enrollment. The augmentation award will allow for two additional awards each year, in FY16 and FY17 (three total student awards with base funding).

Summer Faculty Fellowships (SFF): These awards are provided to NDSGC faculty to develop or revise NASA-relevant college courses or complete STEM research projects. At \$4500 each, the

augmentation award allows for two additional awards each year in FY16 and FY17 (four total awards each year with base funding).

Longitudinal tracking: This includes the yearly fees paid to the National Space Grant Foundation as support for North Dakota's student longitudinal tracking efforts. The NDSGC has implemented a comprehensive longitudinal tracking program for all significantly supported students funded by its programs. The system utilizes automated, customizable surveys requests to gather up-to-date information on the participant's history of NASA program involvement, education, employment and antidotal responses regarding the impact of their participation on their education and careers. When participants are not responsive to the surveys the system utilizes automated and manual searches on popular social media sites such as Facebook, LinkedIn, and Google+; university websites; and on-line employer databases. Based upon the available information, the system can also gather information from the participant's mentors and faculty advisers. For participants who do not respond to the surveys, we call the participant when a phone number is available. In the last 5 years we were able to determine over 85% of our participant's next-step and 90% of these go onto STEM disciplines.

Research Focus Area Awards: Proposals will be solicited from faculty at NDSGC institutions for Research Focus Area (RFA) awards. The work statement for these awards is unknown but proposals will be encouraged to align with the state's RFAs (described in the research infrastructure section of the proposal), but meritorious, NASA-relevant projects in other areas may also be approved. This funding, which will be administered in the form of a general subcontract for affiliate organizations or in a separate project for lead institution awards. The exact budget for these RFA awards is unknown but they may include materials and supplies, travel to NASA field centers, student stipends, and/or one month of faculty salary for approved projects. Awardees at Consortium affiliate institutions will be able to draw funds from the subcontract for approved funding only.

*The following budget items include requests for materials and supplies funding.*

Office, Printing Communications: This line item includes office (binders, storage media, etc.), communications (local, long distance, line charges), printing to include the annual NDSGC newsletter and other Space Grant related materials and supplies.

Human Spaceflight Laboratory: A materials budget is included for this UND faculty and student research which includes space suits, rover, habitat, simulators, and other research projects related to human factors in space exploration. This is described in detail in the Research Infrastructure section of the proposal.

*The following budget items include requests for travel funding.*

Annual ND Mtg, National Meeting, and Western Regional Meeting: Travel funding will support the Director, Deputy Director, and Coordinator for attendance at two Space Grant meetings per year. When appropriate, the Finance Manager who supports the NDSGC may also be in attendance. One affiliate member and/or student is also invited to attend one of these annual meetings to present on NDSGC research or project involvement. Each spring, these meetings

will be in Washington DC. The fall 2017 National Meeting will be in Grand Forks, AZ. Future fall meeting locations are unknown. The duration of each trip will be ~1-5 days (including travel days before/after meetings). The airfare for the Spring Meeting each year is ~\$600 roundtrip from Grand Forks, ND. The per diem in Washington DC is \$71.00. The only travel costs associated with the ND national meeting will be for affiliate institution attendance. The Annual North Dakota Affiliates Meeting will be held at a rotating location in the state. Costs for this meeting include meals provided, per diem, mileage reimbursement or state vehicles, and lodging. NDSGC funded students and faculty may attend this meeting to present on projects or research as well. This category of funding also includes meeting registration fees and other transportation/lodging costs not specifically addressed.

FIRST Robotics Competitions Registration: The Consortium provides travel and support funding for up to five FIRST Robotics team competitions plus funding to regional and national competitions, if applicable. These competitions are described in detail in the pre-college section of the proposal.

Student Space Participant Travel: In FY16 and 17, up to four students will receive up to \$500 each in travel support from the NDSGC to complete an internship at a NASA center.

Student Travel Grants: The NDSGC awards up to \$500 each to students who will be presenting NASA- or STEM-relevant research at a local, regional, or national conference. This opportunity is described in detail in the higher education section of the proposal.

*The following budget items include requests for both materials and travel funding.*

Informal education: This line item can include events organized by the NDSGC (public telescope observation at the UND Observatory, UND Aerospace Tours, NASA Mission-related outreach events, etc.) or NDSGC support/participation in events organized externally (*Super Science Day*, affiliate institution family education events, *Marketplace for Kids*, public library events, FIRST Lego League Tournament, etc.). This may include funding for materials & supplies, event meals or per diem for volunteers, and/or travel and lodging for the event.

Design/Build/Fly Competition: This is a national student competition, traditionally with an NDSU team competing. The NDSGC budget includes travel funding for a team to attend the annual competition and materials funding for their aircraft. This competition is described in detail in the higher education section.

High Altitude Balloon Launches: This includes funding for materials: helium, payload and balloon materials, etc. and travel: student and volunteer per diem, mileage, etc. (for chase and retrieval.) These college-level launches are described in the research infrastructure section of the proposal. This also includes funding for the High Altitude Student Platform (HASP), a national college-level competition that has traditionally included a team from UND. This competition is described in detail in the higher education section of the proposal.

In-service Educator Workshops: This refers to the *NASA in the Classroom* annual workshop to be conducted as a fifteen-hour workshop (spread over multiple days or weeks) for ND K-12

educators and will grant them one professional development credit for participation. Teachers will receive travel funding for attendance (per diem/meals provided, lodging, mileage) and NDSGC personnel will also receive travel funding as this is a rotating location workshop. Materials included will be hands-on investigation materials and educational resources that each participant can bring back to the classroom upon workshop completion. This is described in detail in the higher education section of the proposal.

