NORTH DAKOTA SPACE GRANT CONSORTIUM (NDSGC) STRATEGIC PLAN 2020 – 2024

Starting in 1990, the North Dakota Space Grant Consortium (NDSGC) has been the premier presence of NASA in North Dakota (#NASAinND) through its support of diverse and effective programs that aim to establish a robust and evolving NASA infrastructure. The NDSGC supports projects aligned with NASA's four mission directorates: 1) Aeronautics Research, 2) Human Exploration and Operations, 3) Science, and 4) Space Technology. The NDSGC is committed to providing and supporting opportunities for faculty, students, educators, and members of the public to engage in a coherent and coordinated set of activities devoted to engaging them in science, technology, engineering, and mathematics (STEM) through NASA's mission.

The NDSGC places significant focus on the engagement of populations who identify as female or outside the gender binary, underrepresented minorities, and persons with special needs or disabilities. The NDSGC aims to immerse students in NASA's work, enhance STEM literacy, and inspire the next generation to explore.

These efforts have led to projects such as: NASA internships, research fellowships, scholarships, high altitude ballooning endeavors, human spaceflight research, the statewide STEM Ambassador program, faculty and student research projects, K-12 and college level STEM competition teams, space camps, educator workshops, informal education efforts, calls to the International Space Station, and informal education initiatives across the state.

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 lead institution, 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 may lead to new economic development.

PART I

This four-year strategic plan, in alignment with the NDSGC FY 2020 – 2024 proposal, is a comprehensive document that defines the consortium's goals, SMART objectives, programs, and metrics that will invigorate the NDSGC's work. The challenge of bringing substantive, long-term, and positive change to North Dakota is a major challenge, but this document defines 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.

The NDSGC is guided by the Program Goals and Objectives of the National Space Grant College and Fellowship Program (Space Grant), which was established in 1989:[1]

SPACE GRANT PROGRAM GOAL:

Contribute to the nation's science enterprise by funding education, research and public engagement projects through a national network of university-based Space Grant consortia.

SPACE GRANT OBJECTIVES:

- Establish and maintain a national network of universities.
- Encourage cooperative programs among universities; aerospace industry; and Federal, state and local governments.
- Encourage interdisciplinary education, research and public service programs related to aerospace.
- Recruit and train U.S. citizens, especially women, underrepresented minorities, and persons with disabilities.
- Promote a strong science, mathematics and technology education base from elementary through secondary levels.

The NDSGC aligns its programmatic goals and objectives with those of the NASA Office of STEM Engagement:[2]

- **Goal 1.0:** Enabling contributions to NASA's work
    - Objective 1.1: Students contribute to NASA's endeavors in exploration and discovery.
    - Objective 1.2: Research and development capacity of educational institutions is enhanced, enabling broad and diverse contributions that directly address NASA priorities.

- **Goal 2.0:** Building a Diverse, Skilled Future STEM Workforce.

[1] https://www.nasa.gov/offices/education/programs/national/spacegrant/about/index.html
[2] https://www.nasa.gov/stem/about.html

- Objective 2.1: A broad and diverse set of students are attracted to STEM through NASA opportunities.
- Objective 2.2: Students, including those from underrepresented and underserved communities, explore and pursue STEM pathways through authentic learning experiences and research opportunities with NASA's people and work.
- Objective 2.3: The portfolio of NASA STEM engagement opportunities meets agency workforce requirements and serves the nation's aerospace and relevant STEM needs.
- Objective 2.4: Strategic partnerships with industry, academia, non-profit organizations and educational institutions enhance and extend the impact of NASA's efforts in STEM engagement.

- **Goal 3.0:** Strengthen Understanding of STEM through Powerful Connections to NASA.
  - Objective 3.1: Youth are introduced to STEM concepts and content through readily available NASA STEM engagement resources and content.
  - Objective 3.2: Students gain exposure to STEM careers through direct and virtual experiences with NASA's people and work.

