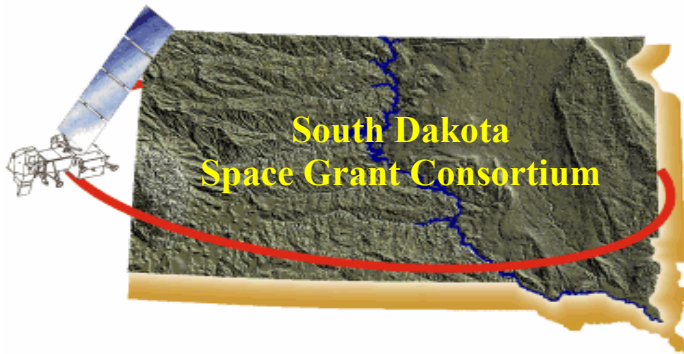


# 15<sup>th</sup> Year Evaluation Program Improvement and Results Report



## South Dakota Space Grant Consortium



**Submitted to:**

**NASA Headquarters**

**by:**

**South Dakota Space Grant Consortium  
South Dakota School of Mines & Technology  
501 E. Saint Joseph Street  
Rapid City, SD 57701  
<http://www.sdsmt.edu/space/>**

Edward F. Duke, Director  
[Edward.Duke@sdsmt.edu](mailto:Edward.Duke@sdsmt.edu)

Phone: 605-394-1975  
Fax: 605-394-5360

September 15, 2005

### **Members and Affiliates**

#### **Institutional Members**

- SD School of Mines & Tech
- SD State University
- Augustana College
- USGS Center for Earth Resources Observation and Science (EROS)

#### **Educational Affiliates**

- Black Hills State University & NASA ERC
- Dakota State University
- University of South Dakota
- Black Hills Astronomical Soc.
- Badlands Observatory
- Lower Brule Community College
- Oglala Lakota College
- Sinte Gleska University
- The Journey Museum
- Kirby Science Discovery Center & NASA ERC
- South Dakota Discovery Center & Aquarium
- Teaching SMART
- Lake Area Technical Institute
- Imagination Station

#### **Industrial Affiliates**

- Cynetics Corp.
- Honeywell
- Horizons, Inc.
- Raven Industries
- RESPEC
- SAIC

#### **Government Affiliates**

- SD Office of Aeronautics
- National Weather Service

## B. TABLE OF CONTENTS

A. Title Page .....	
B. Table of Contents .....	1
C. Introduction and Consortium Improvement.....	2
1. State Profile.....	2
2. A Foundation for Continued Improvement.....	3
D. National Program Emphases.....	5
1. Diversity.....	5
2. Workforce Development.....	5
3. Competitiveness .....	6
4. NASA Ties.....	6
5. Industry Relations .....	7
6. State Government Involvement .....	7
E. Program Elements.....	8
1. Consortium Management.....	8
2. Fellowship/Scholarship.....	12
3. Research Infrastructure .....	15
4. Higher Education .....	17
5. Precollege Education .....	19
6. Public Service: General Public & External Relations.....	21
F. Sustaining Consortium Improvement .....	23
1. Development of a Formalized Evaluation Strategy .....	23
2. Implementation of a Web-Based Management Information System.....	24
G. Evidence of Consortium Concurrence .....	Appendix C

### Appendices

Appendix A. *2005 Strategic Plan*

Appendix B. *Roles and Responsibilities of Members*

Appendix C. Evidence of Consortium Concurrence

## C. Introduction and Consortium Improvement

### 1. State Profile

The Vision: The vision of the South Dakota Space Grant Consortium (SDSGC) is to expand opportunities for all South Dakotans through education, research, and public service in the fields of aerospace and earth science.

The Challenge: South Dakota faces many challenges in efforts to develop a competitive and sustainable science and technology (S&T) infrastructure. The state ranks 46<sup>th</sup> in population, and has the fifth lowest population density. South Dakota has five of the seven poorest counties in the nation, all of which are located on or adjoining the state's nine Indian reservations.

Among the 52 federal jurisdictions, South Dakota ranks between 49 and 52 in the following S&T indicators<sup>1</sup>: federal R&D (51), industry R&D (49), academic R&D (52), high tech employment as a percentage of total jobs (49), science and engineering doctorates awarded (49), science and engineering post-docs (49), public higher education expenditures (50), doctoral scientists in the workforce (50), and doctoral engineers in the workforce (51).

Enrollment at the state's six public universities for fall 2004 was 29,844 of which only 3,043 were in graduate programs. None of the state's universities is rated as "research extensive."<sup>2</sup> There are no degree programs in aeronautics or aerospace, nor is there a significant aerospace industry in the state. Despite a 34% increase in the last two fiscal years, combined research funding at the six public universities is only 5% of that at the nation's single most research-intensive university (Johns Hopkins, over \$1.2B total R&D expenditures in FY2003).

The Opportunity: South Dakota's demographics and limited research capacity make sustained Space Grant funding vital to improving S&T education, research, and economic activity. The impact of Space Grant support is far-reaching, comprising one of the largest sources of fellowships funding in the state. SDSGC acknowledges this opportunity along with the responsibility to invest these funds to maximize the benefits to NASA and the citizens of South Dakota. At the same time, the Consortium recognizes the limitations of its financial and human resources, particularly in the current program year (see box below), and the need to prioritize goals and leverage funding.

In recent years, SDSGC has forged a unique alliance of public, private, and Tribal Colleges and has led the way in linking these institutions with the state's only major federal research facility (USGS Center for Earth Resources Observation and Science, EROS). Building on this foundation, SDSGC will promote equally strong relationships with NASA Centers and will continue to advance the goals of the Governor's *Research 2010 Initiative*. This unprecedented state initiative has fostered new Ph.D. programs and research centers that expand opportunities for NASA-related R&D, new state offices for Research and for Commercialization, and a first-ever state Science and Technology Strategic Plan to coordinate the educational, research, and entrepreneurial goals of the initiative.

<u>SDSGC Resources*</u> :	2003	2004	2005
Total funds	\$332,500	\$350,000	\$173,187
FTEs	2.62	2.27	1.28

\*NASA funds and NASA-funded FTEs. Source: CMIS and 2005 budget.

<sup>1</sup> National Science Foundation, Science and Engineering State Profiles: 2002-2003.

<sup>2</sup> The Carnegie Classification of Institutions of Higher Education, 2000 Edition.

## 2. A Foundation for Continuing Improvement

Consortium Improvement Process: Following NASA's 15<sup>th</sup> Year Evaluation, SDSGC initiated a comprehensive review of its structure, policies, and programs, and established a strategy to improve the quality and effectiveness of the Consortium. As part of this process, the SDSGC management 1) examined guiding documents from NASA, state government, affiliates, and other state consortia (see box); 2) conducted monthly (and at times weekly) teleconferences; 3) met with state and NASA officials; 3) completed visits and interviews with 23 of 26 affiliates; and 4) contracted an independent expert for a yearlong evaluation of the Consortium and the improvement strategy, and to assist in establishing an ongoing evaluation regimen.

Results and New Guiding Principles: The results of the improvement process are embodied in a series of key documents (see box), and specific accomplishments are summarized in Table 1 (following page). At the heart of these documents and policies are SDSGC's new Guiding Principles for Improvement and Sustained Quality:

- **Inclusiveness** — The need to deliver a broad and equitable Fellowship/Scholarship program; to engage all affiliates in Consortium programs; to provide broader input into decision-making; and to recruit more Native American students.
- **Focus** — The need to set realistic goals consistent with available resources; to develop a strategic plan with specific short- and long-term objectives; to prioritize activities based on budget level; to formalize the benefits and expectations of management and affiliates; and to institute a policy to drop inactive affiliates.
- **Alignment** — The need to align the Consortium programs and strategic plan with NASA, state, and affiliate priorities; to recognize the major transformation in NASA direction and make appropriate changes in state programs; and to seek greater guidance from state and industry representatives.
- **Impact** — The need to maintain accurate and consistent measurements regarding programs and participants; to formalize methods for external and self evaluation; to carry on regular assessment of the strategic plan, activities, and outcomes; and to recognize and implement needed adjustments to achieve results.

Mix of Program Elements: SDSGC's relative emphasis in the different program areas is indicated by the following budget distribution, and is consistent with its status as a Capability Enhancement state: Fellowship/Scholarship, 29%; Management, 24%; Higher Education, 22%; Research Infrastructure, 14%; Precollege Education, 7%; and Public Service 4% (based on average of 2003-04 CMIS data).

### Guiding Documents

- National Space Grant Objectives and Strategic Plan
- "Aldrich" Report on Space Exploration Policy
- NASA Education Enterprise Strategy
- Governor's 2010 Initiative
- SD Science & Technology Strategic Plan

### Key Improvement Documents

- Consortium Improvement Plan
- New Fellowship & Scholarship Guidelines
- SDSGC Strategic Plan (App. A)
- Roles & Responsibilities of Members (App. B)
- Evaluation Framework & Logic Model

**Summary:** SDSGC's improvement process has resulted in a new focus on NASA and state needs and achievable steps toward improving research capability and bringing the spirit of exploration and discovery to all citizens of the state.

**Table 1. Summary of Major Improvements**

<b>Weaknesses</b>	<b>Improvement Strategy</b>	<b>Output/Outcome</b>
<b>Inclusiveness</b>		
Lack of a broad, competitive, and equitable Fellowship/Scholarship program	Develop competitive, consortium-wide, application and selection process	Participating institutions increased from 3 to 7 (+133%); first-ever applications from three academic affiliates
Poor engagement of affiliates in decision-making, especially Tribal Colleges	Create two new positions on Management Team; conduct personal visits with all affiliates	Two rotating positions filled (one Tribal College and one informal science affiliate); 23 of 26 affiliate visits complete
Poor recruitment of underrepresented students	Management Team prioritizes recruitment of underrepresented students	Record number of Tribal College fellows (3) in 2005
<b>Focus</b>		
No strategic plan	Management Team develops strategic plan with input from affiliates	<i>Strategic Plan</i> approved and distributed to affiliates (App. A)
Roles and responsibilities of management and affiliates not defined	Draft formal <i>Roles and Responsibilities</i> of management and members	New rules approved and reviewed with affiliates during personal visits (App. B)
Too many affiliates (35) and no drop/add policy	Develop criteria for minimum affiliate participation and drop/add policy	Participation guidelines approved (App. B); nine inactive affiliates dropped (26 remaining)
<b>Alignment</b>		
Weak NASA ties	Prioritize student internships at NASA Centers	Record number of students (6) at NASA Centers in summer 2005
No link to state objectives	Align with Governor's <i>Research 2010 Initiative</i> and <i>State Science and Technology Strategic Plan</i>	State's top officials in research and technology are now members of advisory board
No clear link to affiliate missions and priorities	Review affiliate missions and conduct personal visits	Better understanding of each affiliate's role in Consortium
No advisory board	Expand Technical Advisory Committee (TAC) of NASA EPSCoR program	15-member advisory board with representatives of government, education, and industry
<b>Impact</b>		
No evaluation strategy	Hire professional evaluator to develop short- and long-term evaluation strategy	Yearlong evaluation in progress; interim evaluation framework, logic model, and data-collection methods have been developed
Inconsistent reporting and tracking, especially of underrepresented groups	Computer Information students will develop online reporting and tracking	Web-based data collection and tracking system will be in place by May 2006

