North Dakota Space Grant Consortium (NDSGC)

Proposal Title: North Dakota Space Grant Consortium FY 2015-2018 Proposal
Lead Institution: University of North Dakota

Dr. Santhosh Seelan
Director, North Dakota Space Grant Consortium
University of North Dakota
Department of Space Studies
Clifford Hall Room 532
4149 University Ave Stop 9008
Grand Forks, ND 58202-9008
Phone: 701-777-2355
Email: seelan@space.edu

Sign: Feb 17, 2015

Dr. Harmon Abrahamson
Interim Associate VP for Research & Economic Development
University of North Dakota
Twamley Hall, Room 105
264 Centennial Drive Stop 7134
Grand Forks, ND 58202-7124
Phone: 701-777-4278
Email: Harmon.Abrahamson@und.edu

Sign: 2-19-2015

Consortium Concurrence

1. Bismarck State College

I am sending an email of concurrence to the Space Grant Proposal for the next 3 years of funding (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 our North Dakota students and faculty.
Hiring an additional NDSGC coordinator, establishing a Community College and Tribal College Fellowship Bridge Program will go a long way in increase our engagement with our native community.
Our Space Grant coordinator has been doing In-service workshops but initiating an annual in-service teacher workshop will institutionalize this process.

Sincerely,

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

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2. Cankdeska Cikana Community College

I am in support of continued funding for the Space Grant program.

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

CANKDESKA CIKANA COMMUNITY COLLEGE
Spirit Lake Dakota Nation

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3. Dakota College at Bottineau

To Whom It May Concern:

This letter is written in support of the of the ND Space Grant Consortium proposal presented by Dr. Santhosh Seelan. I am a Physical Science instructor in a small community college in north central North Dakota. We do not have many of the necessary resources to prepare our students for the Sciences of today without the assistance of the ND Space Grant Consortium.

Today's science is constantly evolving; a great deal of monetary support is needed to keep pace. We have students with the great minds necessary to master the science of today however; they need to be exposed to the real world experiences offered our students through internships supported by the consortium. In addition the consortium provides scholarships and programs such as their community college bridge program and STEM ambassadors to help our students reach their true potential.

Not only would is the space grant consortium beneficial to our students, it has been truly beneficial to me personally as an instructor. They have provided support for lab development through faculty fellowships, professional development opportunities, and many valuable resources such as the NASA dome.

Thank- you for consideration in this matter. The investment you make supporting the ND Space Grant Consortium today is sure to pay off many times over in the future and in the future of myself and my students. Please feel free to contact me if you have any questions.

Sincerely,

Angela Bartholomay

Assistant Professor of Physical Sciences
Dakota College @ Bottineau
305 Simerall Blvd
Bottineau, ND

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4. Dickinson State University

Dickinson State University fully supports the North Dakota Space Grant Consortium's request for continued funding for the next three 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. Fort Berthold Community College

Fort Berthold Community College

*Office of the **ACADEMIC DEAN***
220 8th Ave. N
P. O. Box 490
New Town, ND 58763
Phone No. (701) 627-4738
Fax No. (701) 627-4099

It is with great pleasure that I confirm Fort Berthold College's support for the proposal by the North Dakota Space Grant Consortium (NDSGC) for funding of their excellent current and expanded Programs. The NDSGC has assisted our College's students and Faculty in the past by offering us expertise and support to expand and enrich our educational and research offerings. The proposed new activities will supplement their support programs.

We strongly encourage awarding the NDSGC full funding for their proposal.

Sincerely,

KH

Dr. Kerry Hartman
Academic Dean
Chair Science Dept.
Fort Berthold College
New Town, ND 58763
khartm@fortbertholdcc.edu
701-627-4738 x253

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6. Gateway to Science Center

To Whom it May Concern,

I am fully in support of the North Dakota Space Grant proposal for the next 3 years of funding (2015-2018).

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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7. Lake Region State College

I strongly support the Space Grant proposal. NASA Space Grant has allowed my underrepresented and STEM-focused students to receive support and hands-on learning experiences. It also allows us to engage students in research projects and laboratory investigations that they would otherwise have missed. I believe Space Grant is a pillar in the success of the STEM areas at Lake Region State College.

Shaun Prince, Associate Professor

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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8. Mayville State University

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

Bob Miess
330 Third Street NE
Mayville, ND 58257
robert.miess@mayvillestate.edu
701-788-4885

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9. Minot State University

On behalf of the Department of Mathematics & Computer Science at 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.

Sincerely,

Cheryl Nilsen, Chair
Department of Mathematics & Computer Science
Minot State University

Office: Model Hall 108
Phone: 701-858-3106
FAX: 701-858-3568

10. North Dakota Heritage Center

The Space Grant proposal for funding and Strategic Plan related to the North Dakota Space Grant Consortium is a well-crafted document that outlines effectively how the many partners are included in the effort to support NASA education, connections and outreach here in North Dakota. As the lead educator for the State Historical Society of North Dakota, please know we support the efforts laid out in the proposal. 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 projects that are being undertaken here.

I look forward to continuing the efforts to develop STEM-based lesson augmentation for students visiting the State Museum as well as for students who have the opportunity to use our Suitcase Exhibits for North Dakota (SEND) trunks and the North Dakota Studies Energy curriculum components.

Thank you for your efforts 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 the engage in their futures.

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

11. North Dakota State College of Science

I am in full support of this proposal.

Shelley Blome
Director of Financial Aid
NDSCS
800 N 6th St
Wahpeton ND 58076
701.671.2191 T
701.671.2482 F

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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. Sitting Bull College (included as full page letter)

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14. Turtle Mountain Community College

I have reviewed the proposal. I support the continuing of funds for the program. This scholarship is a great asset to a lot of our students here at TMCC and we greatly appreciate it.

Brittany Belgarde
Scholarship Technician
Turtle Mountain Community College
(701)477-7862 ext. 2916

As the Financial Aid Director of a Tribal college located in North Dakota, I fully support your proposal and ask that the donors continue to financially support the North Dakota Space Grant program. Many of our students receive scholarships through this grant. Since our Tribal College is located in a high poverty stricken area, many of our students are under funded. This scholarship assists them immensely and helps them to attain their goal of gaining that degree. Thank you for all that you do for our students.

Wanda Laducer
Financial Aid Director
Phone: 701.477.7875

Fax: 701.477.7943
Ext. 1156
e-mail: wladucer@tm.edu

15. United Tribes Technical College

The North Dakota Space Grant Consortium (NDSGC) has been a great resource for support through NASA Office of Education Space Grant Mission. This was accomplished through two grants that the Untied Tribes Technical College Tribal Environmental Science Department received, the Research Focus Area (RFA) grant for $16,192.50 to complete the project titled, *Watershed Impact Analysis Using AVIRIS and Field Data*, and a Summer Faculty Fellowship to develop a new Advanced Photogrammetry and Remote Sensing course for $5000. These grants assisted both students and faculty in the areas of research and curriculum development. We believe that the continued funding of the NDSGC will only improve the quality of students and faculty at North Dakota's Tribal Colleges.

Thanks again,
Joe Martinetti

Joseph A Martinetti, MS
GIS Instructor
Science and Technology Bldg, Rm 224
Tribal Environmental Sciences Dept
United Tribes Technical College
3315 University Dr
Bismarck, ND 58504
(701) 255-3285, Ext 1335

16. University of North Dakota

I am in full support of the North Dakota Space Grant Consortium 2015-2018 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
Grand Forks, ND 58202-9008, U.S.A
Tel: 701 777 2355
e-mail: seelan@space.edu
Web address: www.space.edu

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17. Valley City State University

I would like to offer my full support for your 3 year North Dakota Space Grant Consortium proposal being submitted by the University of North Dakota. As a member of the consortium Valley City State University has found the programs offered to be very helpful to our students. The STEM Ambassadors program in the new proposal is especially interesting to us because of our commitment to STEM education. In my dealings with the program I have always found the staff to be courteous and helpful. Keep up the good work!

Andre

Dr. Andre DeLorme
Chair, Department of Science
Valley City State University
101 SW College St.
Valley City, ND 58072
Rom 203D Rhoades Science Center
701-845-7573

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18. Williston State College

I approve the attached proposal.

Thanks!
Heather Fink
Executive Director for Student Services/Financial Aid
heather.fink@willistonstate.edu

SITTING BULL COLLEGE

9299 Hwy 24
Fort Yates, ND 58538
(701) 854-8000

Science & Technology
Fax:
(701) 854-8197

McLaughlin Center:
504 Main St.
P.O. Box 613
McLaughlin, SD 57642
(605) 823-4318
Fax:
(605) 823-4982

Mobridge Center:
414 6th St. W.
Mobridge, SD 57601
(605) 845-5762

www.sittingbull.edu

February 11, 2015

Dr. Santhosh Seelan, Director
North Dakota Space Grant Consortium
University of North Dakota
Department of Space Studies
Clifford Hall Room 532
4149 University Ave. Stop 9008
Grand Forks, ND 58202-9008

Dear Dr. Seelan

We acknowledge that we are identified as an affiliate institution in the North Dakota Space Grant Consortium 2015 – 2018 Proposal, that is submitted by Dr. Santhosh Seelan to the NASA Training Grant NNH15ZHA003N and that we intend to carry out all responsibilities identified for us in this proposal.

We understand that the extent and justification of our participation as stated in this proposal will be considered during peer review in determining in part the merits of this proposal. We have read the entire proposal, including the management plan and budget, and we agree that the proposal correctly describes our commitment to the Space Grant program.

Sincerely,

Dr. Koreen Ressler
Vice President of Academics

NATURE, TECHNOLOGY, & BEYOND

DAKOTA COLLEGE AT BOTTINEAU

AN AFFILIATE OF MINOT STATE UNIVERSITY

Dr. Santhosh Seelan, Director
Department of Space Studies
University of North Dakota
Clifford Hall Room 532
2129 University Ave Stop 9008
Grand Forks, ND 58202-9008

Dr. Seelan,

I am pleased to submit the following letter of support for the North Dakota Space Grant Consortium's (NDSGC) FY 2015-2018 proposal.

As the Associate Dean for Academic Affairs at Dakota College at Bottineau (DCB), a two-year partner 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.

Sincerely,

Larry Brooks
Associate Dean for Academic Affairs
Dakota College at Bottineau

Consortium Abstract

The North Dakota Space Grant Consortium (NDSGC) is beginning implementation of a new three-year strategic plan that aligns with the new three-year Space Grant funding cycle (i.e., 2015-2018). 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 strategic plan, the Consortium 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.

Consortium Profile

The North Dakota Space Grant Consortium (NDSGC) encompasses 18 participating organizations, with the lead institution as the University of North Dakota, 15 public colleges and universities, one science center, and the state historical society. Of this group, five affiliates are from American Indian higher education institutions, two are research-intensive universities, and nine are two- or four-year colleges or universities. The Consortium and affiliates represent all geographic areas of the state and the dominant state minority population, which positions the Consortium favorably to serve its diverse, primarily rural constituents.

North Dakota's primary demographics include a predominantly white populace, with an underrepresented minority population dominated by American Indians, followed by the much smaller populations of African Americans and Hispanics. The state's small population is spread throughout a relatively large area, conducive to collaborative communities even across great distances. The NDSGC takes advantage of this Midwest mentality, which supports an enriching educational environment as students and faculty across the state likely share connections that foster partnerships in STEM initiatives. North Dakota has a predominantly rural- and natural resources-based economy, with no significant aerospace industry or direct NASA presence beyond the Space Grant and EPSCoR programs. We view this as a welcome challenge, producing the need for an even more impactful consortium with statewide involvement of each affiliate and surrounding communities to not only increase awareness of NASA and its mission but to inspire the next generation of STEM professionals.

There are several urgent needs that must be met in North Dakota to enhance the quantity and quality of NASA-relevant research projects and technical capacity. These needs include: 1) fostering the growth of NASA-relevant research that currently exists in the state that has the possibility for substantial growth, 2) finding ways to encourage college and university faculty to become part of the NASA community with research and education projects, 3) promoting the development of self-sustaining research clusters around the state, 4) developing an aerospace industrial capability in support of NASA's current and future goals, 5) working more directly and explicitly with the Consortium's affiliates to bring scholarship and research opportunities to the state's college and university students, 6) encouraging affiliates to participate more actively in Consortium programs, and 7) increasing the visibility of NASA-relevant programs to teachers and the general public. The NASA Education Priorities that align with the aforementioned needs are NASA Internship, Fellowships, and Scholarships (NIFS), hands-on student experiences, engaging middle school teachers, strengthening relationships with affiliate community colleges through NDSGC programming, enhancing the capacity of institutions to support innovative research infrastructure strategies, and focusing on the diversity of institutions, faculty, and students.