The NDSGC is also guided by the NASA 2018 Strategic Plan[3] and the National Science and Technology Council's (NSTC) Committee on STEM (CoSTEM) 2018 Strategic Plan.[4]

NDSGC MISSION STATEMENT:

The North Dakota NASA Space Grant Consortium (NDSGC) 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 engaging the North Dakota citizenry in NASA initiatives, 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 NASA priorities, the NDSGC has six overarching goals:

1. Support graduate, undergraduate, and K-12 student STEM experiences that will lead to enhancement of the NASA and technical workforce.
2. Nurture and grow research initiatives that will develop multi-institutional, collaborative research to develop expertise in several NASA-relevant research disciplines.
3. Expand educator competence in space sciences and provide the necessary tools to conduct hands-on STEM investigations with K-12 students.
4. Involve students, staff, and faculty at affiliate institutions in NDSGC programming, with a focus on Tribal Colleges, Community Colleges, and non-research institutions.

[3] https://www.nasa.gov/sites/default/files/atoms/files/nasa_2018_strategic_plan.pdf
[4] https://www.whitehouse.gov/wp-content/uploads/2018/12/STEM-Education-Strategic-Plan-2018.pdf

5. Conduct public service projects that engage and educate the North Dakota citizenry of NASA's mission and activities.
6. Promote diversity and inclusion across programs, with an emphasis on students who identify in underrepresented populations in STEM (gender, race/ethnicity, and special needs/disability status).

PART II

To meet the six overarching goals, the NDSGC has defined 22 programmatic elements that fall into one of three categories:

1. NASA Internships and Fellowships (NIFs 1-5)
2. Mission Directorate Aligned Projects (MDAPs 1-11)
3. Competitively Awarded Projects (CAPs 1-6)

The NDSGC is committed to alignment of these projects with NASA's four mission directorates: 1) Aeronautics Research, 2) Human Exploration and Operations, 3) Science, and 4) Space Technology.[5] Through these initiatives unique to the NDSGC, the consortium will also focus on alignment with NASA Office of STEM Engagement Priorities. The following objectives will guide the actions of the NDSGC from 2020-2024.

In all programmatic elements, the NDSGC will employ inclusive recruitment strategies. This practice includes participation of students, faculty, and staff from all affiliate campuses through in-person visits as well as electronic inclusion (emails, social media, etc.). The NDSGC is also committed to engaging diverse participants. NIF, MDAP, and CAP activities are designed to remove barriers and encourage students from diverse backgrounds to participate in NDSGC activities. These underrepresented and underserved groups include gender identities, racial/ethnic/cultural identities, and special needs or disability identities.

NIFs

The NDSGC is committed to continue support for student **NASA Internships (NIF-1)** and works closely with affiliate institutions to recruit students for these authentic, hands-on experiences involving real-life problem-solving. The NDSGC is committed to support student **Industry Internships (NIF-2)** and works closely with affiliate institutions to recruit students for these authentic, hands-on experiences involving real-life problem-solving. The NDSGC is committed to continue support for **Graduate Research Fellowships (NIF-3)** and **Undergraduate Research Stipends (NIF-4)** and works closely with affiliate institutions to recruit students for these authentic, hands-on experiences involving real-life problem-solving. Fellowships and research stipends are awarded each semester and include a research project in a STEM field, completed under the guidance of a faculty mentor. The NDSGC is committed to continue support for student **Bridge Research Stipends (NIF-5)** and works closely with affiliate institutions to recruit students

[5] https://www.nasa.gov/about/org_index.html

for these authentic, hands-on experiences involving real-life problem-solving. As an evolving student research opportunity, the NDSGC proposes redefining this program to be more distinct from existing student research opportunities. In FY 20, students will participate in a more immersive research experience with additional networking opportunities. The overall goal of the program is to employ inclusive recruitment strategies and increase retention in STEM fields, especially with underrepresented groups. This program is open to students transferring between degree programs (e.g. two-year to four-year institution, B.S. to Ph.D. program, etc.).

MDAPs

The NDSGC is committed to continue support for **Student Scholarships (MDAP-1)** and works closely with affiliate institutions to recruit students for these funding opportunities. NDSGC scholarships include: 1) American Indian Scholarship, 2) Pearl I. Young Scholarship, 3) Lillian Goettler Scholarship, 4) Undergraduate Scholarship, and 5) NDVS/SB Scholarship. The NDSGC is committed to continue support for **Graduate Assistantships (GAs) (MDAP-2)** for students to conduct NASA-relevant, hands-on, space-related research under faculty advisors which involve real-life problem-solving. GAs can serve as GRAs, GTAs (teaching STEM and NASA-relevant courses), or GSAs (serving the NDSGC to meet its goals).