## **D. NATIONAL PROGRAM EMPHASES**

### **1. Diversity**

#### New or expanded strategies to increase participation of underrepresented groups:

- New consortium-wide Fellowship/Scholarship Program encourages applications from underrepresented groups, especially Native Americans
- Workforce Development Program (2003-2005) focuses on Native American students
- Full-time Manager for Workforce Development hired April 2004 - July 2005 to focus on diversity; part-time staff for remainder of 2005 program year; both staff Native American
- Multi-state Workforce Development Program (NativeConnections) in 2003-2004.
- Five Women in Science conferences statewide each year
- Native American Higher Education programs (e.g., Bridges to Success, AISES, NativeConnections) and Precollege Education programs (e.g., Summer Honors, Flandreau Indian School Success Academy) function to recruit and retain Native American students

#### Major accomplishments:

- Native American student fellowships doubled from three to six<sup>3</sup> between 2003-2004
- First Fellowship/Scholarship applicants from Tribal Colleges (three awards to students at Tribal Colleges in summer 2005)
- First Native American Ph.D. graduate from SDSM&T (2005) was Space Grant Fellow
- First South Dakota Space Day held at the Black Hills Pow Wow (Oct. 2005)
- First two Native Americans and first two women on Management Team in 2004-2005
- First NSF funding for proposal submitted by SDSGC: \$250,000 for Opportunities for Enhancing Diversity in the Geosciences (2005-2008)
- First two NASA Explorer Schools in South Dakota are both Tribal Schools (2005)

### **2. Workforce Development**

#### New or expanded strategies to attract and prepare students for NASA-related careers:

- SDSGC's Summer 2005 Fellowship program gave preference to students who also applied for NASA internships and summer programs
- New Strategic Plan (App. A, sect. 7) outlines strategies for recruitment, fellowship support, mentoring and professional development, NASA and industry placement, and tracking
- Full-time Manager for Workforce Development in 2004-2005 (see Diversity)

#### Major accomplishments:

- First SDSGC fellow hired at NASA-KSC (Josephine Santiago, 2004)
- First SDSGC fellow working at NASA Headquarters (Cassandra Soeffing in office of Dr. Ming-Ying Wei, Program Manager for Earth Science Education, 2005-2006)
- Record six students placed at NASA Center internships in single summer (2005)
- Record six students placed in EROS internships in single summer (2005)
- SDSGC fellow conducts first NativeConnections workshops for teachers and Tribal representatives at four Tribal Colleges (2004-2005) in three states (SD, ND, NM)

---

<sup>3</sup> Note: The 2004 CMIS Fellowship/Scholarship Program summary report indicates 12 Native American awardees, although only 6 students received awards. Awards were given to these students from both regular Space Grant and Workforce Development funds, and these had to be reported separately. This reporting problem will not occur under the improved program.

### **3. Competitiveness**

#### New or expanded strategies to increase competitiveness:

- Management Team develops first, uniform, consortium-wide Fellowship/Scholarship guidelines, application form, and review process (2004-2005)
- New Fellowship/Scholarship application announced and distributed to all 13 academic affiliates, including five Tribal Colleges in 2005
- Fellowship/Scholarship Program increased each year in percentage of overall Consortium budget from 26% to 31% to 38% (2003-2005)

#### Major accomplishments:

- Largest response ever from academic affiliates for Fellowship/Scholarship program in 2005 (133% increase; 35 applications from eight institutions; 19 awardees from seven institutions, including two Tribal Colleges)
- First applications from Sinte Gleska University (Rosebud Sioux Tribe) and Si Tanka University (Cheyenne River Sioux Tribe)
- First applications from Dakota State University
- Most awards ever issued to students at Tribal Colleges in single award round (three in summer 2005)

### **4. NASA Ties**

#### New or expanded strategies to strengthen NASA ties:

- New 2005 Fellowship/Scholarship announcement prioritizes NASA internships
- New travel and seed grant applications require support letters from a NASA Center
- New efforts to direct targeted announcements of NASA opportunities to academic affiliates, Tribal Colleges, K-12 teachers, and informal science educators
- Travel funds to visit NASA Centers promoted to all 13 academic affiliates, including Tribal Colleges
- Sponsored five NASA speakers in state in 2004-2005 (Astronauts, AESP, Center researchers)
- Current NASA researchers and former NASA contractor added to advisory board

#### Major accomplishments:

- First two SDSGC fellows hired as NASA employees (see Workforce Development)
- Record six students placed at NASA Center internships in single summer (2005)
- First two NASA Explorer Schools in South Dakota, both Tribal schools
- 52 South Dakota students apply for NASA Science and Technology Scholarship Program
- First NASA Science, Engineering, Mathematics, and Aerospace Academy (SEMAA) and Aerospace Educational Laboratory (AEL) in South Dakota is established at Tribal College affiliate Oglala Lakota College (2005)
- Three SDSGC-affiliated researchers on NASA panels or Science Teams
- New NASA contacts include 11 planning trips (four NASA Centers) and 19 new research contacts (seven NASA Centers and Headquarters) (in response to SDSGC and SD NASA EPSCoR efforts, 2004-2005)

## 5. Industry Relations

### New or expanded strategies to improve industry relations:

- First comprehensive survey of state industries whose Standard Industrial Code designations match the areas of interest NASA and SDSGC (2004-2005)
- Management Team conducts personal visits to all industry affiliates in the state (2005)

### Major accomplishments:

- Industry survey results confirm generally limited aerospace R&D capacity in state but identify potential new industrial partners and internship sponsors
- Affiliation with SAIC (contract operator for EROS) helped place six students from three universities at EROS for summer 2005 internships
- Affiliation with Barrick Gold Corp. helped promote the closed Homestake gold mine in Lead, SD, into one of two final sites being considered by NSF for a Deep Underground Science and Engineering Laboratory (DUSEL); many proposed research activities align with NASA's mission (dark matter, neutrinos, nuclear astrophysics, materials science, geoscience, and the study of life under harsh conditions)
- Horizons, Inc. provided employment opportunities for SDSGC student fellows in the field of remote sensing (specifically LiDAR) research and applications
- New research and internship collaboration established with Aerostar International, Inc. in high-altitude balloon research and RESPEC, Inc. in remote sensing
- Three inactive industrial affiliates dropped

## 6. State Government Involvement

### New or expanded strategies to increase state government involvement:

- New communication with top state officials in Research and Development
- New focus on meeting Governor's *2010 Initiative* Goal 3 to improve state's research capacity
- New focus on meeting Governor's *2010 Initiative* Goal 4E to improve Tribal cooperation
- New alignment with the first State Science and Technology Strategic Plan (2005)
- Focus on collaboration with new state Ph.D. programs and research centers in NASA-related fields: nanoscience and engineering, information technology, remote sensing and GIS (2004-2005)

### Major accomplishments:

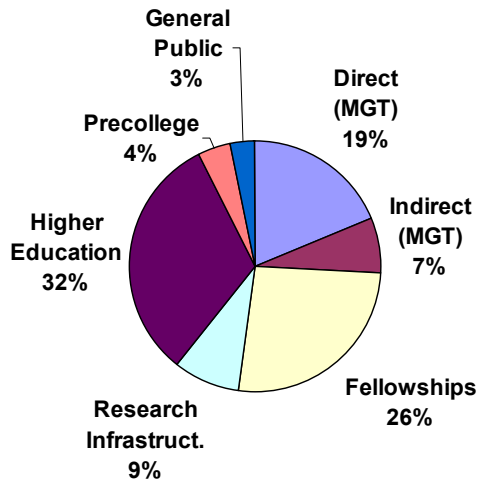
- The two highest-ranking state officials in Research and Development join SDSGC advisory board (2005)
- First state-level matching funds awarded to SDSGC for 2005-2006: \$35,000 in fellowships through state Science and Technology Entrepreneurship Program (STEP)
- SDSGC Director sits on first committee to coordinate state's EPSCoR-like programs (NASA, NSF, NIH, DOE, DoD, EPA)
- First taskforce on engaging Tribal Colleges in state EPSCoR programs headed by SDSGC Management Team member James Rattling Leaf (2005)
- Governor's *Research 2010 Initiative* Goal 3B acknowledges SDSGC as leader in developing collaboration with EROS (2005)
- South Dakota View, sponsored by SDSGC, brings NASA satellite data for the state to government, academic, and private users



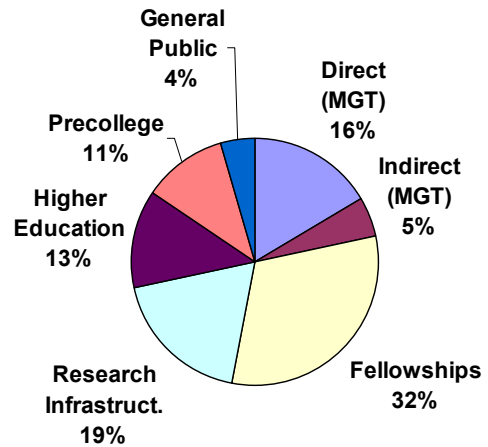
## E. PROGRAM ELEMENTS

The Consortium’s budget distribution (in NASA dollars) during 2003 and 2004 is shown in the charts below. As can be seen from these CMIS data, emphasis is clearly in the Fellowship/Scholarship, Higher Education, and Research Infrastructure program areas, as appropriate for a Capability Enhancement consortium.

**2003 Budget Distribution**



**2004 Budget Distribution**



### 1. Management

#### Description

The goal of SDSGC Management is **“To ensure quality and fairness in all Consortium programs and alignment with the needs of NASA, the member and affiliate organizations, and the state of South Dakota.”** The *2005 Strategic Plan* (App. A) identifies nine specific objectives for management (box at right).

Prior to this year the SDSGC management structure consisted of five members (the Director and Deputy Director from the lead institution and the Associate Directors from each of the three institutional members) who met on an irregular basis. Since July 2004 management has been completely restructured: operational policies and procedures have been formalized (App. B); management meetings have been held on a regular, monthly basis (or more frequently); and the Management Team was been expanded by adding the Manager for Workforce Development and two rotating members selected from the Consortium’s affiliate organizations. All decisions regarding policy are now made by majority vote (and in some cases 2/3 vote) of this expanded Management Team (see App. B, section V).