The NDSGC proposes a unique mix of NIFS, research infrastructure, higher education, pre-college, and informal education programming to build on the strengths of North Dakota and address the state needs in order to expand the state's relevance in STEM and NASA-relevant endeavors.

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. Depending on North Dakota student needs, these internships may take place during the fall and spring semesters as well as the summer semester. These 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.

As the NDSGC grows and more students continue to apply for NIFS, more competitive application requirements have been put in place. Fellowship applicants are now required to submit 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. The same holds true for applications for the Lillian Goettler Scholarship and the Pearl I. Young Scholarship. 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, as they are better able to assess their students' performance and interest in STEM. Applicants are recruited through on-campus career fairs, visits to college classrooms, flyers, social media postings, email listservs, and affiliate representatives. These involve all affiliate institutions, as to be inclusive of all North Dakota students, yet the competitive nature of these awards remains.

A new initiative to begin in FY15 is the implementation of a Community College and Tribal College Bridge Program, which will fall under the NDSGC fellowships. This program will provide the opportunity for 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. Collaborations will also be in place between the student's two-year college faculty as well as NDSU/UND faculty in project development. This program's

objective is to increase the retention of transfer students in STEM, a student population at significant risk for attrition in a STEM field, especially first-generation students. This will also give students hands-on experience in research relevant to their area of study and better help them transition from the more close-knit college environment to that of a research university. The application and selection process for these awards will be the same as the NDSGC fellowship program, yet affiliate representatives at Tribal College and Community College Faculty will be consulted for potential participating students.

Diversity: We have a significant population of American Indians in North Dakota enrolled in degree-granting institutions as of year 2011[1] when compared to the national average. 5.3% of these students in North Dakota are American Indian, which has guided us to place a significant focus on encouraging these students in STEM fields, especially through the American Indian Scholarship. 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. Females and underrepresented minorities in STEM are highly encouraged to apply for the Undergraduate Scholarships, fellowships, and NASA internships. 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." The hands-on learning that occurs with each fellowship and internship opportunity also "Enhance[s the] STEM Experience of Undergraduate Students."[2] Goal 3 of the NASA Office of Education Lines of Business (LOB) in Institutional Engagement, Diversity, is also addressed through NIFS funding provided to the Tribal Colleges.

NASA Goals Alignment: The criteria listed under the NIFS LOB are each addressed. 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.[3] The fellowships and internships 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. Under NASA Education Priorities, the NDSGC will offer summer opportunities for secondary students on college campuses (fellowships) and develop new while strengthening existing relationships with community colleges (Community College and Tribal College Bridge Program). NDSGC NIFS also meet the following Objectives under NASA Education Outcomes: 1.2.

Metrics: All students who receive NIFS 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 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.

SMART Goals: The NDSGC will partially and/or fully fund up to six NASA internships, six fellowships, and 150 undergraduate scholarships in FY15. Projected awards for FY16 and FY17 based on budget limitations are 90 undergraduate scholarships, two NASA internships, and three

[1] http://nces.ed.gov/programs/digest/d12/tables/dt12_265.asp

[2] Section 1.5.1 America COMPETES Reauthorization Act, Space Grant Training Grant 2015-2018, NNH15ZHA003N

[3] https://www.lsamp.org/help/help_stem_cip_2010.cfm

fellowships. In Alignment with the total fall enrollment in degree-granting postsecondary institutions in North Dakota in 2012, the NDSGC will provide a minimum of 51% of NIFS funding to females in STEM annually.[4] The NDSGC will also adhere to the National Center for Education Statistics for goals in NIFS awards to underrepresented minorities in STEM. The NDSGC will provide a minimum of 10.5% of NIFS funding annually to underrepresented minorities in STEM as this is the 2011 enrollment percentage in ND higher education institutions.[5] The NDSGC will provide no more than two semesters of fellowship funding to one individual in order to keep the opportunity available to other North Dakota students interested in completing STEM- or NASA-relevant research.

Budget Assessment: The NDSGC will conduct quarterly meetings to assess spending in NIFS programming. The NDSGC will use these meetings to evaluate current budget levels and ensure timely spending. Affiliate institutions will be encouraged to continue to utilize scholarship funding each academic year.

B. Higher Education:

The Consortium's Higher Education elements include a mixture of regional and national hands-on experiential programs that complement the NDSGC's Research Infrastructure program, its NIFS program, and even the Pre-college program.

Three Graduate Research Assistantships (GRAs) will be provided to the UND Department of Space Studies each fiscal year to fund M.S. students who are conducting NASA-relevant, space-related research and who are pursuing thesis work as a part of their degree requirements. UND Space Studies is a unique, interdisciplinary, global M.S. program that has worked with the Consortium since its founding in 1990.

The NDSGC will continue to support the participation of North Dakota student teams in national competitions organized by NASA and other industries who work toward the achievement of NASA goals. These include: High-Altitude Student Platform (HASP), NASA Robotics Mining Competition, NASA Student Launch Competition, AIAA Design/Build/Fly Competition, 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. These student teams are a prime example of collaboration of two or more STEM disciplines as students from all backgrounds contribute to team success.

Faculty members from all NDSGC affiliate institutions are eligible to apply for Summer Faculty Fellowships (SFF), which are given to faculty members 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.

The NDSGC will support undergraduate and graduate students at affiliate institutions and completing NASA-relevant STEM research to travel to local, regional, and national conferences to present research findings. Through travel grants, students are not only able to share their research with others in the STEM community, but also to network with others in their field. There is a rolling application period for travel funding as conferences occur year-round. Students must submit to the NDSGC an accepted abstract at the desired conference, an essay

[4] http://nces.ed.gov/programs/digest/d13/tables/dt13_304.30.asp?current=yes
[5] http://nces.ed.gov/programs/digest/d12/tables/dt12_265.asp

describing the projected benefit of 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 will incorporate engaging NASA content for all K-12 levels. A new initiative of the NDSGC is to implement an annual in-service teacher workshop titled, "NASA in the Classroom," including NASA-relevant hands-on investigations and NGSS alignment. A pilot workshop was conducted in 2014, with thorough evaluations taken by participants so that future iterations could be significantly improved. The NDSGC will commit to supporting up to 20 teachers to attend each workshop, and will conduct the workshop at a different location each year to encourage attendance by teachers who may live in more rural communities in North Dakota, contingent upon budget levels. The changing location will increase affiliate involvement and invite different professors to conduct sessions within the workshop, bringing in collaborations across STEM disciplines. Educators will be eligible to receive one professional development credit through UND for completion of the workshop.

Another new initiative of the NDSGC for FY15 is to implement a *STEM Ambassador Program* for undergraduate and graduate students enrolled at an NDSGC affiliate institution who will devote time each semester to participating in NDSGC public service or pre-college events like high-altitude balloon launches, space camps, classroom visits, and community outreach. These students will be paid hourly. The student work will be minimal in comparison to Graduate Research Assistants or fellowship recipients, but the impact to the surrounding community and to the participating college students will be great. Students will be able to improve communication skills (a valued talent especially in STEM fields) and inspire the next generation of scientists and engineers. Students selected to participate in the *STEM Ambassadors 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. These students must be majoring in a STEM field or in Education with an emphasis in a STEM field. Because these students will come from various backgrounds, there will be significant collaboration across disciplines in this program.

Diversity: Tribal College involvement is highly encouraged in all of the NDSGC higher education programs, along with female and underrepresented minority participation. 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 the pre-service and in-service workshops delivered at Tribal Colleges.

NASA Goals Alignment: 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 also 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 Program* also "Enhance [the] STEM Experience of Undergraduate Students."[6] The SFF and the NASA student competitions each align with the enhancement of STEM experiences for undergraduate students as well. NDSGC higher

[6] Section 1.5.1 America COMPETES Reauthorization Act, Space Grant Training Grant 2015-2018, NNH15ZHA003N

education programs meet the following Objectives under NASA Education Outcomes: 1.2., 1.3, 1.4, 2.1, 2.2, 2.3.

Metrics: 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 SFF are required to submit a report on their accomplishments to document their efforts and to assess the impact of the course at their institution. Graduate Research Assistants will be longitudinally tracked as well as required to submit a summary report of their research progress/results and an essay on the overall experience upon completion of their projects. The impact of the NASA in the Classroom workshop will be assessed through participant evaluations and follow-ups with the teachers in classroom impact during subsequent school years.

SMART Goals: The NDSGC will award 3 GRAs each fiscal year to Space Studies M.S. students. The NDGSC will support participation of North Dakota students in the five aforementioned NASA student competitions with a significant emphasis placed on increasing affiliate involvement. The NDSGC aims to have at least one non-research affiliate institution involved in a NASA student competition by the end of the 3 year proposal period. The NDSGC will provide funding for up to 5 faculty members each summer (with a focus on non-research institution affiliates) with the goal of significantly improving STEM curriculum content in these faculty members' programs in the academic year immediately following the SFF. Each academic year, the NDSGC will conduct pre-service workshops that impact a minimum of 200 education students from affiliate colleges. Starting in FY15 the NDSGC will conduct an in-service teacher workshop, with the goal of continuation into subsequent years, impacting a minimum of 15 teachers per year. The NDSGC commits to funding up to eight *STEM Ambassadors* in FY15 to aid in improving hands-on learning at the pre-college level and reinforce college-level concepts in participating students through their participation in the program. The NDSGC will award up to five student travel grants in FY15, and at least one will be awarded to a student at a non-research affiliate institution as the NDSGC will more readily advertise this opportunity to increase statewide awareness of the program. All of these goals are in direct agreement with the forgoing NASA Goals Alignment section. The projected number of participants in all NDSGC higher education programs in FY15 is 300.

Budget Assessment: The NDSGC will conduct quarterly meetings to assess spending in higher education programming. The NDSGC will use these meetings to evaluate current budget levels and ensure timely spending. The NDSGC will encourage all faculty mentors of student teams to report materials and travel spending immediately upon competition performance.

C. Research Infrastructure:

In collaboration with North Dakota NASA Experimental Program to Stimulate Competitive Research (EPSCoR), which only serves students and faculty at UND and NDSU, 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. These were developed to guide ND STEM faculty in selecting research projects in their area of expertise, and still helped to further NASA initiatives. The NDSGC has found these RFAs to continue to be relevant and realistic in 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. These RFA awards will be given competitively. 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 review the proposals with a rubric that evaluates intrinsic scientific/technical merit, budget reasonableness, NASA-relevance, North Dakota relevance, inter-institutional, industry, and NASA collaborations, student involvement, and capability to evolve into a self-sustainable research program.

The NDSGC will 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 universities. For example, in 2013 and 2014, a 10-day and 30-day mission were conducted, respectively, with three graduate students living in a confined environment as crewmembers while other students performed the duties of mission control.

The NDSGC has a growing high-altitude ballooning (HAB) program and the hands-on opportunities that result in undergraduate and graduate 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 very own payloads. This has thus far mainly involved faculty and students at UND and one other affiliate institution, but plans are to expand this program further, to involve more affiliates, and give other students the opportunity to experience STEM research in a near-space environment, first-hand.

Diversity: Tribal College affiliates will be strongly encouraged to submit RFA proposals and participate in both HAB and HSFL activities, as well as underrepresented and female faculty at other non-research affiliate institutions. Past RFA award recipients at Tribal Colleges will be encouraged to share these opportunities with their colleagues so that the NDSGC sees increased involvement at these Minority Serving Institutions (MSIs). Goal 3 of the NASA Office of Education LOB in Institutional Engagement, Diversity, is also addressed through RFA funding provided to the Tribal Colleges. Tribal College involvement in RFA projects related to RFA 3) is especially significant in terms of state needs, as much of the recent oil boom activity is taking place on or near American Indian reservations.

NASA Goals Alignment: The RFA program aligns with Objective 2.2 under the 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 North Dakota with the recent oil boom in the Western half of the state. Many affiliate research projects have already addressed this area, and the NDSGC will continue to encourage this research. Objectives 1.4, 1.5, 1.6, and 1.7 are addressed through each of the previously defined RFAs in solar physic, 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. Under NASA Institutional Engagement, these programs align with Goal 2 – Content and Goal 4 – Sustainability through

increasing STEM capacities of institutions to contribute to the NASA mission through research and to sustain their capabilities in STEM personnel, programs, and infrastructure. 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. The projected number of participants in all NDSGC research infrastructure programs in FY15 is 40 students and faculty. NDSGC research infrastructure programs meet the following Objectives under NASA Education Outcomes: 1.1, 1.2, 1.3, 1.5.

Metrics: At the conclusion of an RFA project, PIs are required to submit a progress report documenting their activities and accomplishments, along with their plans for continuing research development. Any students directly funded with a minimum of $2500 through a RFA project will be longitudinally tracked. Students involved in HSFL activities are required to submit reports detailing their involvement in the program, and proposals must be submitted each fiscal year for continued NDSGC funding. Student participants in HAB are required to submit reports detailing research progress to the NDSGC and submit proposals each fiscal year for continued program funding. If student participants are receiving direct NDSGC funding as a GRA or a fellowship through participation in HAB or the HSFL, these students will be longitudinally tracked by the NDSGC.