The NDSGC is committed to continue support for students to participate in the **STEM Ambassador Program (MDAP-3)**. These college students are paid hourly to conduct STEM outreach initiatives across the state. The NDSGC is committed to continue support for **Travel Grants (MDAP-4)** for students at affiliate institutions completing NASA-relevant STEM research to present research findings at conferences, an excellent networking opportunity for continuing their post-secondary education and/or securing a career in a STEM field. The NDSGC is committed to continue to support **High Altitude Ballooning (HAB) Initiatives (MDAP-5)**, led by a team of Space Studies graduate students at UND. The NDSGC is committed to continue to support the **UND Human Space Flight Laboratory (HSFL)[6] (MDAP-6)** located at UND. The research facility includes the Spacesuit Laboratory, Spacecraft Simulators, Inflatable Lunar/Mars Analog Habitat, and Pressurized Electric Rover.

The NDSGC proposes the establishment of a new program, the **Special Needs Education Initiative (MDAP-7)**. Individuals with disabilities remain underrepresented in STEM fields despite recent advances in the accessibility of information technology and other tools used by working professionals. In order to equip the future workforce with rich STEM experiences, the NDSGC will, in partnership with the North Carolina and South Carolina Space Grant Consortia, launch an initiative that targets educators who serve students with special needs. The NDSGC is committed to continue professional development for teachers through both long-duration and short-duration **In-Service (MDAP-8) and Pre-Service (MDAP-9) Educator Workshops**. These workshops, conducted directly by the NDSGC team, engage educators in hands-on collaborative team activities aligned with NASA goals, and curriculum enhancement capabilities (e.g. Next Generation Science Standards - NGSS alignment).

[6] http://www.human.space.edu/

The NDSGC is committed to supporting **Synergistic Activities (MDAP-10)** which will allow K-12 students, educators, college students, faculty, affiliate representatives and NDSGC team members to participate in collaborative opportunities related to NDSGC overarching goals. The NDSGC is committed continue to support and participate in **STEM Outreach Events (MDAP-11)**. These events traditionally include partnerships with the Dakota Science Center, NDSGC affiliates, NDVS/SB, libraries and museums, and the ND STEM Network.

CAPs

The NDSGC is committed to continuing funding for **Faculty Seed Research Grants (CAP-1)**. The NDSGC has defined five Research Focus Areas (RFAs) that reflect both NASA's needs and the needs of North Dakota. The five RFAs are: 1) astronomical/planetary science research, 2) planetary space suit research, 3) Earth sciences research, 4) materials sciences research, and 5) small satellite design, development, and construction. The NDSGC is committed to continue to support **Faculty Course Development Stipends (CAP-2)** open to faculty members at all affiliate institutions who wish to revise or develop a college-level course in a STEM or STEM education field. The NDSGC is committed to continue support for the participation of **Student STEM/NASA Competition Teams (CAP-3)** in national and regional competitions organized by NASA and other STEM industries who work toward the achievement of NASA goals.

The NDSGC is committed to continuing support for undergraduate and graduate research through **College Student Research Mini Grants (CAP-4).** This programmatic element is new to this proposal. Students who are completing research that is STEM-relevant or NASA-relevant, are eligible to apply. These research grants will be awarded each semester and can include travel and materials funding that directly benefits the students' undergraduate research, thesis, or dissertation. The NDSGC proposes a new programmatic element, **Affiliate Mini Grants (CAP-5).** These mini grants would be open to NDSGC affiliate representatives who are hosting or participating in research or education events related to STEM and/or NASA. The NDSGC proposes a new programmatic element, **Educator Mini Grants (CAP-6).** These mini grants would be open to ND K-12 and informal educators who are teaching, hosting, or participating in research or education initiatives related to STEM and/or NASA.

**Note: The full NDSGC Strategic Plan lists alignment tables with NASA's Mission Directorates, NASA's STEM Engagement Priorities, NDSGC's Overarching Goals, and the NDSGC SMART Objectives Table. This version of the Strategic Plan is specific to the FY2020 – FY 2024 Space Grant proposal, and due to the inclusion of the aforementioned tables in previous pages of this proposal, they are omitted here.*