One of the first new policy decisions of the expanded Management Team was to acquire the services of an independent professional evaluator to guide the Consortium during the improvement process and to establish a lasting framework for self-evaluation (see section F on “Sustaining Consortium Improvement”). In a second important move, the management elected to schedule visits with all in-state affiliates to discuss the improvement process and new operational

#### 1. Management Strategic Objectives

- 1.1 Reporting
- 1.2 National network
- 1.3 Consortium network
- 1.4 State government
- 1.5 State industries
- 1.6 Link to public
- 1.7 Increase resources
- 1.8 Diversity
- 1.9 Evaluation

policies (see “Consortium Structure/ Network,” next page). Participation of 25 of the Consortium’s 26 current members and affiliates in the development of this Program Improvement and Results (PIR) Report and related documents is indicated by the signatures and letters of support in section G on “Evidence of Consortium Concurrence.”

Despite far-reaching improvements in management structure and policies in the past year, the Consortium is limited in terms of the financial and human resources (see table below). The situation is particularly acute in the current (2005) Program Year. The unpredictability of funding led to the resignation in August of the Manager for Workforce Development. In response to these tight budgets, management will work to increase non-NASA resources; hence, Strategic Plan Objective 1.7 calls for drafting a development plan by November 2005 (App. A).

<u>SDSGC Resources*:</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>
Base	\$212,500	\$212,500	\$173,187
Augmentation	--	\$87,500	--
Workforce	\$95,000	\$50,000	--
<u>Multi-state Workforce</u>	<u>\$25,000</u>	<u>--</u>	<u>--</u>
<b>Total</b>	<b>\$332,500</b>	<b>\$350,000</b>	<b>\$173,187</b>
FTEs	2.62	2.27	1.28

*\*NASA funds and NASA-funded FTEs. Source: CMIS and 2005 budget.*

### Core Criteria

The results of the 15<sup>th</sup> Year Evaluation and subsequent self-assessment highlighted serious weaknesses in the then existing management structure (see “Improvement and Results”).

Consortium Operations: The SDSGC Headquarters Office has approximately 250 square feet of dedicated office space on the campus of SDSM&T in Rapid City, SD. The office is equipped with standard office computer equipment, telephone and fax, and houses the offices of the Deputy Director and Manager for Workforce Development; offices of the Director and support staff are in adjacent space shared with other departments. (See App. B, sect. III.)

Staff salaries supported by NASA funds include the Director, Deputy Director, and Manager for Workforce Development at the lead institution (approx. 1.5 total FTEs) and the Associate Directors at SDSU and Augustana College (approx. 0.13 and 0.1 FTEs, respectively). NASA-funded FTEs decreased 50% between 2003 and 2005 leading to a reduction in staff.

As an external advisory board, the Management Team has elected to use the 15-member Technical Advisory Committee of the NASA EPSCoR Program to strengthen alignment between the Space Grant and NASA EPSCoR programs, and to provide guidance on state government and industry involvement.

Resource Management: SDSGC has consistently met the matching fund requirements of the program. In the past, most matching consisted of in-kind contributions at the institutional level (faculty and staff salaries, student support, tuition remission). For the first time in 2005-06, SDSGC will receive matching funds directly from the state level in the form of \$35,000 for fellowships. Allocation of administrative costs across institutions and programs is determined by the Management Team (App. B, sect. V). After the required funds are allocated for the fellowships and scholarships and nominal administrative portions are agreed on for each institution, the balance of the budget is allocated to discretionary activities (travel, additional fellowships, precollege and higher education programs, administrative needs, program initiation grants, and

public services). For example, in 2005-06, \$8,500 in funding was designated for an independent Program Evaluator. (See section F on “Sustaining Consortium Improvement.”)

Consortium Structure/Network (Internal): In 2005, Consortium membership reached 35 affiliates. Whereas a large affiliate base was previously considered an attribute, the Management Team is currently reviewing the quality and effectiveness of this large network. New policies defining *Roles and Responsibilities of Members* were adopted in July, which include guidelines for dropping inactive affiliates (App. B). The Management Team has conducted personal visits with all but three affiliates and telephone interviews with out-of-state affiliates to review the new guidelines and expectations and benefits. As a result of the higher expectations for affiliation, nine organizations have been dropped; management expects to gradually reduce the number of formal affiliates even further and to improve the interaction with those remaining.

*Communication*. Past communication with Space Grant contacts has been varied but in many cases poor. The new *Roles and Responsibilities of Members* guidelines include opportunities to increase affiliate communication and participation in decision-making. The responsibilities of the Space Grant contacts are now formalized and include requirements for data collection and annual reporting on resource allocation and evaluation of program impact (App. B, sect. VI)

*Diversity*. In 2003 the Management Team consisted of six white males; in 2005 it included five white males, one white female, one Native American female and one Native American male.

*Meetings*. Management Team teleconferences are held monthly (or more frequently); in addition, all affiliates are invited to face-to-face quarterly meetings and the statewide annual meeting at South Dakota Space Days. The advisory board (Technical Advisory Committee) meets a minimum of once each year.

Collaborations and Partnerships Outside the Consortium: In 2003-04, SDSGC joined five consortia in the “NativeConnections” program. (See “Higher Education.”)

*NASA*. This year, the Consortium and NASA EPSCoR program intensified efforts to promote research contacts at NASA Centers resulting in 11 planning trips to NASA Centers and 19 new contacts between state and NASA researchers. SDSGC is expanding its partnership with Dr. Steve Anderson at Black Hills State University, who is a collaborator on almost \$2 million in research grants (mostly NASA) for planetary geology and Mr. William Arbegast at SDSM&T, who has over 25 years of experience in the aerospace industry including many NASA contracts.

*Other entities*. EROS has been a key partner since SDSGC’s inception, providing a permanent representative to the Management Team, logistical support, and employment opportunities (see more in “Research Infrastructure”). In 2005, new relationships have been instituted with the state’s Office of Commercialization and the Office of Research of the South Dakota Board of Regents. Directors of these state organizations joined the Technical Advisory Board in 2005.

### Improvement and Results

Many of the weaknesses identified in the 15<sup>th</sup> Year Evaluation were related to management (see Table 1 in “Introduction”). Fundamental weaknesses included the lack of a strategic plan; no clear policy on roles and responsibilities of management and affiliates; limited engagement of many affiliates, especially Tribal Colleges; and no evaluation strategy. Since July 2004, SDSGC has 1) a new Director, 2) an expanded and more diverse Management Team, 3) a detailed *Strategic Plan* (App. A), 4) a new formalized structure and policies for management and affiliates (App. B), and 5) is in the midst of a yearlong evaluation process conducted by an independent expert (see section F on “Sustaining Consortium Improvement”).

The revised Improvement Plan submitted to NASA on Dec. 20, 2004 was linked to the draft strategic plan submitted at that time. The Management Team has continued to refine that plan to bring it into closer alignment with NASA and state priorities, and the current *2005 Strategic Plan* (App. A) marks the third major revision. The Management Team and affiliates are now functioning as a learning community and will work together to guarantee long-term improvement in the effectiveness of the Consortium. Examples of strategic objectives, strategies designed to improve management effectiveness, and examples of recent outcomes are shown in the table below.

Improvement need	Improvement strategy	Outcome
Objective 1.3: The Management Team will faithfully represent the diverse interests and resources of the Consortium member institutions and affiliates.		
Poor engagement of affiliates in decision-making, especially Tribal Colleges	1.3.1: Establish two rotating positions on Management Team for affiliates	Tribal College and Informal Science representatives add diversity and inclusiveness
Roles and responsibilities of management and affiliates not clearly defined	1.3.2: Develop and distribute guidelines outlining the roles and responsibilities of management and members	Management and affiliates understand benefits and expectations; Consortium structure strengthened
Objective 1.4: The Management Team will ensure that Consortium programs are aligned with state priorities.		
Need better links with state objectives	1.4.1: Provide briefings to representatives of state government on Consortium activities. 1.4.2: Appoint representatives of government to advisory board	Improved understanding of shared goals and potential to leverage resources; state-level matching funds to Consortium for first time
Objective 1.7: The Management Team will pursue opportunities to increase the resources available to the Consortium, to broaden participation within the state, to collaborate with other state Consortia in areas of mutual interest and capability, and to assure long-term sustainability.		
<i>Self-identified</i> need to increase funding and staffing for SDSGC-related programs	1.7.5: Coordinate submission of proposals to NASA and other agencies on projects in STEM research and education	New funding (2005) to augment Native American programs from NSF-OEGD and Upper Midwest Aerospace Consortium
Objective 1.9: The Management Team will continually monitor and seek to improve the quality and effectiveness of the state program.		
Limited basis for evaluation and no evaluation strategy	1.9.1: Obtain the services of an external Program Evaluator to provide assessment of the Consortium's strategic plan, activities, and outcomes	Evaluation framework, logic model, affiliate survey, and data collection strategy done by Feb. 2006; sustained program improvement

**Summary:** Since July 2004, SDSGC has radically changed its Management with new personnel, new structure, new policies, and, most importantly, a new outlook. Management embraces the new guiding principles of inclusiveness, focus, alignment, and impact. Through improved evaluation methods and affiliate feedback and participation, SDSGC will continue to improve the effectiveness of the program.

## 2. Fellowship/Scholarship Program

### Description

The goal of the SDSGC Fellowship/Scholarship (F/S) Program is **“To administer a Fellowship/Scholarship program that offers educational and research opportunities to students from diverse backgrounds who are pursuing degrees in fields of science, technology, engineering, and mathematics (STEM) that align with NASA’s mission and those of SDSGC members and affiliates.”** The *2005 Strategic Plan* (App. A) identifies seven specific objectives for achieving this goal (box at right).

*Percentage of Budget.* SDSGC has always met the minimum requirement for awarding fellowship funds, but in recent years, the Consortium has increased the share of the budget for this program from 26% (\$86,570) in 2003, to 31% (\$109,770) in 2004, and to 38% (\$66,040) in 2005 (note that the total budget was reduced in 2005).

*Assessment and evaluation.* The Consortium has contracted an independent evaluation expert to develop simple before-and-after surveys to fellowship recipients to assess their knowledge and attitudes about the Consortium, NASA, and STEM careers. (See section F on “Sustaining Consortium Improvement.”)

### Core Criteria

*Recruitment and participation of underrepresented groups.* Since the 15<sup>th</sup> Year Evaluation, SDSGC’s expanded Management Team has included at least one Native American member, and part of their responsibility has been to develop more effective recruitment of Native American students. In both 2003 and 2004, SDSGC met its target of awarding at least 10% of the fellowship funds to minorities. In 2003, SDSGC came up slightly short of its target of awarding 40% of its fellowship funds to women, but the Consortium met that target in 2004. The target percentage for minorities was developed based on census and enrollment statistics, whereas the target percentage for women was prescribed by NASA Headquarters.

*Benchmarks for awards to Native Americans.* Native Americans are the largest minority in South Dakota, making up 9.4% of the population (US Census Bureau, 2004). The state’s public universities had an overall Native American student enrollment of 2.1% in 2004 and 1.9% in 2003 (SD Board of Regents, Fact Books 2005 and 2004). When considering all degree-granting institutions in South Dakota, including Tribal Colleges, the Native American enrollment increased to 6.9% (National Center for Education Statistics: Digest of Education Statistics, 2003). However, when considering only institutions that offer STEM degrees, the Native American enrollment is closer to 2%. Regardless, the percentage of SDSGC fellowship funds awarded in 2003 and 2004 exceeded the enrollment percentages and met or exceeded the target of 10%.