SMART Goals: In the past five years, the NDSGC RFAs have expanded, but the NDSGC aims for further improvement, especially in non-research institution affiliate involvement. There have been successful proposals from Dickinson State University, Fort Berthold Community College, United Tribes Technical College, and Mayville State University, as well as UND and NDSU from FY10 – FY14, but the NDSGC aims to have more collaborative projects, at least one each fiscal year over the course of the upcoming proposal, that include significant student research opportunities as well. 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 starting in FY15.

Budget Assessment: The NDSGC will conduct quarterly meetings to assess spending in research infrastructure programming. The NDSGC will use these meetings to evaluate current budget levels and ensure timely spending. The NDSGC will encourage all PIs of RFAs to spend funds within proposed project period.

Secondary Space Grant Programmatic Elements

A. Precollege:

The NDSGC supports various pre-college programs throughout the state and involvement in these programs has expanded in recent years. These programs serve all students K-12, but the focus is placed on middle and high school students in specific project funding. Involvement with K-12 educators is also key to continued NDSGC support of pre-college programming.

The NDSGC supports high school team participation in the annual *For Inspiration and Recognition of Science and Technology (FIRST) Robotics* Competition. This competition challenges students to design and build their own robot to creatively complete a certain set of tasks and perform these tasks at regional and/or national competitions. The FIRST Robotics competition consistently attracts the interest and help of student families and community

members (e.g. local engineers or mechanics) and these individuals become mentors to the students as a part of their participation in the competition.

The NDSGC also funds high-altitude ballooning (HAB) endeavors with a focus on middle school and high school teams. Graduate students, undergraduates, and faculty members have served as mentors to 8th grade students for entire grade-wide "Mega-launches" (three have occurred thus far in the previous proposal period) and the NDSGC hopes to expand this effort to involve more school districts from across the state. The NDSGC also supports the Near-Space Balloon Competition (NSBC), in which middle and high school teams design, build, and fly their very 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.

The NDSGC has participated in conducting day camps as a participant in an externally organized STEM initiative for elementary and middle school students in recent years. For FY15, the NDSGC proposes the implementation of a Space Grant led "Space Camp." This camp will include Aerospace labs tours, NASA-relevant and hands-on investigations, and small-scale STEM competitions. If successful in FY15, and funds are available in subsequent years, the program will expand to include a high school level opportunity, and a camp focused solely on K-12 female students.

The NDSGC also conducts a number of classroom visits to all K-12 levels. This includes presentations of NASA unique content and hands-on STEM investigations. Funding in this area is mainly travel for the NDSGC Deputy Director and future Coordinator and materials for the in-class activities.

Diversity: The involvement of females and underrepresented minorities in STEM is highly encouraged in all of the NDSGC pre-college programs. The NDSGC plans to reach out specifically to Tribal Communities to increase involvement in HAB and NSBC, starting with classroom visits to catalyze student interest. 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."

NASA Goals Alignment: These pre-college programs align with NASA Objective 2.4, as each of the aforementioned programs provides students with authentic first-hand learning opportunities and inspires not only the students, but their families and communities as well. The 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.

Metrics: The assessment of the impact of the FIRST Robotics program on participating North Dakota high school students will be done through continued contact with the high school teachers who oversee student activity in this event. These teachers will document how many

FIRST Robotics students continue to college and pursue STEM degrees. Students and teachers involved in HAB and NSBC will fill out evaluations and surveys 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.

SMART Goals: The projected number of participants in NDSGC pre-college programs for FY15 is 400. Significant expansion in this area has occurred due to increased teacher awareness of NDSGC sponsored activities through the NDSGC's strengthened presence at statewide conferences for both math and science teachers. Each academic year, the NDSGC will fully or partially fund up to five teams' participation in FIRST Robotics. 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 Camp in FY15, with a focus on grades K-8. If funding levels permit, the NDSGC will implement a Space Camp for Girls, and a Space Camp focused on research opportunities for grades 9-12, both in FY16. The NDSGC will continue to conduct statewide classroom visits with the goal of involving at least one school in a Tribal Community starting in FY15, and increasing the number of visits to rural communities as well.

Budget Assessment: The NDSGC will conduct quarterly meetings to assess spending in pre-college programming. The NDSGC will use these meetings to evaluate current budget levels and ensure timely spending. The NDSGC will encourage teacher mentors of all NSBC teams to report materials and travel spending immediately following the annual competition.

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 (e.g. Girls Scouts), the *Nurturing American Tribal Undergraduate Research and Education (NATURE)* students, prospective college students, and other special interest groups. These are interactive tours where attendees actually command spacecraft simulators and get a behind-the-scenes look at authentic NASA research conducted at UND. When appropriate, this will also include trips to the UND Observatory, to use the telescopes and equipment for observations. The NDSGC will also 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.

Diversity: The involvement of females and underrepresented minorities in STEM is representative of the North Dakota population for all of the NDSGC informal education programs. When special groups show interest in participation, like Girl Scouts or the NATURE program students, their involvement is highly encouraged. The NDSGC also plans to reach out specifically to Tribal Communities through public outreach events. 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." Under the STEM Engagement LOB, the underrepresented and underserved communities are a focus in NDSGC informal education programs. Goal 3 of the NASA Office of Education LOB in Institutional Engagement, Diversity, is also addressed through participation in Tribal College affiliates hosting informal education events run by the NDSGC.

NASA Goals Alignment: 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.

Metrics: Participants in informal education events will be requested to 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.

SMART Goals: The projected number of participants in NDSGC pre-college programs for FY15 is 1000. The NDSGC Deputy Director, future Coordinator, and *STEM Ambassadors* at UND will be trained on the use of the University of North Dakota's traveling inflatable planetarium in FY15 so that this can be included in future community outreach events. The NDSGC will participate in an informal education event hosted by a Tribal College affiliate or held in a Tribal Community in FY15 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 FY15 than were held in FY14 through the connections made with the ND STEM Network. This trend will continue in FY16 and FY17.

Budget Assessment: The NDSGC will conduct quarterly meetings to assess spending in informal education programming. The NDSGC will use these meetings to evaluate current budget levels and ensure timely spending.

Consortium Management

A. Consortium Management:

The lead institution for the NDSGC is the University of North Dakota (UND). The Director, current Coordinator, Finance Manager (not funded by NDSGC), and Graphic Design Artist, are all housed in the John D. Odegard School of Aerospace Sciences. The structure of the NDSGC includes Dr. Santhosh Seelan (Director) and Caitlin Nolby (Coordinator) leading the operations of all programming which involves the 18 affiliates as active partners in ensuring the consortium's success. The consortium as a whole meets once a year and provides strategic directions to the Director and Coordinator.

B. Consortium Structure/Network (Internal):

The NDSGC encompasses 18 participating organizations, with UND as the lead institution, 15 public colleges and universities, one science center, and the state historical society. Of this group, five affiliates are from American Indian higher education institutions, two are research-universities, and nine are two- or four-year institutions. The NDSGC and affiliates represent all geographic areas of the state including Tribal communities, which positions the consortium favorably to serve its diverse, primarily rural, constituents.

1. Bismarck State College—two year community college
2. Cankdeska Cikana Community College—tribal college at Spirit Lake Indian Reservation
3. Dakota College at Bottineau—two year community college
4. Dickinson State University—public four year college
5. Fort Berthold Community College—tribal college at Fort Berthold Indian Reservation
6. Gateway to Science Center—children's science museum in Bismarck
7. Lake Region State College—two year community college
8. Mayville State University—public four year college
9. Minot State University—public four year college
10. North Dakota Heritage Center—state history museum in Bismarck
11. North Dakota State College of Science—two year technical college in Wahpeton
12. North Dakota State University—doctoral research university in Fargo
13. Sitting Bull College—tribal college at Standing Rock Indian Reservation
14. Turtle Mountain Community College—tribal college at Turtle Mountain Indian Reservation
15. United Tribes Technical College—tribal college in Bismarck supported by all four Indian Reservations in the state
16. University of North Dakota—doctoral research institution in Grand Forks
17. Valley City State University—public four year college
18. Williston State College—two year community college

The role of each affiliate representative is to disseminate information to their colleagues and students campus-wide regarding NDSGC and NASA opportunities shared with them via NDSGC personnel. The affiliate members are to encourage participation in all NDSGC and NASA opportunities, especially with female and students underrepresented in STEM fields. Non-research affiliates are to announce and make selections for undergraduate scholarships and share recipient details with the NDSGC.

Building a NASA presence at affiliate institutions is being addressed through multiple strategies. The NDSGC is to complete campus visits with each affiliate at least every other year to not only tour campus and meet with STEM faculty, but to conduct pre-service teacher workshops and to encourage participation in all NDSGC programming. The Annual Affiliates Meeting has a rotating location as to engage all members of the NDSGC, showcasing unique research and projects, and encouraging participation from communities statewide. Starting in FY15 the NDSGC plans to participate in affiliate career fairs (and similar events) to increase awareness of NASA and NDGSC opportunities, especially in NIFS and NASA student competitions. The goal of the NDSGC over the three year proposal period is add at least one more representative at each affiliate institution to the network of active NDSGC advocates.

Minority Serving Institutions*:* Plans to increase and sustain "meaningful involvement" of Tribal Colleges in North Dakota (as stated in the solicitation) will occur through collaborations and partnerships made in NDSGC programming. The strongest area of involvement will be in NIFS. Each fiscal year, the NDSGC will continue to designate $2500 in undergraduate scholarship funding to each of the five Tribal Colleges for American Indian students committed to attending UND or NDSU to complete a four year degree in STEM. Students at these colleges will be encouraged to apply for NASA internships and NDSGC fellowships, especially through the new Community College and Tribal College Bridge Program, described earlier in this proposal. Faculty at Tribal Colleges will be encouraged to continue to submit proposals for RFA project funding, especially when NASA collaborations and student involvement is at the forefront of the proposed research. More affiliate visits to the Tribal Colleges starting in FY15 will also strengthen relationships with these institutions, their faculty, and students.

C. Consortium Operations:

As a result of expanding NDSGC activities in the state, and the need to pay more attention to the changing scenario due to oil development in the Western part of the state, where many of our tribal colleges are situated, we propose modifications to the consortium operations in FY 2015. We propose changes to the responsibilities of the NDSGC Director, promoting the current Coordinator to Deputy Director and hiring a new Coordinator. This is being done with careful reorganization of the administrative budget. NDSGC personnel responsibilities are as follows.

The Director is responsible for budget creation, research infrastructure programming, strategic planning, annual report submission, student funding selections (NIFS). With the additional hire and reorganization of the responsibilities, the Director will focus more on 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*.

D. Collaborations and Partnerships Outside of the Consortium:

The NDSGC has a total of three significant collaborations outside of the consortium. In higher education, pre-college, and informal education programming, it is important the NDSGC maintain a working relationship with ND educators. This is done through 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."[7] The NDCTN keeps the NDSGC informed of educator professional development opportunities in which the consortium can get involved, 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.

The NDSGC recently began a partnership with the ND STEM Network as well. The ND STEM Network is headquartered at Valley City State University, an NDSGC affiliate institution. The NDSGC is a member of this network, as are many other individuals and institutions who participate in NDSGC programming. 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."[8] This is in direct alignment with the SMART goals of the NDSGC as achievement of the ND STEM Network goals will directly benefit students who follow the STEM pipeline into higher education, and encourages those still at the K-12 level to participate in pre-college and informal education programming led by the NDSGC. The NDSGC has participated in many ND STEM Network meetings and will conduct a session with educators at the ND STEM Network Summit in April 2015. Partnership here has also connected the NDSGC to countless other organizations in the state who now collaborate with the consortium on programming, especially informal education.

The NDSGC also maintains strong positive relationships with the state and local legislators in securing match funding for the consortium. The healthy state budget in North Dakota is a privilege that the NDSGC recognizes not many other consortia have the luxury of experiencing. 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.

All of the aforementioned partnerships significantly increase awareness of the NDSGC throughout the state. Other publicity and outreach plans include the use of social media, communications with the UND media relations team before each NDSGC program or event, and press release notices made by the NDSGC and affiliates when appropriate.

E. Principal Investigator (PI) Résumé

The résumé of Dr. Santhosh Seelan is included on the following two pages.