Middle School Mega Launches: This refers to the high altitude balloon launches conducting with North Dakota middle school students and is inclusive of an entire grade (more if it is a rural school with fewer students). The budget requests travel funding (e.g. mileage or school bus rental for launch, chase, and retrieval of balloon and payloads for college student and faculty volunteers and K-12 students and teachers) and materials (helium and payload materials). These are described in detail in the Pre-college section of the proposal.

Near-Space Balloon Competition: This refers to NSBC, the statewide high altitude balloon competition for middle and high school student teams. The budget requests travel funding (e.g. mileage or school bus rental for launch, chase, and retrieval of balloon and payloads for college student and faculty volunteers and K-12 students and teachers) and materials (helium and payload materials). The winning team may also receive a NDSGC-sponsored school field trip within North Dakota that is NASA- or STEM-relevant (e.g. Gateway to Science Center in Bismarck, ND) and includes items like museum admission or school bus rental. These are described in detail in the Pre-college section of the proposal.

Pre-service educator workshops: The NDSGC team will conduct pre-service workshops at affiliate colleges and universities for education students each year. The budget requests materials funding for educational resources and classroom ready hands-on investigations, and travel funding so that workshops can be conducted statewide. These are described in detail in the higher education section of the proposal.

Robotics Mining Competition: This is a national NASA student competition, traditionally with a UND team competing. The NDSGC budget includes travel funding for a team to attend the annual competition and materials funding for their robot. This competition is described in detail in the higher education section.

Rover Challenge: This is a national NASA student competition, traditionally with an NDSU team competing. The NDSGC budget includes travel funding for a team to attend the annual competition and materials funding for their rover. This competition is described in detail in the higher education section.

Eclipse: This line item refers to the 2017 Total Solar Eclipse Project with high altitude balloon launches. The budget includes travel funding to attend a July workshop for training on the design and construction of the common payload. The proposed budget includes funding for a faculty/staff/student team to travel to the workshop and final launch on August 21, 2017. The materials budget includes funding for helium, payload construction, ground station, and additional science/engineering payloads for test launches and the final launch.

Space Camp: This is a day camp for K-12 students that will take place on UND campus (travel included in FY15 for a small scale high altitude balloon launch, chase, and retrieval) each summer throughout the three-year duration of the proposal. Materials include resources for hands-on investigations like high altitude payload design or rocket building. The budget also requests funding for student meals or snacks. This initiative is described in detail in the pre-college section of the proposal.

Student Launch Competition: This is a national NASA student competition, traditionally with a UND team competing. The NDSGC budget includes travel funding for a team to attend the annual competition and materials funding for their rocket. This competition is described in detail in the higher education section.

Indirect Costs (IDC) – This includes IDC at the University’s approved rate of 35.6% for other sponsored projects. It is based on modified total direct costs which exclude fellowships/scholarships, graduate tuition waivers, equipment greater than \$5,000 and subcontracts in excess of the first \$25,000 for each award.

The North Dakota Legislature traditionally provides a cash match to the NDSGC and we foresee this continuing into the future.

## Appendix

### Summary Table of SMART Objectives

Diversity encouragement is present in each SMART Objective. NIFS = NASA Internships, Scholarships and Fellowships. HE = Higher Education. RI = Research Infrastructure. P-C = Pre-college. IE = Informal Education, POP = Period of Performance.

Program	Verb	Metric	Population	Object	Goal	Timeframe
NIFS	Fund	NIFS awarded	College students	Females	51%	Annually
NIFS	Fund	NIFS awarded	College Students	Underrep. Minorities in STEM	10.5%	Annually
NIFS	Fund	# of NASA Internships	College Students	College Students	8	Annually
NIFS	Fund	# of Fellowships	College Students	College Students	9	Annually
HE	Fund	# of GRAs funded	UND SpSt Graduate Students	UND SpSt Graduate Students	4	Annually
HE	Involve	# Involved in NASA student competitions	Affiliate Institutions	≥ 1 team from non-research Institutions	5	Annually
HE	Fund	# of SFF awarded	Affiliate Institution Faculty	Non-research Institutions Faculty	4	Annually
HE	Provide	# of students attending pre-service workshops	College students	Education students at affiliate colleges	200	Annually
HE	Fund	# of STEM Ambassadors	College Students	STEM passionate college students	10	Annually
HE	Provide	# of teachers at in-service workshop	In-service teachers	In-service teachers	15	Annually
HE	Fund	# of travel grants	College students	≥ 1 from non-research affiliate institution	5	Annually
RI	Participate	# of RFAs funded	Affiliate Institutions	Faculty, Students	2	POP
RI	Participate	# HSFL activities funded	Non-research affiliate colleges	Faculty , Students	2	POP
P-C	Participate	# of HAB “mega-launches”	8 <sup>th</sup> grade classes	Rural or Tribal community school	2	POP
P-C	Participate	# of classroom visits	K-12 classrooms	Rural or Tribal community school	2	POP
P-C	Fund	# of FIRST Robotics Teams	High School students	Rural or Tribal community school	3	Annually
P-C	Participate	# of NSBC teams	Students grades 6-12	Rural or Tribal community schools	6	Annually
P-C	Participate	# of Space Camp attendees	Students grades K-8	Rural or Tribal community students	15	Annually
IE	Participate	# of participants at outreach events	ND general public	Especially rural and Tribal community	1000	Annually