*Competitiveness.* Competitiveness and consortium-wide balance were weaknesses identified in the 15<sup>th</sup> Year Evaluation and are discussed below under “Improvement and Results.”

*Graduate and undergraduate students.* Only three affiliates have graduate programs in science and engineering (SDSM&T, SDSU, USD), so a significant portion of the Fellowship Program is geared toward undergraduates. In 2004, 43% of fellowships were to undergraduates, and in 2005, 84% of the fellowship funds awarded to date have been to undergraduates.

*Undergraduate research and student mentoring.* Professional development training opportunities for SDSM&T student fellows was incorporated into the SDSGC Fellowship Program in 2004. Fellows are offered monthly training throughout the semester on presentation

### **2. Fellowship/Scholarship Strategic Objectives**

- 2.1 Competitiveness
- 2.2 NASA and EROS ties
- 2.3 Industry ties
- 2.4 Mentoring and professional development
- 2.5 Diversity
- 2.6 Longitudinal tracking
- 2.7 Evaluation

skills, résumé and cover letter writing, and interviewing. In the future, similar mentoring activities will be implemented at other academic affiliates.

*Longitudinal tracking of students.* All students who have received significant (>\$1,000) fellowship or scholarship assistance from SDSGC will be longitudinally tracked through first employment or beginning of advanced degrees. During the 2005-06 academic year, SDSGC will support a faculty member and three students in the Center of Excellence in Computer Information Systems at Dakota State University (DSU) to develop and implement online exit surveys, a web-based tracking system, and other improvements to the SDSGC website. The DSU students have been identified and the project is under development. (See “Sustaining Consortium Improvement.”)

### Improvement and Results

NASA’s 15<sup>th</sup> Year Evaluation of the Consortium cited serious weaknesses in the Fellowship Program. The criticisms focused on 1) lack of competitiveness in selection of awardees, and 2) inconsistent reporting of awards to women and underrepresented groups.

*Competitiveness.* Prior to the 15<sup>th</sup> Year Review, fellowships and scholarships were primarily awarded to students at three institutions. With the assistance of NASA Headquarters staff in January 2005, SDSGC developed a uniform, consortium-wide Fellowship Program. The new guidelines and application were distributed to all 13 higher education affiliates in February 2005. Applications for summer 2005 were reviewed by the Management Team and rated according to the applicants’ academic performance, quality of application, two faculty recommendations, motivation toward NASA-related STEM, and the applicants’ interest in summer internships at NASA Centers or EROS. Thirty-five applications were received from eight institutions. Nineteen students from seven institutions received awards. This is a record number of institutions at which students received awards and an increase of 133% compared to the previous year. Of the 19 summer 2005 awardees, three were Native American (16%) and seven were women (37%).

*Reporting of awards.* The 15<sup>th</sup> Year Evaluation noted inconsistencies in the reporting of awards to students from underrepresented groups. In part, this occurred because many students received awards from both regular Space Grant and Workforce Development funds; these had to be reported separately in CMIS tables, resulting in double-counting of these students. The new Fellowship application process and new longitudinal tracking methods should prevent subsequent problems. Individual awards will not be made from multiple sources in the future.

*External metrics (Native Americans).* The total number of fellowship awardees increased from 28 students in 2003 (average award \$3,091) to 41 students in 2004 (average award \$2,677), although this is largely a result of a 26% increase in available funds in 2004. The 2005 Fellowship Program is not yet complete so the data are not included here. Between 2003 and 2004, the number of Native American student fellowship awardees doubled from three to six. The three Native American awardees in 2003 corresponded to 11% of the total awardees, and they received 15% of the total fellowship funds. In 2004, the six Native American awardees corresponded to 15% of the total awardees, and they received 10% of the total fellowship funds. In each case, both the number of awardees and the total amount of the awards to Native American students exceeded the enrollment statistics in the state’s public institutions and the census statistics for South Dakota’s Native American population. In addition to Native American students at SDSM&T and SDSU, the Consortium awarded two summer 2005 fellowships to Native American students at Sinte Gleska University (SGU) and one fellowship to

a student from Si Tanka University, representing the largest number of SDSGC fellowships ever awarded to applicants from Tribal Colleges.

*External metrics (women).* In 2003, nine of the 28 fellowship awardees were women (32%), and those women received 33% of the total funds awarded. In 2004, 12 of the 41 student awardees were women (29%), and they received 42% of the total fellowship funds. The later metric exceeds the targeted goal of 40% of total fellowship dollars to women. Objectives 2.1 and 2.5 of SDSGC’s 2005 Strategic Plan include new strategies for attracting underrepresented groups into STEM disciplines, so that fellowship awards will increasingly reflect the diversity of the student bodies in its public, private, and Tribal College affiliates.

*Tribal College highlights and NASA ties.* Two Native American Tribal College students from Sinte Gleska University received SDSGC summer 2005 fellowship stipends. One of the students completed an internship at the NOAA Climate Monitoring and Diagnostic Lab in Boulder, CO, where he worked in the Solar Radiation Group. A Native American Tribal College transfer student to SDSM&T from Oglala Lakota College received a summer 2005 fellowship after previously completing two summer internships at NASA Goddard. These minority student internships are a measure of the Consortium’s success in using the Fellowship Program to link minority students to NASA research experiences and NASA-related technology opportunities.

*Recent fellowship placements.* Six students from four affiliates were placed at NASA Centers for summer 2005 internships. Six additional students from three affiliates were placed at EROS internships. Also in 2005, Cassandra Soeffing (a SDSGC doctoral student fellow in 2003-2004) was named an Einstein Fellow and began work in August for a full year in the office of the Program Manager for NASA’s Earth Science Education Program at NASA Headquarters.

Examples of strategic objectives and strategies to improve the Fellowship Program and examples of recent outcomes are shown in the table below.

Improvement need	Improvement strategy	Outcome
Objective 2.1: Ensure the fair distribution of funds to member universities and educational affiliates.		
Lack of a broad, equitable Fellowship Program	2.1.1: Uniform Consortium-wide application process implemented in 2005	Record number of applicants and 133% increase in number of institutions
Objective 2.2: Offer hands-on, tangible research experiences to student research fellowship awardees.		
Allow students to experience first-hand the thrill of discovery and innovation	2.2.1: Support internships with NASA Centers, EROS, and industry	Record 6 students at NASA Centers and 6 at EROS in summer 2005
Objective 2.4: Provide mentoring and professional development experiences to student researchers, which will develop skills that contribute to the future workforce.		
<i>Self-identified</i> need to enhance communication and presentation skills	2.4.3: Professional development training provided to student fellows	Student fellow professional development implemented in 2004
Objective 2.5: Ensure funding for fellowships to women, underrepresented minorities, and persons with disabilities.		
Limited support for students at Tribal Colleges	2.5.4: Offer fellowships to qualified Native American student at Tribal Colleges	Record 3 Tribal College student awardees in summer 2005

### 3. Research Infrastructure Program

#### Description

The goal of the SDSGC Research Infrastructure Program is “**To promote the improvement of research programs and capabilities of institutional and affiliate members with an emphasis on the fields of aerospace, earth science, and supporting STEM disciplines.**” The *2005 Strategic Plan* (App. A) identifies seven specific objectives for achieving this goal (box at right).

#### **3. Research Infrastructure Strategic Objectives**

- 3.1 Research proposals
- 3.2 Research support
- 3.3 Collaborations
- 3.4 Facilities
- 3.5 Integrate research and education
- 3.6 Diversity
- 3.7 Evaluation

*Program characteristics.* As a result of the 15<sup>th</sup> Year Evaluation and recommendations from NASA Headquarters, SDSGC increased the percentage of the Consortium’s budget for Research Infrastructure from 9% in 2003 to 19% in 2004; this underscores SDSGC’s commitment to this program area, as appropriate for a Capability Enhancement state. In 2004, \$65,074 went to support the following research infrastructure programs: 1) faculty development to enhance research opportunities, 2) faculty/graduate student research fellowships at EROS, 3) research capability enhancement through program initiation grants and travel support, 4) Upper Midwest Aerospace Consortium support for earth science research and education, and 5) diversity coordination for Native American research.

*Assessment and evaluation.* (See section F on “Sustaining Consortium Improvement.”)

*Recruitment and participation of underrepresented groups.* The Consortium enhances recruitment and retention of underrepresented groups through its support of programs such as the American Indian Science and Engineering Society (AISES), NSF Bridges to Success, and NativeConnections (described under “Higher Education”) and the Flandreau Indian School Success Academy and Summer Honors Program (described under “Precollege Education”).

*Longitudinal tracking of students.* (See “Fellowship/Scholarship Program.”)

#### Core Criteria

*Support multidisciplinary research aligned with NASA Mission Directorates.* Through its research and educational programs, SDSGC is committed to the following core criteria: 1) integrating research and training; 2) providing students with hands-on, tangible experiences; 3) promoting collaborations among universities, industry, and government; 4) promoting research collaboration and mentoring between larger research institutions and smaller affiliates, especially Tribal Colleges; 5) supporting engineering design teams; and 6) developing shared research and training facilities, such as remote sensing test sites, across the state.

Since its inception, SDSGC has promoted Earth Science and remote sensing research themes. This year, two new research themes are under development, one focused on Flight Support and one focused on Space Hardware/Software Engineering. Through the coordinated effort of SDSGC and the SD NASA EPSCoR program, 19 new research contacts were established in the past year between state researchers and scientists and engineers at seven of NASA’s 10 Research Centers (GSFC, ARC, SSC, KSC, JPL, JSC, LaRC) and at NASA Headquarters. In addition, new contacts were facilitated with three major research universities, three federal agencies or national laboratories, and four industry partners.

*EROS.* The USGS Center for Earth Resources Observation and Science (EROS) is an important member of SDSGC and is home to NASA’s Land Processes DAAC, which processes, archives, and distributes land related data collected by NASA satellites. EROS support for SDSGC activities promotes the interdisciplinary study of the Earth’s land systems. EROS is the world’s largest repository of civilian remote sensing data. The Center has an annual budget of



\$60 million and is staffed by approximately 600 contract and USGS employees that work onsite at EROS, at SDSGC universities, and at NASA Goddard. The current contractor at EROS, Science Applications International Corp. (SAIC), is a key industrial affiliate of the Consortium. As a result of its partnerships with EROS and SAIC, the Consortium has been successful in building research infrastructure within the state through 1) collaborative projects among faculty, students, and EROS scientists; 2) STEM internships for SDSGC students; and 3) a highly active outreach program to schools and the general public.