[7] http://www2.edutech.nodak.edu/tcn/

[8] http://ndstem.vcsu.edu/

PI CV/Résumé

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Professional Preparation

Annamalai University, Tamil Nadu, India, B.Sc. Geology, 1971
Indian Institute of Technology, Bombay (now Mumbai), India, MSc Applied Geology, 1974
Hebrew University of Jerusalem, Israel, Post Graduate Diploma in Groundwater Research, 1975
Free University of Berlin, Germany, Practical Training in Remote Sensing, May-July 1979
Jawaharlal Nehru Technological University, Hyderabad, India, Ph.D. Remote Sensing, 1994

Appointments

2013 – January- May: Associate Dean (Interim), School of Aerospace Sciences, University of North Dakota (UND)
2010 - Present: Chair, Department of Space Studies, John D. Odegard School of Aerospace Sciences, Director, ND NASA Space Grant, and Director, ND NASA EPSCoR
2009 - January to May: Associate Dean (Interim), School of Aerospace Sciences, UND
2007 – 2010: Graduate Director, Department of Space Studies, School of Aerospace Sciences, UND
2006 – Present: Professor (tenured), Department of Space Studies, School of Aerospace Sciences, UND
2005 – 2006: Associate Professor, Department of Space Studies, School of Aerospace Sciences, UND
2003 – 2005: Associate Professor and Chair, Department of Earth System Science and Policy, School of Aerospace Sciences, UND
2000 – 2005: Lead Scientist, Crop and Range Alert System Project, Upper Midwest Aerospace Consortium (UMAC), School of Aerospace Sciences, UND
1999 – 2003: Research Associate Professor, UMAC, School of Aerospace Sciences, UND
1999 – 2003: Director, Earth Science Information Partners Project, UMAC, School of Aerospace Sciences, UND
1998 – 1999: Research Associate, UMAC, School of Aerospace Sciences, UND
1997 – 1998: Land Monitoring Consultant, Terralink New Zealand Ltd, New Zealand
1995 – 1996: Coordinator, ATLA, Wellington, New Zealand
1990 – 1995: Head, NRSA Data Center and Director IRS Data Dissemination, National Remote Sensing Agency (NRSA), Dept. of Space (DOS), Govt. of India, Hyderabad, India
1988 – 1995: Scientist, Grade SF, NRSA, DOS, Govt. of India, Hyderabad, India
1984 – 1990: Principal Investigator of Groundwater Projects, DOS, Govt. of India, Hyderabad, India
1983 – 1988: Scientist, Grade SE, NRSA, DOS, Govt. of India, Hyderabad, India
1980 – 1983: Scientist, Grade SD, NRSA, DOS, Govt. of India, Hyderabad, India
1977 – 1980: Scientist, Grade SC, NRSA, DOS, Govt. of India, Hyderabad, India
1976 – 1977: Senior Research Analyst, Operations Research Group, Baroda, India
1975 – 1976: Research Analyst, Operations Research Group, Baroda, India

Publications

Contributed over 100 papers, abstracts, book and book chapters; edited a newsletter and five conference proceedings; and prepared over 60 project reports. Select publications are:

1 Seelan, S. Remote Sensing of Groundwater. Chapter under 'Hydrology and Water Resources' section of Volume III of *Remote Sensing Handbook*. Invited contribution. Taylor and Francis Inc. Manuscript reviewed and accepted.

2 Zhang, X., S. Seelan, J. Nowatzki. 2014. Technological innovations bringing spatial technology to precision agriculture in the Northern Great Plains. *Technology and Innovation* 16 (1), 27-35.
3 Zhang, Xiaodong, S. Seelan and G. Seielstad. 2010. Digital Northern Great Plains: A Web-Based System Delivering Near Real Time Remote Sensing Data for Precision Agriculture. *Remote Sensing. 2*(3), 861-873.
4 Seelan, S, D. Baumgartner, G. Casady, V. Nangia, G. Seielstad. 2007. Empowering Farmers and Ranchers with Geospatial Knowledge: A Success Story from the U.S. Upper Midwest. Geocarto International. Vol 22, No. 2,
5 Seelan, S, S. Laguette, G. Casady and G. Seielstad. 2003. Remote sensing applications for precision agriculture: a learning community approach. Remote Sensing of Environment. Vol 88/1-2 pp 157-169.

Key Administrative and Managerial Experience

i) Administrative

Have held key administrative positions in industry and academia. These include: 1) Head of India's Remote Sensing Data Center – responsible for 45 technical staff involved with satellite tasking, and processing, disseminating, and archiving data from five different satellite systems including Landsat, IRS and SPOT, 2) Associate Dean (interim) of the College of Aerospace Sciences, University of North Dakota – the college has five departments, 1900 students, 900 faculty staff (including 200 flight instructors) and about 140 aircrafts and helicopters, 3) Chair, Department of Space Studies, UND – the department has eight tenured or tenure track faculty and graduated more than 700 graduate students since 1987, and 4) Chair, Department of Earth System Science and Policy, UND – helped establish the program and served as its founding Chair.

ii) Project Management

Served as PI, Director, or Lead Scientist for nationwide projects such as 1) Groundwater investigations using remote sensing to support Drinking Water Technology Mission in India, 2) Indian Remote Sensing Satellite Data Utilization Program, 3) Indo-German Technical Collaboration on Remote Sensing, 4) Indo-Canadian Synthetic Aperture Radar Program, 5) Indian Remote Sensing Satellite (IRS) Data Dissemination worldwide through international contacts and negotiations, 6) NASA sponsored Crop and Range Alert System Project for the US Upper Midwest, 7) North Dakota Space Grant and NASA EPSCoR programs, and 8) Three NASA CAN projects. Also served on: 9) IRS 1A and 1B Mission Management Board, 10) IRS 1A Operations Review Board, 11) IRS 1C Critical Design Review and 12) Remote Sensing Application Mission Council of India.

iii) Budget Management

Vastly experienced in budgeting and budget management through the various key administrative and project management roles mentioned above.

iv) Other Relevant Experience

Many of the administrative and project management roles described above included strategic planning, marketing and business development, developing collaborations, building teamwork, change management, motivating and leading people, timely completion of tasks, regular and accurate reporting, applying science and technology for societal benefits, and support for the under privileged and underrepresented.

North Dakota Space Grant Consortium -- FY 2015 budget

Total budget = $750,000

Period of Performance: 06/08/15-06/07/16

Description	Program	NASA MM	MATCH MM	NASA BUDGET	MATCH BUDGET	TOTAL BUDGET
FACULTY:						
Seelan, Santhosh (Director)		3.00	0.00	$34,237	$0	$34,237
Hardersen, Paul		0.00	0.25	$0	$2,302	$2,302
Casler, James		0.00	0.25	$0	$2,640	$2,640
Fevig, Ron		0.00	0.25	$0	$2,161	$2,161
Rygalov, Vadim		0.00	0.25	$0	$2,225	$2,225
Gaffey, Michael		0.00	0.25	$0	$2,859	$2,859
TOTAL FACULTY SALARIES				$34,237	$12,188	$46,425
STAFF						
Nolby, Caitlin		12.00	0.00	$45,864	$0	$45,864
Space Grant Coord		0.00	10.84	$0	$34,318	$34,318
Admin. Asst.		3.75	0.00	$13,991	$0	$13,991
ASN Personnel		0.00	1.33	$0	$5,227	$5,227
Graphic Artist		2.97	1.13	$9,689	$3,682	$13,371
TOTAL STAFF SALARIES				$69,544	$43,227	$112,771
STUDENTS						
Graduate Assistants	1 half-time position; 2 quarter-time position	9.00	0.00	$29,201	$0	$29,201
Student Assts				$5,000	$0	$5,000
TOTAL STUDENTS				$34,201	$0	$34,201
TOTAL DIRECT SALARIES				$137,982	$55,414	$193,397
FRINGE BENEFITS				$44,486	$23,108	$67,594
SUBTOTAL PERSONNEL				$182,468	$78,523	$260,991
OPERATING EXPENSES						
Scholarships/Fellowships				$110,000	$0	$110,000
Student Participant Interns at NASA Centers				$37,500	$0	$37,500
Tribal College and Community College Bridge Fellowship Program				$4,335	$2,665	$7,000
Graduate Tuition				$17,388	$0	$17,388
Fees:	Summer Faculty Fellowships			$0	$22,500	$22,500
	Longitudinal tracking			$0	$4,000	$4,000
Subcontracts/RFA	Research Focus Area Awards			$0	$20,000	$20,000
Materials and Supplies:	Office, Printing, Communications			$0	$3,500	$3,500
	Informal Education			$0	$1,500	$1,500
	Design/Build/Fly Competition			$0	$4,000	$4,000
	High Altitude Balloon Launches			$0	$1,000	$1,000
	Human Spaceflight Laboratory			$0	$12,000	$12,000
	In-Service Educator Workshops			$0	$1,000	$1,000
	Middle School Mega-Launches			$0	$1,500	$1,500
	Near Space Balloon Competition			$0	$3,000	$3,000
	Pre-Service Educator Workshops			$0	$2,000	$2,000
	Robotics Mining Competition			$0	$4,000	$4,000
	Rover Challenge			$0	$4,000	$4,000
	Space Camp			$0	$1,000	$1,000
	Student Launch Competition			$0	$4,000	$4,000
Travel:	Annual ND Mtg, National Meeting & Western Regional Mtg			$0	$20,000	$20,000
	Informal Education			$0	$1,500	$1,500
	Design/Build/Fly Competition			$0	$4,000	$4,000
	FIRST Robotics competitions Registration			$0	$10,000	$10,000
	High Altitude Balloon Launches			$0	$1,000	$1,000
	In-Service Educator Workshops			$0	$3,000	$3,000
	Middle School Mega-Launches			$0	$2,000	$2,000
	Near Space Balloon Competition			$0	$4,000	$4,000
	Pre-Service Educator Workshops			$0	$3,000	$3,000
	Robotics Mining Competition			$0	$4,000	$4,000
	Rover Challenge			$0	$4,000	$4,000
	Space Camp			$0	$500	$500
	Student Launch Competition			$0	$4,000	$4,000
	Student Space Participant Travel			$0	$3,000	$3,000
	Student Travel Grants			$0	$2,500	$2,500
SUBTOTAL OPERATING EXP.				$169,223	$158,165	$327,388
Total Direct Costs				$351,691	$236,688	$588,379
Indirect cost expense (35.6%)				$78,309	$83,312	$161,621
TOTAL BUDGET				$430,000	$320,000	$750,000

North Dakota Space Grant Consortium -- FY 2016 budget
Total budget = $555,000
Period of Performanc 06/08/16-06/07/17

Description	Program	NASA MM	MATCH MM	NASA BUDGET	MATCH BUDGET	TOTAL BUDGET
FACULTY:						
Seelan, Santhosh (Director)		3.00	0.00	$35,607	$0	$35,607
TOTAL FACULTY SALARIES				$35,607	$0	$35,607
STAFF						
Nolby, Caitlin		12.00	0.00	$47,699	$0	$47,699
Space Grant Coord		0.18	9.10	$607	$29,985	$30,592
Admin. Asst.		3.75	0.00	$14,551	$0	$14,551
Graphic Artist		0.00	4.10	$0	$13,906	$13,906
TOTAL STAFF SALARIES				$62,856	$43,891	$106,747
STUDENTS						
Graduate Assistant	3 quarter-time position	0.00	6.75	$0	$22,776	$22,776
Student Assts				$2,444	$0	$2,444
TOTAL STUDENTS				$2,444	$22,776	$25,220
TOTAL DIRECT SALARIES				$100,907	$66,667	$167,575
FRINGE BENEFITS				$38,967	$22,029	$60,996
SUBTOTAL PERSONNEL				$139,875	$88,696	$228,571
OPERATING EXPENSES						
Scholarships/Fellowships				$75,000	$0	$75,000
Student Participants at NASA Centers				$13,500	$0	$13,500
Tribal College and Community College Bridge Fellowship Program				$3,500	$0	$3,500
Graduate tuition waiver				$13,524	$0	$13,524
Fees:	Summer Faculty Fellowships			$0	$9,000	$9,000
	Longitudinal tracking			$0	$4,000	$4,000
Subcontracts/RFA	Research Focus Area Awards			$0	$10,000	$10,000
Materials and Supplie	Office, Printing, Communications			$0	$2,500	$2,500
	Informal Education			$0	$500	$500
	Design/Build/Fly Competition			$0	$2,000	$2,000
	High Altitude Balloon Launches			$0	$500	$500
	Human Spaceflight Laboratory			$0	$5,733	$5,733
	In-Service Educator Workshops			$0	$500	$500
	Middle School Mega-Launches			$0	$500	$500
	Near Space Balloon Competition			$0	$1,500	$1,500
	Pre-Service Educator Workshops			$0	$500	$500
	Robotics Mining Competition			$0	$2,000	$2,000
	Rover Challenge			$0	$2,000	$2,000
	Space Camp			$0	$500	$500
	Student Launch Competition			$0	$2,000	$2,000
Travel:	Annual ND Mtg, National Meeting & Western Regional Mtg			$0	$10,000	$10,000
	Informal Education			$0	$1,000	$1,000
	Design/Build/Fly Competition			$0	$2,000	$2,000
	FIRST Robotics competitions Registration			$0	$5,000	$5,000
	High Altitude Balloon Launches			$0	$500	$500
	In-Service Educator Workshops			$0	$2,000	$2,000
	Middle School Mega-Launches			$0	$1,000	$1,000
	Near Space Balloon Competition			$0	$2,000	$2,000
	Pre-Service Educator Workshops			$0	$1,500	$1,500
	Robotics Mining Competition			$0	$2,000	$2,000
	Rover Challenge			$0	$2,000	$2,000
	Student Launch Competition			$0	$2,000	$2,000
	Student Space Participant Travel			$0	$1,000	$1,000
	Student Travel Grants			$0	$1,500	$1,500
SUBTOTAL OPERATING EXP.				$105,524	$77,233	$182,757
Total Direct Costs				$245,399	$165,929	$411,328
Indirect cost expense (35.6%)				$54,601	$59,071	$113,672
TOTAL BUDGET				$300,000	$225,000	$525,000