### Improvement and Results

*Leverage of existing strengths to improve performance.* The Consortium will continue to leverage existing ties between EROS and its academic affiliates to develop new research capabilities, programs, and collaboration. Specific developments in the past year include: 1) establishment of the Geographic Information Science Center of Excellence at SDSU, which is a state-funded research center focusing on collaboration between SDSU and EROS in the area of earth observation and monitoring; and 2) deployment of EROS research personnel at SDSM&T to collaborate on projects such as software and systems engineering, wildfire prediction and modeling, and monitoring primary productivity in grassland ecosystems.

*Industry survey.* In order to assess the needs and capabilities of the state's industries in areas of interest to SDSGC and NASA, the Consortium sponsored a market research project in 2004-2005 involving roughly 95 state businesses in aviation, aerospace, and related industries. Based on the 17 survey responses, 28% have some level of R&D, only two had any defense contracts, and none had any NASA contracts. Thirty percent were interested in having university student internships, and SDSGC will attempt to connect these businesses with qualified science and engineering students. Two existing industrial affiliates have expressed renewed interest in supporting undergraduate and graduate students, interns, and perhaps post-doctoral researchers. Aerostar International, Inc. will collaborate with SDSGC in high-altitude balloon projects, and RESPEC, Inc. will support research and development in remote sensing.

*State government ties.* In the past year, SDSGC has met with state government officials in order to establish better links between SDSGC activities and state priorities as articulated in the *South Dakota Science and Technology Strategic Plan* (July 2005 draft). Many state priorities are aligned with SDSGC and NASA goals, including 1) securing National Science Foundation approval of a Deep Underground Science and Engineering Laboratory at the Homestake mine site, 2) strengthening research opportunities with EROS, 3) accelerating support for research and training in critical areas (e.g., new Ph.D. programs and research centers in material science, information technology, remote sensing and GIS), 4) improving coordination among the state's EPSCoR-like programs (NSF, NASA, DoD, DOE, NIH), 5) fostering cooperative research between industry and universities, 6) promoting interdisciplinary research at the undergraduate and graduate level, and 7) nurturing entrepreneurship in the educational system. (See alignment matrix in App. A.)

*External metrics.* Research supported by SDSGC resulted in the following numbers of student and faculty publications and presentations: 26 in 2003, 24 in 2004, and four reported so far in 2005. Recent funding to SDSGC personnel includes "Enhancement of the U.S. Drought Monitor by Integrating NASA Earth Science Data" (partners include EROS and Augustana College, \$1.02M from NASA, 2005) and "South Dakota View" (\$89,500 from USGS, 2004). South Dakota View (SDView) is a consortium of educational institutions, government agencies and private sector organizations with a common goal of building partnerships and infrastructure to facilitate the availability, timely distribution and utilization of remotely sensed data.

Examples of strategic objectives and strategies to improve Research Infrastructure and examples of recent outcomes are shown in the table below.

Improvement need	Improvement strategy	Outcome
Objective 3.1: Increase the number of research proposals submitted by SDSGC institutions in fields aligned with NASA’s mission.		
<i>Self-identified</i> need to increase NASA-related research funding	3.1.2: Coordinate proposals that involve multiple disciplines and institutions	\$1.02M for Drought Monitor NASA grant (2005); \$89,500 for SDView (2004)
Objective 3.3: Build research collaborations both within and outside the state.		
<i>Self-identified</i> need to nurture research culture at smaller institutions, especially Tribal Colleges	3.3.3: Link institutions with limited research infrastructure to research-intensive institutions	Collaboration between SGU and SDSM&T funded through “NativeConnections” and NASA REASoN

#### 4. Higher Education Program

##### Description

The goal of the SDSGC Higher Education Program is **“To build interdisciplinary programs related to NASA’s mission and goals at the state’s institutions of higher education and to support related programs that serve to strengthen STEM education in South Dakota.”** The *2005 Strategic Plan* (App. A) identifies six specific objectives for achieving this goal (see box).

*Program characteristics.* In 2003 and 2004, higher education funding represented an average of 23% of the overall Consortium budget. In 2004, \$44,849 went to support the following programs as reported in CMIS: 1) student and faculty travel support to

present technical papers, 2) American Indian Science and Engineering Society (AISES) student chapter support, 3) university student mentorship for FIRST Robotics, 4) pipeline capacity building, 5) Program Initiation Grants, 6) Short Wave Aerostat Mounted Imager (SWAMI) Project, 7) Space Grant Student Fellow Coordination, 8) Student Research Balloon Project, 9) 2004 Space Grant “Student Summit,” 10) Native American Bridges to Success Program, 11) Tribal College Relations Program, 12) proposal coordination, and 13) South Dakota View.

*Assessment and evaluation.* (See section F on “Sustaining Consortium Improvement.”)

*Recruitment and participation of underrepresented groups.* The Consortium enhances recruitment and retention of underrepresented groups through its support the following Higher Education programs:

- **American Indian Science and Engineering Society (AISES)**—AISES is a national organization founded to increase the number of American Indians in STEM fields. In 2003 and 2005, SDSGC staff and student fellows organized and hosted the AISES Region Five Conference in Rapid City with about 150 Native American students and staff attending each year.
- **Bridges to Success Program**—This undergraduate Native American student research program is a partnership between Oglala Lakota College (OLC) and SDSM&T and is funded by NSF with assistance from SDSGC. Students conduct summer research projects under faculty mentorship. The objective is to create a support structure that increases retention and graduation of Native American scientists and engineers. Many of the “Bridges” students from OLC

#### 4. Higher Education Strategic Objectives

- 4.1 Curriculum and NASA content
- 4.2 NASA & EROS ties
- 4.3 State government
- 4.4 Industry involvement
- 4.5 Diversity
- 4.6 Evaluation

complete their two-year Tribal College degrees and then articulate into SDSM&T to complete a four-year science and engineering degree.

- NativeConnections Workshops—With funding from SDSGC’s multi-state “Native-Connections” Workforce Development grant, a student fellow helped develop a series of workshops in conjunction with EROS, Sinte Gleska University, Spatial Data Technologies, Inc., and SDSM&T. Basic concepts of GIS, GPS and remote sensing were presented to precollege and university teachers and tribal representatives in 2004-2005 at two Tribal Colleges in South Dakota, one in North Dakota, and one Native American Center in New Mexico.

### Core Criteria

*Emphasis on undergraduate education.* SDSGC programs focus on developing strong undergraduate programs in aerospace and earth science through fellowships and scholarships and other program support. In 2004, 43% of fellowships were awarded to undergraduates. In 2005, 84% of the 2005 fellowship funds awarded to date have been to undergraduates to participate in projects such as NASA MODIS sensor registration and NASA drought mitigation research.

*Multidisciplinary programs.* SDSGC higher education funding is especially targeted to promote hands-on interdisciplinary experiences for individual students or design teams such as:

- Student Research Balloon Project—After SDSGC representatives attended two “Starting Student Hardware Programs” workshops in Boulder, CO, in 2003 and 2004, a balloon design project called “Student Engineered Electronic Satellites” (SEESat) was initiated at SDSGC’s lead institution for first-year engineering students.

- Aero Design Team—In just its fifth year of competition, the Aero Design Team from SDSGC’s lead institution navigated to first place in the 2005 Aero Design West remote-controlled airplane competition in Fort Worth, TX. The Aero Design Team is part of the Center for Advanced Manufacturing and Production that uses teams of students for innovative engineering and science education, and for teaching team-building skills. SDSGC provided \$3,000 for project expenses.

*Longitudinal tracking of students.* (See “Fellowship/Scholarship Program.”)

### Improvement and Results

Subsequent to the 15<sup>th</sup> Year Evaluation, SDSGC has made concerted efforts to improve its Higher Education Program through: enhancing NASA content, strengthening NASA and EROS ties at the faculty and student level, increasing alignment with state government research and development priorities, improving industry relations, continuing to support participation of Native American students, and developing a long-term evaluation strategy.

*External metrics.* In just the first year since developing a new consortium-wide Fellowship/Scholarship Program, SDSGC has nearly doubled the number of institutions that host SDSGC fellows. This list includes of Sinte Gleska University (a Tribal College), SDSM&T, SDSU, Dakota State University, Black Hills State University, Augustana College, and Si Tanka University (student transferring). In coming years, the response should be even greater and the number of institutions will likely increase further.

As reported above, 35 applications were received under the summer 2005 fellowship program from students representing eight colleges and universities, and 19 awardees were selected from seven institutions. Six Space Grant student fellows from four institutions were placed at NASA Centers for summer internships in 2005 and six additional students conducted summer research programs through EROS. The first-ever SD Space Grant “Student Summit” was held in 2004, where student fellows presented their research and educational projects to the community.

An example of a strategic objective and strategy designed to improve the Higher Education Program and an example of a recent outcome is shown in the table below.

Improvement need	Improvement strategy	Outcome
Objective 4.3: Establish and maintain linkages between SDSGC and higher education and state government.		
Need better links with state objectives in entrepreneurship	4.2.2: Provide cofunding for state Science and Technology Entrepreneurship Program scholars with NASA interests	STEP scholarships of \$18,000 available at each of three SDSGC institutions in AY05-06 (total \$54,000)

## 5. Precollege Education Program

### Description

The goal of the SDSGC Precollege Education Program is **“To increase student awareness and access to education and career opportunities in aerospace, earth science, and supporting STEM disciplines.”** The *2005 Strategic Plan* (App. A) identifies seven specific objectives for achieving this goal (box at right).

*Program characteristics.* In 2003 and 2004, precollege funding represented only 4% and 11%, respectively, of the Consortium budget. In 2004, \$39,245 went to support the following programs: 1) Augustana Science Day, 2) Badlands Observatory’s “Dark Skies, Bright Minds” program, 3) Engineer’s Week, 4) SDSGC Visiting Scientist Outreach Program, 5) SD Student Signatures in Space, 6) UMAC EdPARC, 7) Women in Science conferences, 8) Aerospace Career and Education Camp, 9) Flandreau Indian School Success Academy, and 10) Summer Honors Program for Native American students.

*Assessment and evaluation.* (See section F on “Sustaining Consortium Improvement.”)

*Recruitment and participation of underrepresented groups.* The Consortium enhances recruitment and retention of underrepresented groups through its support of at least five annual Women in Science conferences, the Flandreau Indian School Success Academy, the Native American Summer Honors Program, and the 2005 South Dakota Space Day at the Pow Wow event. In 2004, SDSGC promoted NASA Explorer Schools (NES) at teacher conferences with help from NASA AESP. In 2005, the first two NES schools in South Dakota were selected and both are Tribal Schools. SDSGC’s Outreach Coordinator and a Native American member of the Management Team are both scheduled to speak at the Explorer School inaugural event for Todd County Middle School on Oct. 12, 2005, and SDSGC is attempting to schedule one or two NASA personnel to speak at the event.

### 5. Precollege Education Strategic Objectives

- 5.1 NASA Dissemination
- 5.2 Partnerships
- 5.3 Teacher-training
- 5.4 Science and education events
- 5.5 State standards
- 5.6 Diversity
- 5.7 Evaluation

### Core Criteria

*Alignment with state standards and systemic reform.* Alignment of SDSGC’s Precollege education programs with state and national education standards has received new attention in the past year with the addition of an informal science educator to the Management Team. SDSGC supports the “E-missions” math and science teacher-training workshops, which embrace state education standards in math, science, and language arts. Also, in 2005, after two years of development and support from NASA and SDSGC, Dr. Lee Vierling and his colleagues at Virginia Tech and the University of Colorado completed the “Earth Systems Connections”

(ESC) standards-based, elementary educational curriculum. The ESC curriculum is now available to teachers nationwide from NASA in CD-ROM format.

*Emphasis on teacher preparation.* Specific programs for teacher preparation include 1) the ESC curriculum described above, 2) Earth Science Tools for Educators (ESTE) workshops provided through SDSGC and UMAC EdPARC, 3) “E-missions” math and science teacher-training workshops, and 4) a new partnership to begin in 2006 between the SD Discovery Center and Aquarium and the Berkeley Space Science Laboratory funded by a NASA Parent Science Research Award grant to establish a “Great Explorations in Math & Science” (GEMS) teacher-training program that will focus on space science curricula.

### Improvement and Results

Following on NASA’s 18.5% budget cuts in 2004, SDSGC was advised by NASA Headquarters staff to continue to prioritize its Higher Education and Research Infrastructure programs and to de-emphasize Precollege Education and Public Service, in keeping with the state’s Capability Enhancement designation. It was further recommended that Precollege Education programs that were retained be targeted toward teacher-training activities such as those noted above under “Core Criteria.” In seeking additional sources of support for precollege programs, SDSGC staff submitted and were awarded a three-year, \$250,000 grant from NSF for Opportunities for Enhancing Diversity in the Geosciences (NSF-OEGD), which begins fall 2005. The program will feature place-based geoscience activities for K-12 students, families and teachers with a focus on the geology and Lakota cultural significance of the Black Hills landscape.

*External metrics.* From March 2003 through the present, the SDSGC Visiting Scientist Outreach Program conducted 55 separate outreach programs on space-related subjects and NASA missions to K-12 audiences and reached 3,025 students and teachers. These figures do not include the annual SD Space Day event that attracts thousands each year and is reported under “Public Service.” Science Day at Augustana College reaches approximately 300 students (10% Native American, 49% women) and 25 teachers in a daylong experience of hands-on science exploration and discovery. The 2004 and 2005, Women in Science (WIS) conferences respectively reached about 500 and 600 high school girls, their parents and educators. The Native American Summer Honors Program provides about 90 high school student participants annually with supplemental curriculum enrichment in STEM. Nearly 100% of the Honors Program students graduate from high school and over 80% go on to college. Through the Flandreau Indian School (FIS) Success Academy, about 400 Native American high school students experienced a combination of hands-on SDSGC workshops and NASA events. About 10 FIS students per year take science courses for college credit at SDSU through SDSGC Workforce Development funding. The five “E-missions” teacher-training workshops held in 2004-2005 reached 61 teachers from 41 schools who then brought the program to 809 middle school students, 70 of which were Native American. In 2005, SDSGC contributed \$10,000 for materials for the “Robo Camp” robotics program for 30 Native American middle and high school students and six teachers in partnership with Sinte Gleska University’s Department of Education GEAR-UP Program.

In 2005, two Tribal Schools were selected as the first NASA Explorer Schools in South Dakota—Todd County Middle School and Little Wound School. In coming years, SDSGC will focus its Precollege resources on support of these schools, and assistance to other schools that are attempting to become Explorer Schools.

*Role in promotion of a strong STEM education base.* Despite the comparatively small size of the precollege program element, SDSGC will continue to invest in important STEM education activities and to work with its affiliate organizations to accomplish extensive leveraging effects

with NASA funds. Examples of strategic objectives and strategies designed to improve the Precollege Education program and examples of recent outcomes are shown in the table below.

Improvement need	Improvement strategy	Outcome
Objective 5.2: Facilitate partnerships for grant applications that aim to strengthen precollege STEM education.		
Need for additional support to augment Precollege program	5.2.1: Preparation of proposals to NASA or other organizations that support precollege STEM education	New \$250K NSF-OEDG (submitted by SDSGC staff and funded), new GEMS (funded)
Objective 5.3: Increase teacher capacity to effectively incorporate aerospace and earth science into the curriculum.		
<i>Self-identified</i> need to increase priority on teacher training	5.3.2: Provide professional development workshops for educators on aerospace and earth science	AESP, ESTE, E-missions, GEMS, ESC curriculum, first 2 Explorer Schools in state (2005)
Objective 5.6: Inspire and motivate women, underrepresented minorities, and persons with disabilities into STEM careers.		
Prioritize recruitment of underrepresented groups	5.6.1: Support programs that inform, inspire, and motivate underrepresented students	WIS conferences, GEAR-UP, FIS, Summer Honors Program, Explorer Schools, NSF-OEDG

## 6. Public Service Program: General Public and External Relations

### Description

The goal of the SDSGC Public Service Program is “**To enhance public scientific literacy in aerospace and earth science; to complement community efforts in STEM education; and to inspire citizens of diverse backgrounds through the excitement of scientific exploration and discovery.**” The *2005 Strategic Plan* (App. A) identifies four objectives for achieving this goal (box at right).

### 6. Public Service Strategic Objectives

- 6.1 NASA dissemination
- 6.2 Science and education events
- 6.3 Diversity
- 6.4 Evaluation

*Program characteristics.* Public Service represented 3% and 4% of the Consortium’s overall budget in 2003 and 2004. In 2004,

\$15,286 went to support the following programs that promote the excitement of space exploration and scientific discovery to several thousand people each year: 1) South Dakota Space Days, 2) SD Solar System Ambassador Program, 3) Public Relations/Visiting Scientist Program to non-K-12 educational and civic groups, and 4) *StarDate* on South Dakota Public Radio.

- South Dakota Space Days—Students and teachers from throughout SD are invited to participate in hands-on STEM educational activities and visit with experts in aerospace, aeronautics, earth science, engineering, computer science, physics, and other fields. Students are advised on the educational requirements for careers in such fields. Guest speakers such as NASA astronauts give presentations and meet with students to explain the impact NASA has on their lives.

- Solar System Ambassador Program—Two volunteer ambassadors on either end of the state provide public presentations about space and space exploration at events across the state to spread excitement about the nation’s space program.

- Public Relations/Visiting Scientist—SDSGC’s Deputy Director and Outreach Coordinator gives numerous presentations and exhibits on space and earth science, satellite remote sensing, and other NASA topics to the general public and responds to media requests for information.

- StarDate on SD Public Radio—Broadcast twice daily, *StarDate* informs the general public about current events in space and ends with the credit line “Sponsored by NASA South Dakota Space Grant Consortium, [www.sdsmt.edu/space](http://www.sdsmt.edu/space).”

*Assessment and evaluation.* (See section F on “Sustaining Consortium Improvement.”)

*Participation of underrepresented groups.* In October 2005, South Dakota Space Day will be held at the Black Hills Pow Wow, an event that may draw up to 14,000 attendees to Rapid City from around the region and across the U.S. (of which up to 1,000 youth and their families are expected to experience Space Day).

### Core Criteria

*Promotion of understanding and stimulation of interest in STEM disciplines and NASA’s mission.* The programs discussed above all include dissemination of information that promotes STEM disciplines and NASA’s mission. For example, at Space Day, thousands of informational packets are distributed to students and teachers.

### Improvement and Results

In October 2005, SDSGC will host “SD Space Day at the Pow Wow: Merging Technology and Tradition” at the Rapid City Civic Center and the Journey Museum. Native American youth and their families attending the Pow Wow are the target audience with emphasis on inspiring Native American students about STEM education and careers. NASA experts Dr. Theodore Gull (Astrophysicist at Goddard) and Dr. Fritz Hasler (recently retired from a 40-year career at Goddard) are featured speakers. Exhibits on earth and space science and technology and South Dakota’s “Science on the Move” mobile science laboratory tractor-trailer will be available for hands-on science experimentation. Native American university students that conducted summer research projects through the Bridges to Success Program (see “Higher Education”) will present posters and talk to the younger students about their successes in science and engineering. This multi-tiered educational event for minority students will be evaluated by SDSGC’s Management Team through participant surveys as a basis for improving similar programs in the future.

*External metrics.* A measure of the Consortium’s success in stimulating interest in NASA, is the fact that SDSGC’s outreach staff continually receive requests from educational and civic groups to give space-related lectures and community education courses. SDSGC has gained the reputation as the state’s leading authority in space-related issues. Press and broadcast media reporters routinely contact SDSGC for information relating to space and space exploration. In July 2005 for example, SDSGC Deputy Director and Outreach Coordinator Tom Durkin served on a two-member panel for a call-in public radio program on the future of space exploration. Recognition has been given to SDSGC staff for these public presentations (e.g., plaque awarded to SDSGC staff for presenting NASA’s Mars Exploration Rover Mission at the 2004 Annual Conference of the SD Engineering Society).

An example of a strategic objective and strategy designed to improve the Public Service program and examples of recent outcomes are shown in the table below.

Improvement need	Improvement strategy	Outcome
Objective 6.2: The SDSGC will support activities of scientific discovery across the state.		
Need to engage a diverse citizenry in the experience of exploration and discovery	6.2.2: Space Days 2005 will be held at the Black Hills Pow Wow, one of the nation’s largest Native American gatherings	Up to 1,000 youth and adults will have the opportunity to see NASA exhibits, lectures, and SDSGC outreach programs

## F. SUSTAINING CONSORTIUM IMPROVEMENT

### 1. Development of a Formalized Evaluation Strategy

The Management Team is keenly aware of the fact that, whereas data have been collected on specific actions or activities undertaken over the years, there has been very limited assessment of whether or not these activities have had the intended effect. In March 2005, the Consortium entered into a one-year contract with Dr. Diane Kayongo-Male to provide an independent assessment of the Consortium's improvement process and to develop a long-term evaluation strategy. Dr. Kayongo-Male holds the rank of Professor in the Department of Rural Sociology at South Dakota State University. She has conducted evaluation research for more than 25 years and has taught a graduate-level Evaluation Research course since 1988. The contract also supported a Ph.D. graduate student in the Sociology Department through July 2005. The final Evaluation Report and recommendations will be completed in February 2006.

#### Approach and Progress

The strategy takes into account evaluation research standards, but also the feasibility of data collection and assessment strategies relative to SDSGC funding, personnel, and technology. One very strong recommendation is that the Management Team prioritizes the activities of the Consortium and decides which outcomes are short term and which are long term. This recommendation assumes that the funding for the Consortium remains at about the same level and that evaluation is not fully funded as a separate activity. SDSGC is committed to funding a graduate student with evaluation experience to assist with the evaluation process for at least one additional year, and SDSGC will fund three Information Technology students to develop an online system for participant surveys, data collection, tracking, feedback, and collation and generation of summary tables (see section 2, below).