North Dakota Space Grant Consortium -- FY 2017 budget
Total budget = $555,000

Period of Performanc 06/08/17-6/07/18

Description	Program	NASA MM	MATCH MM	NASA BUDGET	MATCH BUDGET	TOTAL BUDGET
FACULTY:						
Seelan, Santhosh (Director)		3.00	0.00	$37,031	$0	$37,031
TOTAL FACULTY SALARIES				$37,031	$0	$37,031
STAFF						
Nolby, Caitlin		12.00	0.00	$49,607	$0	$49,607
Space Grant Coord		0.00	9.03	$0	$30,922	$30,922
Admin. Asst.		3.75	0.00	$15,133	$0	$15,133
Graphic Artist		0.00	4.10	$0	$14,462	$14,462
TOTAL STAFF SALARIES				$64,739	$45,384	$110,123
STUDENTS						
Graduate Assistant	3 quarter-time position	0.00	6.75	$0	$23,687	$23,687
Student Assts				$2,444	$0	$2,444
TOTAL STUDENTS				$2,444	$23,687	$26,131
TOTAL DIRECT SALARIES				$104,215	$69,071	$173,286
FRINGE BENEFITS				$40,242	$22,791	$63,034
SUBTOTAL PERSONNEL				$144,457	$91,863	$236,320
OPERATING EXPENSES						
Scholarships/Fellowships				$75,000	$0	$75,000
Student Participants at NASA Centers				$8,918	$4,582	$13,500
Tribal College and Community College Bridge Fellowship Program				$3,500	$0	$3,500
Graduate tuition waiver				$13,524	$0	$13,524
Fees:	Summer Faculty Fellowships			$0	$9,000	$9,000
	Longitudinal tracking			$0	$4,000	$4,000
Subcontracts/RFA	Research Focus Area Awards			$0	$5,000	$5,000
Materials and Supplie	Office, Printing, Communications			$0	$2,500	$2,500
	Informal Education			$0	$500	$500
	Design/Build/Fly Competition			$0	$1,985	$1,985
	High Altitude Balloon Launches			$0	$500	$500
	Human Spaceflight Laboratory			$0	$3,000	$3,000
	In-Service Educator Workshops			$0	$500	$500
	Middle School Mega-Launches			$0	$500	$500
	Near Space Balloon Competition			$0	$1,500	$1,500
	Pre-Service Educator Workshops			$0	$500	$500
	Robotics Mining Competition			$0	$2,000	$2,000
	Rover Challenge			$0	$2,000	$2,000
	Space Camp			$0	$500	$500
	Student Launch Competition			$0	$2,000	$2,000
Travel:	Annual ND Mtg, National Meeting & Western Regional Mtg			$0	$10,000	$10,000
	Informal Education			$0	$1,000	$1,000
	Design/Build/Fly Competition			$0	$2,000	$2,000
	FIRST Robotics competitions Registration			$0	$5,000	$5,000
	High Altitude Balloon Launches			$0	$500	$500
	In-Service Educator Workshops			$0	$2,000	$2,000
	Middle School Mega-Launches			$0	$1,000	$1,000
	Near Space Balloon Competition			$0	$2,000	$2,000
	Pre-Service Educator Workshops			$0	$1,500	$1,500
	Robotics Mining Competition			$0	$2,000	$2,000
	Rover Challenge			$0	$2,000	$2,000
	Student Launch Competition			$0	$2,000	$2,000
	Student Space Participant Travel			$0	$1,000	$1,000
	Student Travel Grants			$0	$1,500	$1,500
SUBTOTAL OPERATING EXP.				$100,942	$74,067	$175,009
Total Direct Costs				$245,399	$165,930	$411,329
Indirect cost expense (35.6%)				$54,601	$59,070	$113,672
TOTAL BUDGET				$300,000	$225,000	$525,000

Budget Narrative and Details

Faculty and Staff:
The Consortium management includes the Director, Dr. Santhosh Seelan; the Deputy Director, Caitlin Nolby; and a new Coordinator (TBA). The below tables reflect a 4% increase in salaries in subsequent years.

FY15 Key Personnel Budget Breakdown

Position	Measurement	NASA Funding	Match Funding
Santhosh Seelan, Director	Dollars	$34,237	$0
	Time	3 months	0
Caitlin Nolby, Deputy Director	Dollars	$45,864	$0
	Time	12 months	0
TBA, Coordinator	Dollars	$0	$34,318
	Time	0	10.84 months

FY16 Key Personnel Budget Breakdown

Position	Measurement	NASA Funding	Match Funding
Santhosh Seelan, Director	Dollars	$35,607	$0
	Time	3 months	0
Caitlin Nolby, Deputy Director	Dollars	$47,699	$0
	Time	12 months	0
TBA, Coordinator	Dollars	$607	$29,985
	Time	.18 months	9.1 months

FY17 Key Personnel Budget Breakdown

Position	Measurement	NASA Funding	Match Funding
Santhosh Seelan, Director	Dollars	$37,031	$0
	Time	3 months	0
Caitlin Nolby, Deputy Director	Dollars	$49,607	$0
	Time	12 months	0
TBA, Coordinator	Dollars	$0	$30,922
	Time	0	9.03 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.

Five faculty from the UND Department of Space Studies will provide 0.25 months of salary match each in FY15. 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 1.33 months of salary match in FY15. 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:
Graduate research assistantships will be awarded as one ½-time GRA and two ¼ time GRAs for FY15 (reducing this to three ¼ time positions in FY16 and FY17). Funded GRAs are expected to conduct M.S. thesis research in an area within UND Space Studies. Tuition remission for the 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 fellowship funding is for the student to complete research at UND or NDSU the summer prior to enrollment. The FY15 budget includes funding for two students at $3,500 each, and FY16 and FY17 include funding for one student each summer.

Summer Faculty Fellowships (SFF): These awards are provided to NDSGC faculty to develop or revise NASA-relevant college courses. At $4500 each, the FY15 budget includes five awards, and the FY16 and FY17 budget each include two awards.

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. This integrated system is designed to stay in touch with and regularly survey program participants as they progress though their education and career. It is based upon a balanced blend of automation and direct human interaction to maintain contact with program participants. 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 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. Due to budget constraints in FY16 and FY17, not all NDSGC personnel may be able to attend. Each spring, these meetings will be in Washington DC. The fall 2015 National Meeting will be in Tucson, 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 airfare for the fall 2015 meeting will be ~$800 roundtrip from Grand Forks, ND. The per diem in Tucson, AZ is $56.00. 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 FY15, up to six students will receive up to $500 each in travel support from the NDSGC to complete an internship at a NASA center. In FY16 and FY17, up to two students will receive up to $500 each in travel support from the NDSGC.

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 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 Deputy Director and new Coordinator 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.

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.

Statements of Commitment and Letters of Support

Dear Caitlin,

For the past several semesters, you have presented in both sections of our T&L 470 Course: Science in the Elementary School, directly impacting 40 – 50 pre-service teachers each semester. I greatly appreciate your presentation as you connect these teachers to quality and interactive NASA and space related resources. Your time with us is also very captivating and engages my pre-service teachers through fascinating space inquiries and fun educational games. I also am very pleased with your upbeat and enthusiastic personality which delights your audience and makes them curious to learn more about your space-related topics.

Thank you for your service to our T&L department over the last two years. Your expertise, wealth of resources, and enthusiasm for space is highly valuable for our future teachers. I greatly support your outreach and Space Grant program as a whole.

Sincerely,

Mark D. Guy, Professor
Department of Teaching & Learning – Science Education
231 Centennial Drive STOP 7189
University of North Dakota
Grand Forks, ND 58202
701-777-3139

To whom it may concern:
Please accept my recommendation to fund the ND space Grant Consortium. I have had the opportunity to attend workshops made available as a result of the program, and I have found this to be some of the best professional development I have received. After leaving, I had ample resources, materials and know how to go into the classroom and begin activities immediately. The impact of these sessions far exceeded the audience, as after doing the activities with students and discussing with other educators, many other educators are now using NASA activities and discussing space related topics in their content areas. I highly recommend the proposal to be accepted and support the activities funded by them. Please feel free to contact me with any questions.

Thank you for your consideration,

Mike McHugh
Aviation Instructor

Bismarck Public Schools - Career Academy
mike_mchugh@bismarckschools.org
(W) 701-323-4340 Ext. 3029
(C) 701-425-6302

In January, Caitlin Nolby came to my classroom to talk to my 7th grade math classes about how solar energy is used with space crafts and equipment and how math is incorporated with it. She created an engaging and exciting lesson about it and my students loved having her talk to them. It was nice to have someone knowledgeable about the subject be able to come in and talk to my students. I am grateful that her job allows her to come and share her knowledge with students. This is a great program and I hope it continues in the future.

Emily DeForest
7th Grade Wolves Math
Valley Middle School
emily.deforest@gfschools.org
701-746-2205, ext 3122

February 13, 2015

To Whom it May Concern:

It is my pleasure to write a letter in support of the North Dakota Space Grant Consortium.

Last fall, my students and I were able to participate in a near-space balloon launch through UND's Near-Space Balloon Competition. My students wrote a proposal, designed an experiment, and then constructed their payload to launch on a near-space balloon. The project required both critical thinking skills and collaboration as my students moved forward within the parameters of a near-space balloon payload. Designing and building the payload that weighed less than two pounds challenged my students become engineers. The experience my students received from participating in a meaningful and authentic research project was one that I would not have been able to duplicate in my classroom on my own.

In conclusion, I fully support the North Dakota Space Grant Consortium as they seek funding for their amazing program. My students and I will always remember the lessons learned from our experience with the Near-Space Balloon Competition.

Sincerely,

Marci Johnson
Science Teacher
Shiloh Christian School
Bismarck, ND 58503
Appendices

MAY-PORT CG MIDDLE/HIGH SCHOOL, DIST. # 14
900 MAIN STREET WEST
MAYVILLE, ND 58257
Phone 788-2281 FAX 788-2959

Our Mission is "C.L.E.A.R." (Challenge Learn Empower Assist Respect)

Scott M. Ulland, Principal
May-Port CG Middle/High School

Michael Bradner, Superintendent
May-Port CG School Dist.

Jeffrey Houdek, Principal
May-Port CG Middle/Elem. School

February 11, 2015

I wish to let you know that my school and I strongly support the North Dakota Space Grant Consortium's (NDSGC) mission and programs. My experience with the NDSGC has demonstrated their willingness to involve North Dakota K-12 teachers and students in collaborative, NASA-relevant, research and higher-education projects. I have had the pleasure of working with the NDSGC on two separate occasions.

In March of 2014, as President of the North Dakota Council of Teachers of Mathematics, I invited Caitlin Nolby to be our banquet speaker and provide us with information on the NDSGC. As a direct result of this, Caitlin was asked to speak at schools throughout North Dakota on the mission of the NDSGC and the opportunities they provide for the classroom. In the fall of 2014 I was involved with the NDSGC on the Near Space Balloon Competition (NSBC). As a result of Caitlin's talk in March, I was aware of the competition and how it benefits the students. At the May-Port CG Middle School and High School we had two seniors, a sophomore, and three sixth grade students that participated. This provided wonderful knowledge sharing and mentoring opportunities.

Our schools involvement in the NSBC was a huge success. All of the students involved emerged with an increased understanding of near space atmospheric conditions, a greater appreciation for the laws of science, and a much better understanding of the scientific method. All members of the team contributed and have an increased awareness of what it takes to conduct an experiment and analyze the results. The students had a fun time and learned some very valuable lessons.

As an educator, I was very impressed with the NDSGC college faculty and students that helped with or judged the competition. When talking with the event coordinators and judges the students always felt like equals and their input was valued. The staff at the NDSGC also met with the students over Skype and provided input during a visit to the UND campus. This input was very beneficial and really helped the students focus on the purpose and intent of the competition. I was proud to hear the judges highlight the student's positive attitude, enthusiastic nature, and willingness to extend help to their competitors. These three things are important in our youth; the NSBC competition recognizes this and encouraged these students to continue these positive traits.