#### Midway through the contract, the evaluators have completed the following tasks:

- a) Reviewed records and reports from the SDSGC for the last few years, including CMIS data;
- b) Reviewed Space Grant reports from other states in the Capability Enhancement and Program Grant categories;
- c) Studied the Program Performance and Results Report Guidelines and the Program Performance and Results Report (15<sup>th</sup> Year Evaluation 1998-2002) from the NASA evaluation team;
- d) Summarized the weaknesses identified in the Program Performance and Results Report;
- e) Interviewed members of the Management Team;
- f) Attended one Management Team meeting and one meeting via teleconference;
- g) Prepared a matrix of topics for key informant interviews and for a new affiliate survey to be administered in fall 2005;
- h) Prepared a list of recommended data collection strategies;
- i) Submitted an Interim Logic Model; and
- j) Submitted an Interim Framework Evaluation Report.

The Interim Logic Model is based on the Consortium's *Strategic Plan* and NASA's Program Performance and Results Report. It gives a graphical description of the inputs, strategies or activities, output or process measures, and outcomes. The Management Team recognizes many remaining weaknesses in the *Strategic Plan* and will continue to work with the evaluator to improve the plan. In particular, it will be important to prioritize the many objectives and strategies in terms of short- and long-term needs; to restate many objectives in simple, quantifiable terms;



and to distinguish better between process outputs and outcomes. The Final Logic Model will accompany the evaluation report in February 2006.

The long-term evaluation plan will be based on the Logic Model, and will include strategies for monitoring outputs and process measures, collection of qualitative data, alignment with national benchmarks, designing participant feedback forms, and acquiring online feedback. Once the Management Team adopts the Logic Model as a workable framework for the Consortium, it will be feasible to hire a graduate student to do the evaluation research in subsequent years. It is recommended that this student be one who has completed an Evaluation Research course.

### Remaining tasks

The Management Team will complete its the three remaining affiliates visits by October 2005. As soon as the visits are completed and feedback is provided to the evaluator on those visits, the evaluator will prepare a survey and send it to the affiliates and conduct interviews via telephone. The design of the affiliate interviews and survey will address: a) ways to improve process monitoring and evaluation, b) attitudes about outcome assessment measures and procedures for gathering these measures, c) institutional responsibilities for assessment, d) ideas for improving communication among Consortium members, and e) benefits and expectations of membership in the Consortium.

## **2. Implementation of a Web-Based Management Information System**

A key recommendation of the interim report is that SDSGC institute a simple Management Information System (MIS) to assist with data collection, tracking, and quantification of program impact. An example of an effective MIS is Michigan State University's online system for documenting outreach activities. After completing an activity, participants are asked to complete an online survey comprised of a checklist of type of activity, an open-ended data box for qualitative details on the types of people involved in the activity, actions taken and any outcomes produced, number of people who participated in the activity, location of the activity, project managers, sponsors and co-sponsors, hours of effort for the person answering the survey, hours of effort for the total university contribution to this activity, and contributions in cash and kind. The MIS then automatically collates the data and produces summary tables.

During the 2005-06 academic year, SDSGC will provide funding to Dr. William Figg and three students at the Center of Excellence in Computer Information Systems at Dakota State University to adapt the Michigan State MIS system for use as a data collection and tracking system for the Consortium. The students are also tasked with completely redesigning the SDSGC website, including new graphics (a new look and feel) and a new ".org" URL. The new site and URL will serve to underscore the statewide reach of the Consortium and de-emphasize the influence of the lead institution (a concern expressed by several academic affiliates). More importantly, the new website will allow electronic processing of fellowship applications, student surveys (before and after fellowships and internships), general program feedback, tracking after graduation, and annual affiliate surveys (Appendix B, sect. VI).

**Summary:** SDSGC is working together as a learning community and is fully committed to a process of external and self-evaluation that will provide quantitative and qualitative assessment of progress toward strategic objectives and overall program impact.

**G. EVIDENCE OF CONSORTIUM CONCURRENCE**

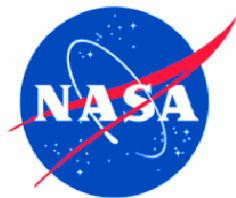
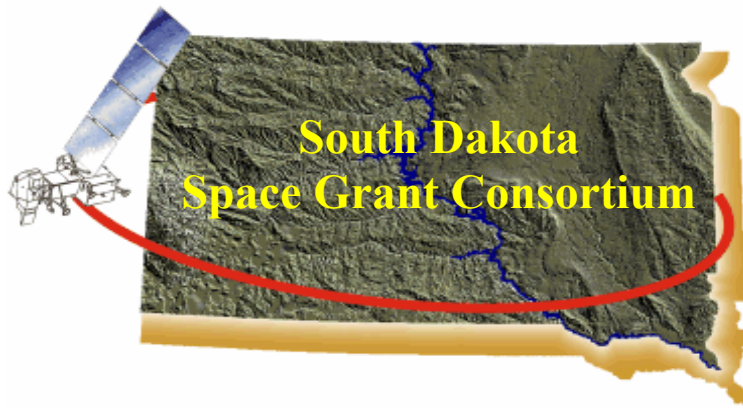
**See Appendix C**

## Appendix A

### NASA South Dakota Space Grant Consortium

# 2005 Strategic Plan

September 7, 2005



South Dakota Space Grant Consortium  
Headquarters Office  
501 E. Saint Joseph Street  
Rapid City, SD 57701  
[www.sdsmt.edu/space](http://www.sdsmt.edu/space)  
(605) 394-1975

# NASA South Dakota Space Grant Program

## Vision

The vision of the SDSGC is to expand opportunities for all South Dakotans through education, research, and public service in the fields of aerospace, earth, and space science.

## Mission

As the link between NASA and the citizens of South Dakota, SDSGC's mission is to instill the spirit of exploration and discovery in students and educators and in the general public, with a special focus on the fields of science, technology, engineering, and mathematics (STEM) that are essential for the development of the nation's workforce.

## Values

The NASA South Dakota Space Grant Consortium is committed to excellence in student and faculty research and to promoting STEM education and expanding outreach projects across the state of South Dakota. We specifically seek to include women, Native Americans, and other underrepresented groups in all of the programs and activities supported by the South Dakota Space Grant Consortium.

## Time Frame

The specific goals and objectives listed under each of the seven program areas are long-term and apply to the upcoming five-year Space Grant cycle (2005-2009). The strategies and outcome indicators to achieve those targeted goals apply to 2005, with the understanding that they will be evaluated quarterly and updated as needed at the Consortium's annual performance audit meeting described under the Management section.

## 1. Consortium Management

**Goal:** To ensure quality and fairness in all Consortium programs and alignment with the needs of NASA, the member and affiliate organizations, and the state of South Dakota.

**Objective 1.1:** (Reporting) The Management Team will provide timely reporting and responses to NASA Headquarters regarding Consortium operations and finances.

**Outcome indicator:** *All reports will be submitted on time and in accordance with NASA guidelines.*

**Objective 1.2:** (National network) The Management Team will work to strengthen relationships with NASA Centers and the USGS Center for Earth Resource Observation and Science (EROS), the national Space Grant network, and the state's NASA EPSCoR Program.

**Strategy 1.2.1:** Maintain and expand relationships with NASA Centers and EROS through faculty visits and student internships.

**Outcome indicator:** *At least two faculty will visit NASA Centers or EROS each year to promote collaborative research, and at least three students will participate in internship programs at NASA Centers. Through assistance from*

*Space Grant, at least five student interns will be placed at EROS (SAIC), although the funding for those internships will not necessarily be provided solely through Space Grant.*

**Strategy 1.2.2:** The Management Team and other representatives of the Consortium will continue to play an active role in the national Space Grant network.

**Outcome indicator:** *Representatives of the Management Team will be present at biannual national meetings and the Western Region Space Grant Meeting.*

**Strategy 1.2.3:** Provide effective coordination between the state Space Grant and NASA EPSCoR programs.

**Outcome indicator:** *Members of the Management Team also hold positions on the Technical Advisory Committee and the Steering Committee of the state NASA EPSCoR Program. (See also 3.3.1.)*

**Objective 1.3:** (Consortium network) The Management Team will faithfully represent the diverse interests and resources of the Consortium member institutions and affiliates.

**Strategy 1.3.1:** Establish two rotating positions on the Management Team, for a period of two years each, which will be filled by representatives of member institutions and affiliates.

**Outcome indicator:** *Announce available positions on Management Team to all Consortium members and affiliates and select two members by January 2005.*

**Strategy 1.3.2:** Develop written guidelines outlining the roles and responsibilities of Consortium management, member institutions, and all categories of affiliate organizations.

**Outcome indicator:** *Draft roles and responsibilities document produced by March 2005.*

**Strategy 1.3.3:** Maintain effective communication with Consortium member institutions and affiliates through an electronic newsletter.

**Outcome indicator:** *Semi-annual electronic newsletter sent to all member institutions, affiliates, teachers, and interested parties.*

**Objective 1.4:** (State government) The Management Team will ensure that Consortium programs are aligned with state priorities.

**Strategy 1.4.1:** Provide annual briefing to representatives of state government on Consortium activities.

**Outcome indicator:** *Members of the Management Team meet once per year with representatives of state government to discuss alignment with state priorities, such as the Governor's 2010 Initiative.*

**Strategy 1.4.2:** Appoint additional representatives of state government to advisory board. (See also 1.8.4.)

**Outcome indicator:** *At least one additional representative of state government will be appointed to advisory board by August 2005.*

**Objective 1.5:** (State industry) The Management Team will foster interaction between the Consortium and state industries involved in aerospace and related technologies.

**Strategy 1.5.1:** Conduct a survey to identify aerospace-related industries in the state and to assess their potential participation in the Consortium.

**Outcome indicator:** *Aerospace industry survey of about 95 industries in South Dakota completed by May 2005 (industries previously identified by their Standard Industrial Code designations as having some connection to aerospace or other NASA interests). (See also 3.3.4 and 4.4.1.)*

**Strategy 1.5.2:** Appoint additional industry representatives to advisory board. (See 1.8.4.)

**Outcome indicator:** *At least one additional representative of state industry will be appointed to advisory board by February 2006.*

**Objective 1.6:** (Link to public) The Management Team will seek to maintain and improve the effectiveness of the Consortium as the link between the public and NASA in the state.

**Strategy 1.6.1:** Develop and maintain electronic databases and mailing lists of contacts in formal and informal education, media, state and local government, non-profit organizations, clubs, and individual citizens.

**Outcome indicator:** *Electronic databases available by November 2005 and updated quarterly thereafter.*

**Strategy 1.6.2:** Redesign the Consortium website to provide more effective dissemination of information about NASA, the state Consortium, and research and educational opportunities in STEM-related fields, and to collect and compile evaluative data on Consortium programs.