Sincerely,

Jonathan Fugleberg

Jonathan Fugleberg, Math/Physics Teacher
MayPort CG MS/HS, Mayville, ND

UND AEROSPACE
UNIVERSITY OF NORTH DAKOTA

February 11th, 2015

To whom it may concern,

Since my arrival at UND in 2004 the North Dakota Space Grant Consortium has been a driving force supporting my research in space suits and human space systems.

From an initial $25,000 grant given by Space Grant in 2005, we were able to build from the ground up a human spaceflight component in the State of North Dakota. Now UND is a world-recognized university on space suit technologies and planetary habitability thanks to the initial confidence given by ND Space Grant, with external grants totaling more than 1 million dollars.

Even today, Space Grant is an important component in our activities, providing our students with research and travel funding, the organization of educational tours to our laboratories, and an amazing outreach program which benefits students all over the state.

For this reason, I want to express my utmost support to the great work that North Dakota Space Grant Consortium is doing, and the great asset it represents for the state of North Dakota.

Sincerely,

Dr. Pablo de León,
Associate Professor.
Human Space Systems
Tel: 701-777-2369

Department of Space Studies
John D. Odegard School of Aerospace Sciences
Clifford Hall Room 512
4149 University Avenue Stop 9008
Grand Forks, ND 58202-9008
701/777-2480 • FAX 701/777-3711
www.space.edu

Kathy Lentz
1016 6th Ave NE
Valley City, ND 58072
February 9, 2015

To Whom It May Concern,

I am pleased to write a letter of support for the North Dakota Space Grant Consortium. I am a fifth grade teacher at Washington Elementary School in Valley City, ND. I also serve as adjunct professor at Valley City State University.

I am fortunate to have worked with representatives of the ND Space Grant Consortium for many years at the collegiate level. Caitlin Nolby has been a guest speaker in my Science Methods for Elementary Teachers class for two years. When she visits, she shares a wealth of space-related information with my pre-service teachers. She provides hands-on activities, demonstrations, and information regarding NASA resources and websites. She models specific NASA lesson plans and encourages my students to teach science in a way that children will love!

Caitlin has also been a guest presenter at my elementary school. She taught four different classes of fifth graders. She guided them to design a spacesuit that would protect a marshmallow astronaut. The students became engineers as they brainstormed creative ways to keep their marshmallow intact. She shared information about planets and other objects in space. She also talked about the International Space Station. We look forward to having her return to Washington School in the spring!

The ND Space Grant Consortium is committed to help develop young scientists and engineers in our North Dakota schools. I ask that you continue supporting the grant so they can continue this quest. If you have any questions, please feel free to contact me at 845-8049.

Sincerely,

Kathleen Lentz

Kathleen Lentz

Dakota Science Center
Science is for Everyone!
PO Box 5023, Grand Forks, ND 58206
701-795-8500
www.dakota-science.org

North Dakota Space Grant Consortium
University of North Dakota
Space Studies Department
5th Floor Clifford Hall
P.O. Box 9008
Grand Forks, ND 58202-9008

February 9, 2015

Dear Dr. Seelan,

The Dakota Science Center supports the mission of the North Dakota NASA Space Grant Consortium. The Space Grant shares Space Studies education with K-12 students and teachers. It also educates the North Dakota citizenry about NASA, its purpose, and its missions.

The Mission of the Dakota Science Center is to encourage lifelong curiosity and fascination with science in children, parents, teachers, and the community through discovery, exploration and interaction. The Dakota Science Center collaborates with the North Dakota Space Grant Consortium to provide out-of-school educational programs. Developed programs and curriculum are shared with educators on the Dakota Science Center web page.

Sincerely,

Dr. Laura Munski
Executive Director
Dakota Science Center

North Dakota
Center for Distance Education
4776 28th Ave S Ste 301
Fargo ND 58104-8523
Phone: 701-298-4830
Fax: 701-298-4858
Dr. Alan J. Peterson, State Director
www.NDCDE.org

I would like to express my gratitude to the ND Space Grant Consortium for allowing me the opportunity to attend the 2015 SEEC conference in Houston, Texas. I am so grateful to have been granted the privilege to learn with and connect to teachers from around the country. Not only did this experience provide me with an opportunity to learn about the wonderful things that NASA is doing, but it provided me the a sense of belonging to a group of teachers with a greater purpose, essentially to feel as though I am part of something bigger and reinforcing to me that I have not only the power but the duty to share this with my students. The knowledge that I have acquired has inspired me to learn more about space and to do what I can to share that inspiration with my students. I can honestly say that I have not stopped sharing with my family, colleagues and students since my return. I will soon begin work to implement some of the hands on activities I was introduced to at the conference (as well as the workshop in Grand Forks this past spring) in an online blended format for my school. In the upcoming years I hope to return the SEEC conference as a presenter to share how I am using these incredible resources to inspire our ND kids. I am excited to show our kids what NASA has to offer and how they can be a part of it.

Thank you again.

Sincerely,

Tonya Greywind

Tonya Greywind
Science/STEM Teacher

UND AEROSPACE
UNIVERSITY OF NORTH DAKOTA

Department of Space Studies
Clifford Hall, Room 512
4149 University Avenue Stop 9008
Grand Forks, ND 58202-9008
Phone: 701.777.2480
Fax: 701.777.3711
Email: info@space.edu
space.edu

February 13, 2015

Dear Dr. Seelan,

As a faculty member in the Department of Space Studies, and as the director of high-altitude balloon and small spacecraft development programs at the University of North Dakota (UND), I strongly support the activities of the North Dakota Space Grant Consortium (NDSGC). In particular, I am pleased to be involved as a collaborator on the NDSGC proposal which would secure funding for the 2015-2018 time period.

A number of projects that engage faculty and students in space activities have been, and will continue to be enabled by this funding. These include projects involving other states' Space Grant chapters, the North Dakota Space Grant Affiliate Institutions, and other North Dakota educational entities. I have had the good fortune to be heavily involved in several of these efforts. For a number of years I have been serving as a faculty advisor for the University of North Dakota/University of North Florida High-Altitude Student Platform (HASP) program. My collaborator at the University of North Florida, Dr. Nirmal Patel, and I have greatly benefited from the support of each of our state's Space Grant chapters in these HASP activities, along with the support of the Louisiana Space Consortium. NDSGC, along with the Space Grant chapters from Colorado and Virginia, supported my sounding rocket payload development efforts through the RockOn and RockSat programs. Numerous regional high-altitude balloon activities that I have played a leading role in have been supported by NDSGC. These include the annual North Dakota Near-Space Balloon Competition, the 5th Annual Academic High Altitude Conference, and local stratospheric balloon flights that support UND student payloads and middle school student payloads. Finally, NDSGC provided seed money that allowed me to initiate a small spacecraft (CubeSat) program at UND. Needless to say, NDSGC, and the National Space Grant College and Fellowship Program in general, have been an invaluable part of my career activities. I hope I can give back at least as much as I have received from NASA Space Grant.

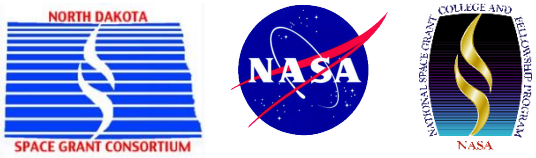
North Dakota Space Grant Consortium funding for the 2015-2018 time period is critical for the continued expansion of space-based STEM activities in North Dakota and beyond. I look forward to continued involvement in these activities, and strongly support funding for the North Dakota Space Grant Consortium.

Sincerely,

Ronald Fevig

Ronald Fevig, Ph.D.
Associate Professor

Strategic Plan of the Consortium



North Dakota Space Grant Consortium (NDSGC)
Strategic Plan 2015-2018

Preface: Since 1990, the North Dakota Space Grant Consortium (NDSGC) has been the premier NASA higher education program in the state by supporting diverse and effective programs that aim to establish a robust and evolving NASA infrastructure. These efforts have led to a variety of programs such as high altitude ballooning, planetary space suit research, the awarding of fellowships and scholarships across the state, placing North Dakota college students as interns at NASA field centers, and providing avenues to involve females and underrepresented minorities in the NASA mission.

The past accomplishments have been made possible by the statewide affiliate institutions of Space Grant, as well as the support from the North Dakota Legislature and the University of North Dakota (UND). This support is a testimony to the confidence of North Dakota's policymakers and educators in the NASA Space Grant mission, which is to increase the number of college students pursuing science, technology, engineering, and mathematics (STEM) degrees and employment in the NASA and technical workforce. Much of the Consortium's past work could not have been possible without this support.

Although the NDSGC has demonstrated significant past success, it is time for fresh new ideas and expansions of existing successful efforts. This strategic plan has the broad goal of dramatically increasing NASA research and education in North Dakota, in terms of science and engineering, which can invigorate and motivate the state's K-12 and higher education students while also developing capabilities that might lead to new economic development.

Part I: This three-year strategic plan, in alignment with the current proposal, is a comprehensive document that defines the Consortium's goals, SMART objectives, programs, and metrics that will reinvigorate the Consortium's work. The challenge of bringing substantive, long-term, and positive change to North Dakota is a major challenge, but this proposal and our strategic plan define the way forward to accomplish these goals. 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 NASA and the all-encompassing realm of space science and exploration.

Mission statements

The Consortium mission is guided by the overall NASA Space Grant mission, the definition of the Consortium as a Capability Enhancement Consortium, the goals of the NASA Office of Education, and its own mission statement, which are shown below:

National Space Grant Mission Statement: The NASA Space Grant College and Fellowship Program is a national network that promotes science, technology, engineering and mathematics (STEM) education through cooperative and multidisciplinary programs while recruiting and training the workforce.

Capability Enhancement Consortium: There is a required amount of funds that must be spent on graduate fellowships and undergraduate scholarships. Capability enhancement consortia should focus on the development of space-related research infrastructure in the state and provide funds for improvements in the quality of aerospace research and education. These consortia should minimize precollege and informal education investments in order to concentrate resources on building research infrastructure and improving the state's aerospace education base. The focus of expenditures and effort varies according to the resources and needs identified in the state.

NASA Office of Education Goals: The NASA Office of Education defines its goals in the context of NASA's overall strategic plan and explicitly states these goals in terms of three education outcomes. The three outcomes are:

1. Outcome 1 – Higher Education: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals through a portfolio of investments.
2. Outcome 2 – Elementary to Secondary Education: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty.
3. Outcome 3 – Informal Education: Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission.

North Dakota Space Grant Consortium Mission Statement: 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 these mission statements, the NDSGC has five overarching 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 student support
5. Conduct public service projects that engage and educate the North Dakota citizenry of NASA's mission and activities.

Part II: To fulfill these goals, the NDSGC will focus on the five programmatic areas as defined by NASA: NASA Internships, Fellowships, and Scholarships (NIFS), Higher Education (HE), Research Infrastructure (RI), Pre-college (P-C), and Informal Education (IE). Through unique NDSGC initiatives, the consortium will focus on alignment with NASA Education Outcomes. The following goals will guide the actions of the NDSGC from 2015-2018.

Management Goals: To accomplish the program goals below, the Consortium will take the following actions to improve its management effectiveness, which will allow it to fulfill its mission.

1. Promote current Coordinator to Deputy Director by August 1, 2015. The Deputy Director will be primarily responsible for: assisting in Director tasks, 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 reporting.

2. Hire a new Coordinator who will begin working by August 1, 2015, to significantly increase the impact of Space Grant statewide. The Coordinator will be primarily responsible for: assisting in Deputy Director tasks, 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.

3. Continue to encourage affiliates to become more directly involved in NDSGC programs, which includes both faculty and student participation. By the end of the three year proposal period, the NDSGC aims to have at least one additional consortium representative at each affiliate institution.

4. Continually improve the contents of the NDSGC website (http://ndspacegrant.und.edu/), with an emphasis on the increasingly competitive applications for all areas of funding.

NASA Internships, Fellowships, and Scholarships NIFS

1. Send qualified North Dakota undergraduate and graduate students to participate in internship programs at NASA centers. Student placement at NASA centers for a 10-week (summer) or 15-week (semester) research experience is an excellent way to match students directly with NASA researchers and to work on flight hardware and mission science. Participation in NASA center internships is also a way for graduating students to be placed in jobs directly with NASA, which supports NASA's workforce development goals. (*Outcome 1.2)*

2. Provide qualified North Dakota undergraduate and graduate students with fellowship opportunities that encourage their completion of STEM degrees and employment in the STEM workforce. The NDSGC will provide no more than two semesters of fellowship funding to one individual in order to

keep the opportunity available to other North Dakota students interested in completing STEM- or NASA-relevant research. (*Outcome 1.2)*

3. Increase female pursuit of STEM degrees at North Dakota's colleges and universities by providing 51% of the Consortium's annual NIFS funding to female college students.[9]
    a. Specifically addressed through the annual award of the Lillian Goettler and Pearl I. Young Scholarships to female students in STEM at NDSU and UND, respectively.

4. Increase underrepresented minority pursuit of STEM degrees at North Dakota's colleges and universities by providing 10.5% of the Consortium's annual NIFS funding to American Indian, Black, and Hispanic college students.[10]
    a. Specifically addressed through the annual award of American Indian Scholarships to students attending one of the five Tribal Colleges and committed to the pursuit of a four-year degree at UND or NDSU.
    b. A new initiative of the NDSGC includes the implementation of a *Community College and Tribal College Bridge Program*, which will fall under the NDSGC fellowships. This program will provide the opportunity for 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. Collaborations will also be in place between the student's two-year college faculty as well as NDSU/UND faculty in project development. This program's objective is to increase the retention of transfer students in STEM, a student population at significant risk for attrition in a STEM field, especially first-generation students. This will also give students hands-on experience in research relevant to their area of study and better help them transition from the more close-knit college environment to that of a research university. The application and selection process for these awards will be the same as the NDSGC fellowship program, yet faculty at Tribal College and Community College affiliate institutions will be consulted for potential student participant. *(Outcome 1.2)*

Higher Education (HE)

1. Provide funding for the High-Altitude Student Payload (HASP). HASP is an advanced high-altitude national ballooning program where space instrumentation can be initially tested and validated prior to flight on suborbital or orbital rockets. Participating faculty and students receive real-world experience and training in designing, building, and flying space instrumentation. (*Outcome 1.2, 1.3)* http://laspace.lsu.edu/hasp/

2. Provide funding for the NASA Student Launch Competition. This is a NASA-sponsored student rocket competition where teams must design and build a rocket that will achieve an altitude as close to one mile as possible. This program provides design, engineering, and team-building experiences that increase the in-state engineering and mission operations expertise of students and faculty. (*Outcome 1.2, 1.3)* http://www.nasa.gov/audience/forstudents/studentlaunch/home/

3. Provide funding for the NASA Robotics Mining Competition. This competition is for "university-level students to design and build a mining robot that can traverse the simulated Martian chaotic terrain, excavate Martian regolith and deposit the regolith into a Collector Bin within 10 minutes." (*Outcome 1.2, 1.3)*
http://www.nasa.gov/offices/education/centers/kennedy/technology/nasarmc.html

[9] http://nces.ed.gov/programs/digest/d13/tables/dt13_304.30.asp?current=yes
[10] http://nces.ed.gov/programs/digest/d12/tables/dt12_265.asp

4. Provide funding for the NASA Rover Challenge. The challenge focuses on designing, constructing and testing technologies for mobility devices to perform in different lunar and planetary environments, and it provides valuable experiences that engage students in the technologies and concepts that will be needed in future exploration missions (*Outcome 1.2, 1.3)* http://www.nasa.gov/roverchallenge/home/#.VNM4OWjF-So

5. Provide funding for the AIAA Design/Build/Fly Competition. "Student teams will design, fabricate, and demonstrate the flight capabilities of an unmanned, electric powered, radio controlled aircraft which can best meet the specified mission profile." (*Outcome 1.2, 1.3)* http://www.aiaadbf.org/

6. Provide Space Studies graduate students at UND with Graduate Research Assistantship (GRA) funding to conduct NASA-relevant research. The UND Department of Space Studies is the nexus of various disciplines of space research in North Dakota and provides diverse and advanced opportunities in NASA-relevant areas of science and engineering. Funded students are expected to conduct research and graduate with a publishable M.S. thesis. http://www.space.edu.

7. A new initiative of the NDSGC for FY15 is to implement a *STEM Ambassador Program* for undergraduate and graduate students in a STEM field (or education with a STEM emphasis) who will devote time each semester to participate in NDSGC public service or pre-college events like high-altitude balloon launches, space camps, classroom visits, and community outreach. The student work will be minimal in comparison to Graduate Research Assistants or fellowship recipients, but the impact to the surrounding community and to the participating college students will be great. Students will be able to improve communication skills (a valued talent especially in STEM fields) and inspire the next generation of scientists and engineers. This program also has the potential to serve as an indicator of student success as a future GRA or fellowship recipient. *(Outcome 1.3, 2.4)*

8. The NDSGC will support undergraduate and graduate students at affiliate institutions completing NASA-relevant STEM research to travel to local, regional, and national conferences to present research findings. Through travel grants, students are not only able to share their research with others in the STEM community, but also to network with others in their field. *(Outcome 1.2)*

9. The NDSGC will support Summer Faculty Fellowships (SFF), which are given to faculty members 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. *(Outcome 1.1, 2.3)*

10. Increase North Dakota K-12 teacher knowledge and competence in NASA- and space-relevant educational content while providing K-12 students with authentic NASA-relevant educational experiences through pre-service workshops conducted by the NDSGC. *(Outcome 2.1)*

11. A new initiative of the NDSGC is to implement an annual in-service teacher workshop titled, "NASA in the Classroom," including NASA-relevant hands-on investigations and NGSS alignment. The NDSGC will conduct the workshop at a different location each year to encourage attendance by teachers who may live in more rural communities or Tribal communities. The changing location will increase affiliate involvement and invite different professors to conduct sessions within the workshop, bringing in collaborations across STEM disciplines. *(Outcome 2.2)*

Research Infrastructure

1. Provide funding to affiliate faculty and their students for scientifically sound proposals to complete NASA-relevant Research Focus Area (RFA) projects that lead to long-term, self-sustaining, collaborative research endeavors in North Dakota. This program aims to match affiliate faculty directly with NASA researchers to develop research projects that can be implemented by the faculty in North Dakota. The long-term goals of this program are to increase faculty expertise in NASA-relevant research and to assist the faculty in developing independent, self-sustaining research programs. 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. These were defined by the NDSGC through alignment with NASA's strategic goals and objectives. *(Outcome 1.1, 1.2, 1.5)*

2. The NDSGC will 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 universities. For example, in 2013 and 2014, a 10-day and 30-day mission were conducted, respectively, with three graduate students living in a confined environment as crewmembers while other students performed the duties of mission control. *(Outcome 1.1, 1.2, 1.3, 1.5)*

3. The NDSGC will fund the growing high-altitude ballooning (HAB) program and the hands-on opportunities that result in undergraduate and graduate student research.. Students are trained in tracking, launch, and chase procedures after designing and building their very own payloads. This has thus far mainly involved faculty and students at UND, but plans are to expand this program further, to involve more affiliates, and give other students the opportunity to experience STEM research in a near-space environment, first-hand. *(Outcome 1.1, 1.2, 1.3, 1.5)*

Pre-college

1. The NDSGC will fund high school team participation in the annual *For Inspiration and Recognition of Science and Technology (FIRST) Robotics* Competition. This competition challenges students to design and build their own robot to creatively complete a certain set of tasks and perform these tasks at regional and/or national competitions. The FIRST Robotics competition consistently attracts the interest and help of student families and community members (e.g. local engineers or mechanics) and these individuals become mentors to the students as a part of their participation in the competition. *(Outcome 2.4)*

2. The NDSGC will fund high-altitude ballooning (HAB) endeavors with a focus on middle school and high school students. Graduate students, undergraduates, and faculty members have served as mentors to 8th grade students for entire grade-wide "Mega-launches" (three have occurred thus far in the previous proposal period) and the NDSGC aims to expand this effort to involve more school districts from across the state. *(Outcome 2.4)*

3. The NDSGC will support the Near-Space Balloon Competition (NSBC), in which middle and high school teams design, build, and fly their very own science and engineering payloads aboard a high-altitude balloon launched by the college-level mentors. This initiative follows 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. *(Outcome 2.4)*

4. A new NDSGC initiative includes the implementation of a Space Grant led "Space Camp." This camp will include Aerospace labs tours at UND, NASA-relevant and hands-on investigations, and small-scale STEM competitions. If successful in FY15, and funds are available in subsequent years, the program will expand to include a high school level opportunity, and a camp focused solely on K-12 female students. *(Outcome 2.4)*

Informal Education

1. NASA in North Dakota – Develop a state-wide public service program to educate students, teachers, and the general public about NASA's Science Mission Directorate (SMD) missions to explore and study the solar system and universe. The new Coordinator position and *STEM Ambassadors* program will be essential to success in outreach events across the state. *(Outcome 3.1, 3.3)*

Through each of the aforementioned programs, the NDSGC will highly encourage the participation of female and underrepresented minority students, faculty, teachers, and the general public. This diversity consideration is included in each of the SMART (specific, measureable, attainable, realistic, and timely) Objectives listed in the following table. **Note this is a duplicate table of Appendix Item #2 as requested in the 2015-2018 proposal solicitation.*

Summary Table of SMART Objectives

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
HE	Fund	GRAs funded	UND SpSt Graduate Students	UND SpSt Graduate Students	3	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	5 (2)	FY15 (FY16, FY17)
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	8 (5)	FY15 (FY16, FY17)
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 (3)	FY15 (FY16, FY17)
RI	Participate	# of RFAs funded	Affiliate Institutions	Faculty, Students	3	3 years
RI	Participate	# HSFL activities funded	Non-research affiliate colleges	Faculty , Students	1	FY15

P-C	Participate	# of HAB "mega-launches"	8th grade classes	Rural or Tribal community school	3	3 years
P-C	Participate	# of classroom visits	K-12 classrooms	Rural or Tribal community school	3	3 years
P-C	Fund	# of FIRST Robotics Teams	High School students	Rural or Tribal community school	5	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	FY15
IE	Participate	# of participants at outreach events	ND general public	Especially rural and Tribal community	1000	Annually

**End of NDSGC Strategic Plan*

Summary Table of NDSGC Goals

Goal	Goal Description	Program Alignment
1.	Support undergraduate/graduate student STEM experiences that will lead to enhancement of the NASA and technical workforce	Higher Education, Research Infrastructure
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	Research Infrastructure
3.	Expand K-12 educator competence in space sciences to provide them the necessary tools to conduct investigations in the classroom	Pre-college, Higher Education, Informal Education
4.	Distribute scholarships and fellowships to North Dakota undergraduate and graduate students in STEM fields with an emphasis on female and American Indian student support	NIFS
5.	Conduct public service projects that engage and educate the North Dakota citizenry of NASA's mission and activities	Informal Education

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. **Note this is a duplicate table of the SMART Objectives included in the NDSGC Strategic Plan.*

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
HE	Fund	GRAs funded	UND SpSt Graduate Students	UND SpSt Graduate Students	3	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	5 (2)	FY15 (FY16, FY17)
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	8 (5)	FY15 (FY16, FY17)
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 (3)	FY15 (FY16, FY17)
RI	Participate	# of RFAs funded	Affiliate Institutions	Faculty, Students	3	3 years
RI	Participate	# HSFL activities funded	Non-research affiliate colleges	Faculty , Students	1	FY15
P-C	Participate	# of HAB "mega-launches"	8th grade classes	Rural or Tribal community school	3	3 years
P-C	Participate	# of classroom visits	K-12 classrooms	Rural or Tribal community school	3	3 years
P-C	Fund	# of FIRST Robotics Teams	High School students	Rural or Tribal community school	5	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	FY15
IE	Participate	# of participants at outreach events	ND general public	Especially rural and Tribal community	1000	Annually

Summary Table of Projected Contributions to NASA Education API for FY2015

Performance Goal	FY15 APIs	NDSGC Specific Contributions
2.4.1	ED-15-1	The NDSGC places a focus on providing significant, direct student awards in higher education to both underrepresented minority students (e.g. the American Indian Scholarship) and female students (e.g. the Pearl I. Young and Lillian Goettler Scholarships) in STEM. Underrepresented minorities, females, and students with disabilities are strongly encouraged by the NDSGC to apply for scholarships, fellowships, and NASA internships.
2.4.2	ED-15-2	The NDSGC conducts pre-service workshops utilizing NASA resources each semester at the lead institution and at affiliate institutions. The NDSGC places a focus on involvement of Tribal College affiliates in training STEM educators. The NDSGC also conducts in-service training at the North Dakota Science and Math Teachers Annual Conference and plans to implement an annual in-service workshop fully organized by the NDSGC starting in FY2015.
2.4.4	ED-15-4	The NDSGC maintains the NASA Museum Alliance through strategic partnerships with affiliate institutions: the Gateway to Science Center and the North Dakota Heritage Center. Contributions to STEM and NASA-relevant exhibits and hands-on activities at these centers and participation in community events is ongoing. The NDSGC also provides opportunities for learners to engage in NASA unique content at NDSGC-organized outreach events like *Family Science Days* and through informal education institutions like the Dakota Science Center in Grand Forks, ND.
2.4.5	ED-15-5	The NDSGC continues to improve the statewide Near-Space Balloon Competition (NSBC) which provides an opportunity for STEM engagement for student teams grades 6-12 and conducts grade-wide balloon launches as well. K-12 involvement in many hands-on activities has also increased as the NDSGC continues to strengthen and form new relationships with teachers across North Dakota. The NDSGC participates in multiple classroom visits statewide, introducing K-12 students and teachers to engaging NASA content throughout the school year. The NDSGC will continue to fund NASA-relevant K-12 competitions like FIRST Robotics and Student Spaceflight Experiments Program involving launches to the International Space Station.

Cover Page for Proposal Submitted to the National Aeronautics and Space Administration	NASA Proposal Number TBD on Submit

NASA PROCEDURE FOR HANDLING PROPOSALS

This proposal shall be used and disclosed for evaluation purposes only, and a copy of this Government notice shall be applied to any reproduction or abstract thereof. Any authorized restrictive notices that the submitter places on this proposal shall also be strictly complied with. Disclosure of this proposal for any reason outside the Government evaluation purposes shall be made only to the extent authorized by the Government.

SECTION I - Proposal Information

Principal Investigator	E-mail Address	Phone Number
Santhosh Seelan	seelan@aero.und.edu	701-777-2355

Street Address (1)	Street Address (2)
4149 Campus Rd	Clifford Hall, Room 532, Mail Stop 9008

City	State / Province	Postal Code	Country Code
Grand Forks	ND	58202-6086	US

Proposal Title : North Dakota Space Grant Consortium 2015-18 Proposal

Proposed Start Date	Proposed End Date	Total Budget	Year 1 Budget	Year 2 Budget	Year 3 Budget
06 / 08 / 2015	06 / 07 / 2018	1,030,000.00	430,000.00	300,000.00	300,000.00

SECTION II - Application Information

NASA Program Announcement Number	NASA Program Announcement Title
NNH15ZHA003N	NATIONAL SPACE GRANT COLLEGE and FELLOWSHIP PROGRAM (SPACE GRANT) Training Grant 2015-2018

For Consideration By NASA Organization *(the soliciting organization, or the organization to which an unsolicited proposal is submitted)*

NASA , Headquarters , Office of Education , Integration , Space Grant

Date Submitted	Submission Method	Grants.gov Application Identifier	Applicant Proposal Identifier
	Electronic Submission Only		

Type of Application	Predecessor Award Number	Other Federal Agencies to Which Proposal Has Been Submitted
New		

International Participation	Type of International Participation
No	

SECTION III - Submitting Organization Information

DUNS Number	CAGE Code	Employer Identification Number (EIN or TIN)	Organization Type
102280781	4B858		ZZ

Organization Name (Standard/Legal Name)	Company Division
University Of North Dakota, Grand Forks	RESEARCH DEVELOPMENT AND COMPLIANCE
Organization DBA Name	**Division Number**
U N D	

Street Address (1)	Street Address (2)
264 CENTENNIAL DR	

City	State / Province	Postal Code	Country Code
GRAND FORKS	ND	58202	USA

SECTION IV - Proposal Point of Contact Information

Name	Email Address	Phone Number
Santhosh Seelan	seelan@aero.und.edu	701-777-2355

SECTION V - Certification and Authorization

Certification of Compliance with Applicable Executive Orders and U.S. Code

By submitting the proposal identified in the Cover Sheet/Proposal Summary in response to this Research Announcement, the Authorizing Official of the proposing organization (or the individual proposer if there is no proposing organization) as identified below:

- certifies that the statements made in this proposal are true and complete to the best of his/her knowledge;
- agrees to accept the obligations to comply with NASA award terms and conditions if an award is made as a result of this proposal; and
- confirms compliance with all provisions, rules, and stipulations set forth in this solicitation.

Willful provision of false information in this proposal and/or its supporting documents, or in reports required under an ensuing award, is a criminal offense (U.S. Code, Title 18, Section 1001).

Authorized Organizational Representative (AOR) Name	AOR E-mail Address	Phone Number
Harmon B. Abrahamson	harmon.abrahamson@und.edu	701-777-4278

FORM NRESS-300 Version 3.0 Apr 09

AOR Signature *(Must have AOR's original signature. Do not sign "for" AOR.)*	Date
[signature]	2-19-2015

FORM NRESS-300 Version 3.0 Apr 09

APPENDIX A. Required Certifications and Assurances

Certification Regarding

Debarment, Suspension, and Other Responsibility Matters

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 34 CFR Part 85, Section 85.510, Participant's responsibilities. The regulations were published as Part VII of the May 26, 1988 Federal Register (pages 19160 - 19211). Copies of the regulation may be obtained by contacting the U.S. Department of Education, Grants and Contracts Service, 400 Maryland Avenue, S.W. (Room 3633 GSA Regional Office Building No. 3), Washington, DC. 20202-4725, telephone (202) 732-2505.

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or Local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or Local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or Local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

University of North Dakota
Organization Name

PR/Award Number or Project Name

Harmon Abrahamson, Interim Associate VP for Research & Economic Development
Name and Title of Authorized Representative

Signature

2-19-2015
Date

Certification of Nondiscrimination, Compliance with Applicable Executive Orders and U.S. Code
Proposal Cover Sheet

Title: Director of North Dakota Space Grant Consortium

Principal Investigator: Santhosh Seelan

Institution University of North Dakota

Street/PO Box: 532 Clifford Hall, 4149 University Ave. Stop 9008

City: Grand Forks State: ND Zip: 58202 Country: USA

Email: seelan@space.edu

Phone: 701-777-2355 Fax: 701-777-3711

Co-Investigator	Institution & Address	Phone & E-mail

By submitting the proposal identified in the Cover Sheet/Proposal Summary either in response to a NASA Research Announcement or as an Unsolicited Proposal, the Authorizing Official of the proposing institution (or the individual proposer if there is no proposing institution) as identified below:

- Certifies that the statements made in this proposal are true and complete to the best of his/her knowledge;
- Agrees to accept the obligations to comply with NASA award terms and conditions if an award is made as a result of this proposal; and
- Confirms compliance with all provisions, rules and stipulations set forth by these two Certifications [namely, (i) *Certification of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs,* and (ii) *Certifications, Disclosures, And Assurances Regarding Lobbying and Debarment & Suspension*].

Willful provision of false information in this proposal and/or its supporting documents, or in reports required under an ensuing award, is a criminal offense (U.S. Code, Title 18, Section 1001).

Title of Authorizing Official: Interim Associate VP for Research & Economic Development

Signature: Harmon B. Abrahamson Date: 2-19-2015

Name of Proposing Institution: University of North Dakota

Phone: 701-777-4278 Fax: 701-777-6708 E-mail: Harmon.Abrahamson@und.edu

Cage Code: 4B858 DUNS Number: 10-228-0781 TIN Number: 45-6002491

Certification Regarding Lobbying for Contracts, Grants, Loans, and Cooperative Agreements

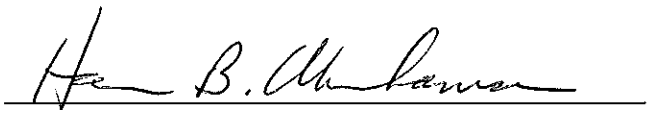
The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certificate shall be subject to a civil penalty of not less than $10,000, and not more than $100,000 for each such failure.



Signature

2-19-2015

Date

Harmon Abrahamson, Interim Associate VP for Research & Economic Development

Name and Title of Authorized Representative

University of North Dakota

Organization Name

Assurance of Compliance – China Funding Restriction

Institution Name:

Proposal Title:

Grant Number:

(DEVIATION FEB 2012)

(iv) An Assurance of Compliance with The Department of Defense and Full-Year Appropriation Act, Public Law 112-10 Section 1340(a); The Consolidated and Further Continuing Appropriation Act of 2012, Public Law 112-55, Section 539; and future-year appropriations herein after referred to as "the Acts", whereas:

(1) NASA is restricted from using funds appropriated in the Acts to enter into or fund any grant or cooperative agreement of any kind to participate, collaborate, or coordinate bilaterally with China or any Chinese-owned company, at the prime recipient level and at all subrecipient levels, whether the bilateral involvement is funded or performed under a no-exchange of funds arrangement.

(2) Definition: "China or Chinese-owned Company" means the People's Republic of China, any company owned by the People's Republic of China, or any company incorporated under the laws of the People's Republic of China.

(3) The restrictions in the Acts do not apply to commercial items of supply needed to perform a grant or cooperative agreement.

(4) By submission of its proposal, the proposer represents that the proposer is not China or a Chinese-owned company, and that the proposer will not participate, collaborate, or coordinate bilaterally with China or any Chinese-owned company, at the prime recipient level or at any subrecipient level, whether the bilateral involvement is funded or performed under a no-exchange of funds arrangement.

Title of Authorizing Official: Interim Associate VP for Research & Economic Development

Printed Name: Harmon Abrahamson Signature: H. B. Abrahamson

Date: 2-19-2015

Name of Proposing Institution:
University of North Dakota

Phone: 701-777-4278 Fax: 701-777-6708

E-mail: Harmon.Abrahamson@und.edu

REPRESENTATION BY PROSPECTIVE RECIPIENT THAT THEY ARE NOT THE ASSOCIATION of COMMUNITY ORGANIZATIONS for REFORM NOW (ACORN) or a SUBSIDIARY of ACORN

(a) In accordance with section 534 of the Consolidated and Further Continuing Appropriations Act of 2012 (Pub. L.112-55), none of the funds made available by the Act may be distributed to the Association of Community Organizations for Reform Now (ACORN) or its subsidiaries.

(b) The prospective recipient represents, by submission of its offer, that it is not the Association of Community Organizations for Reform Now (ACORN) or a subsidiary thereof, and that no funds made available under this award will be distributed to ACORN or its subsidiaries.

REPRESENTATION BY CORPORATIONS REGARDING AN UNPAID DELINQUENT TAX LIABILITY OR A FELONY CONVICTION UNDER ANY FEDERAL LAW

(a) In accordance with sections 544 and 543 of the Consolidated and Further Continuing Appropriations Act of 2012 (Pub. L.112-55), none of the funds made available by that Act may be used to enter into a grant or cooperative agreement with any corporation that -

(1) Has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability, where the awarding agency is aware of the unpaid tax liability, unless an agency has considered suspension or debarment of the corporation and made a determination that this action is not necessary to protect the interests of the Government; or

(2) Was convicted (or had an officer or agent of such corporation acting on behalf of the corporation convicted) of a felony criminal violation under any Federal law within the preceding 24 months, where the awarding agency is aware of the conviction, unless an agency has considered suspension or debarment of the corporation and made a determination that this action is not necessary to protect the interests of the Government.

(b) The prospective recipient represents that -

(1) It is [ ] is not [X] a corporation that has had any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability; and

(2) It is [ ] is not [X] a corporation that was convicted, or had an officer or agent acting on behalf of the corporation convicted, of a felony criminal violation under a Federal law within the preceding 24 months.

Assurance of Compliance – Tax Delinquency or Felony Conviction

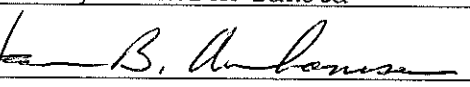
CERTIFICATION BY PROSPECTIVE RECIPIENTS REGARDING FEDERAL INCOME TAX FILING and FEDERAL INCOME TAX VIOLATIONS

(a) In accordance with section 527 of the Consolidated and Further Continuing Appropriations Act of 2012 (Pub. L.112-55), none of the funds made available by the Act may be used to enter into a grant or cooperative agreement in an amount greater than $5 Million unless the prospective recipient certifies in writing to NASA that, to the best of its knowledge and belief, the prospective recipient has filed all Federal tax returns required during the three years preceding the certification, has not been convicted of a criminal offense under the Internal revenue Code of 1986, and has not, more than 90 days prior to certification, been notified of any unpaid Federal tax assessment for which the liability remains unsatisfied, unless the assessment is the subject of an installment agreement or offer in compromise that has been approved by the Internal Revenue Service and is not in default, or the assessment is the subject of a non-frivolous administrative or judicial proceeding.

(b) The prospective recipient's proposal shall include a signed written certification as follows -

To the best of my knowledge and belief, ---(name of offeror)--- has filed the Federal tax returns required during the three years preceding this certification, has not been convicted of a criminal offense under the Internal revenue Code of 1986, and has not, more than 90 days prior to certification, been notified of any unpaid Federal tax assessment for which the liability remains unsatisfied, unless the assessment is the subject of an installment agreement or offer in compromise that has been approved by the Internal Revenue Service and is not in default, or the assessment is the subject of a non-frivolous administrative or judicial proceeding.

Recipient University of North Dakota

Signature 

Name Harmon Abrahamson

Title Interim Associate VP for Research & Economic Development

Date of execution 2-19-2015