**Outcome indicator:** *Consortium website completely redesigned by faculty and students at the Center of Excellence in Computer Information Systems at Dakota State University by February 2006.*

**Objective 1.7:** (Increase resources) The Management Team will pursue opportunities to increase the resources available to the Consortium, to broaden participation within the state, to collaborate with other state Consortia in areas of mutual interest and capability, and to assure long-term sustainability.

**Strategy 1.7.1:** Establish an annual Development Plan that identifies opportunities to increase funding, staffing, and matching funds for the state program and update plan at quarterly meetings.

**Outcome indicator:** *Draft annual Development Plan complete by November 2005.*

**Strategy 1.7.2:** Review mission statements and strategic plans of other state Consortia to identify potential collaborations.

**Outcome indicator:** *Review of other state plans complete by February 2006.*

**Strategy 1.7.3:** Serve as a clearinghouse for information on funding opportunities from NASA and other agencies that support STEM-related research and education, especially in areas of aerospace and earth science.

**Outcome indicator:** *At least 20 targeted announcements of opportunity will be disseminated through electronic newsletter and website each year.*

**Strategy 1.7.4:** Coordinate submission of proposals to NASA and other agencies on projects in STEM research and education.

**Outcome indicator:** *Facilitate at least one multi-partner proposal each year to NASA or other agencies. (See also 3.1.2.)*

**Objective 1.8:** (Diversity) The Management Team will ensure diversity in all Consortium programs and activities by seeking to include women, underrepresented minorities, and persons with disabilities.

**Strategy 1.8.1:** The Management Team will emphasize diversity in selection of participating organizations, programs, fellowships and scholarships, faculty awards, and future Management Team members.

**Outcome indicator:** *Diversity will be modeled in all aspects of the Consortium and participation by underrepresented groups will increase.*

**Strategy 1.8.2:** The Management Team will conduct discussions with the Directors of the South Dakota School for the Deaf and the South Dakota School for the Blind and Visually Impaired with the purpose of increasing NASA and STEM opportunities for the disabled.

**Outcome indicator:** *NASA content or other STEM educational opportunities are expanded at these institutions.*

**Objective 1.9:** (Evaluation) The Management Team will continually monitor and seek to improve the quality and effectiveness of the state program.

**Strategy 1.9.1:** Obtain the services of an external Program Evaluator during the 2005 program year to provide assessment of the Consortium's strategic plan, activities, and outcomes, and to establish a long-term strategy for continuing evaluation.

**Outcome indicator:** *Program evaluator selected by March 2005 and participates in subsequent quarterly meetings.*

**Strategy 1.9.2:** Institute long-term evaluation procedures consistent with the recommendations of the Program Evaluator and with available resources.

**Outcome indicator:** *Following submission of the Program Evaluator's final report in February 2006, the Management Team will determine appropriate data collection and evaluation procedures that are consistent with available resources.*

**Strategy 1.9.3:** Redesign the Consortium website so that evaluation data can be collected through online surveys and compiled for analysis by the Management Team.

**Outcome indicator:** *Consortium website completely redesigned by faculty and students at the Center of Excellence in Computer Information Systems at Dakota State University to include data collection and database generation by February 2006.*

**Strategy 1.9.4:** Perform quarterly reviews of the Strategic Plan and issue annual updates.

**Outcome indicator:** *Strategic plan updated at an annual performance audit meeting.*

**Strategy 1.9.5:** In addition to the SDSGC Management Team, which will assess program quality on a continual basis, solicit input from an independent advisory board consisting of the expanded South Dakota NASA EPSCoR Technical

Advisory Committee in order to promote better alignment with NASA, industry, and state priorities.

**Outcome indicator:** *The advisory board will be convened for an annual meeting by February 2006.*

## 2. Fellowship/Scholarship Program

**Goal:** To administer a fellowship/scholarship program that offers educational and research opportunities to students from diverse backgrounds who are pursuing degrees in fields of science, technology, engineering, and mathematics (STEM) that align with NASA's mission and those of SDSGC members and affiliates.

**Objective 2.1:** (Competitiveness) Ensure the fair distribution of funds to member universities and educational affiliates.

**Strategy 2.1.1:** A centralized, Consortium-wide annual Call for Fellowship/Scholarship Applications shall be implemented in 2005 and made available to all of the Consortium's higher education members and affiliates via e-mail and SDSGC website.

**Outcome indicator:** *Annual Call for Fellowship/Scholarship Applications at all higher education members and affiliates, competitive review, and selection of awardees.*

**Strategy 2.1.2:** Utilize the Consortium Management Team to ensure consensus on schools selected to participate in fellowship/scholarship program each year, with emphasis on increasing participation of Tribal Colleges.

**Outcome indicator:** *Awards reflect the diversity of the Consortium's membership and statewide balance.*

**Objective 2.2:** (NASA and EROS ties) Offer hands-on, tangible research experiences to student research fellowship awardees at NASA Centers and EROS.

**Strategy 2.2.1:** Offer internships that integrate training with interdisciplinary research at NASA Centers and EROS-SAIC.

**Outcome indicator:** *In 2005, at least three interns will be placed at NASA Centers and at least five student interns will be placed at EROS-SAIC.*

**Outcome indicator:** *Augustana College will provide opportunities for three students for research projects at EROS in 2005.*

**Strategy 2.2.2:** Support student research opportunities through SD NASA EPSCoR collaborative research projects.

**Outcome indicator:** *At least two SD Space Grant Fellows will participate in SD NASA EPSCoR research projects annually.*

**Strategy 2.2.3:** Offer research fellowships that support SDSGC initiatives (Badlands Observatory astronomical research or "Dark Skies, Bright Minds" Program, robotics, NASA's "Microgravity University" Reduced Gravity Student Flight Opportunity Program, etc.)

**Outcome indicator:** *At least three fellowships offered each year.*



**Objective 2.3:** (Industry ties) Offer hands-on, tangible research experiences to student research fellowship awardees at aerospace and related science and technology industries.

**Strategy 2.3.1:** Support internships that provide students with hands-on experience in the aerospace and related industries.

**Outcome indicator:** *In 2005, at least three interns will be placed at NASA Centers and at least five student interns will be placed at EROS-SAIC (see also 2.2.1).*

**Strategy 2.3.2:** Offer co-funding for students in the state's Science and Technology Entrepreneurship Program (STEP) if their business interests align with NASA and SDSGC.

**Outcome indicator:** *At least two STEP fellows will receive supplemental funding through SDSGC each year.*

**Objective 2.4:** (Mentoring and professional development) Provide mentoring and professional development experiences to student researchers, which will develop skills that contribute to the future workforce.

**Strategy 2.4.1:** Require student researchers to present results at annual South Dakota Space Grant Consortium "Student Summit" and possibly other professional, K-12, or civic group outreach experience to relay their research outcomes and raise the level of awareness of NASA in the community.

**Outcome indicator:** *100% of all student researchers funded through NASA South Dakota Space Grant will present results each year.*

**Strategy 2.4.2:** Professional development training will be provided by faculty in the field of technical communication to SDSGC student fellows to better equip them to present themselves and their work to future employers.

**Outcome indicator:** *Opportunities will be offered to 100% of SDSGC student fellows to take advantage of professional development training.*

**Objective 2.5:** (Diversity) Ensure funding for fellowships and scholarships to women, underrepresented minorities, and persons with disabilities.

**Strategy 2.5.1:** Utilize intensive marketing techniques (personal visits, direct faculty contacts, email) to encourage women and minority students to apply for funding.

**Outcome indicator:** *Awards to women and minorities equal or exceed 10% to minorities and 40% to females.*

**Strategy 2.5.2:** Offer fellowships to qualified Native American students at Tribal College affiliates.

**Outcome indicator:** *At least one fellowship awarded annually to a student at a Tribal College or to a Tribal College student seeking to transfer to another SDSGC university.*

**Objective 2.6:** (Longitudinal tracking) All students who have received significant fellowship or scholarship assistance from SDSGC will be longitudinally tracked through first employment or beginning of advanced degrees.

**Strategy 2.6.1:** Develop and implement online exit surveys and tracking system in collaboration with faculty and students of the Center of Excellence in

Computer Information Systems at Dakota State University during the 2005-2006 academic year. (See also 1.9.3.)

**Outcome indicator:** *Use of a web-based system will improve SDSGC's ability to assess the impact of its student programs and to maintain better contact with graduates of the program.*

**Objective 2.7:** (Evaluation) The Consortium will develop methods to document, measure, and assess the impact of the fellowship and scholarship programs in conjunction with its implementation of an overall evaluation strategy (see 1.9).

**Strategy 2.7.1:** Develop and administer simple before-and-after surveys of students' knowledge and attitudes about the Consortium, NASA, and STEM careers.

**Outcome indicator:** *Adjustments are made to the fellowship and scholarship program to strengthen activities that are working and drop or correct activities that are not having the intended impact.*

### 3. Research Infrastructure

**Goal:** To promote the improvement of research programs and capabilities of institutional and affiliate members with an emphasis on the fields of aerospace, earth science, and supporting STEM disciplines.

**Objective 3.1:** (Research proposals) Increase the number of research proposals submitted by SDSGC institutions in fields aligned with NASA's mission.

**Strategy 3.1.1:** Distribute announcements of research opportunities in NASA-related fields to faculty at member institutions.

**Outcome indicator:** *At least ten research announcements are distributed among appropriate SDSGC institutions each year.*

**Strategy 3.1.2:** Coordinate the development of research proposals among faculty at member institutions, especially proposals that involve multiple disciplines and institutions.

**Outcome indicator:** *At least one NASA-related research proposal is submitted each year as a result of SDSGC coordination. (See also 1.7.4.)*

**Objective 3.2:** (Research support) Support new and developing research, especially multidisciplinary and collaborative projects, in fields aligned with NASA's mission.

**Strategy 3.2.1:** Support new research initiatives through competitively awarded seed grants.

**Outcome indicator:** *At least five Program Initiation Grants are supported each year from SDSGC and/or state NASA EPSCoR funds.*

**Strategy 3.2.2:** Support faculty and student travel to NASA Centers, EROS, and other institutions or events for the purpose of developing new research projects.

**Outcome indicator:** *At least five travel grants for research development are awarded each year from SDSGC and/or state NASA EPSCoR funds. (See also 3.3.2.)*

**Strategy 3.2.3:** Support graduate and undergraduate student research that is aligned with NASA's mission.

**Outcome indicator:** *At least two SDSGC fellowships or scholarships are awarded each year for students to work on NASA EPSCoR or other NASA-related research projects.*

**Objective 3.3:** (Collaborations) Build research collaborations both within and outside the state.

**Strategy 3.3.1:** Coordinate SDSGC research programs with the state's NASA EPSCoR program and other NASA research programs having similar objectives.

**Outcome indicator:** *Members of the Management Team also hold positions on the Technical Advisory Committee and the Steering Committee of the state NASA EPSCoR Program. (See also 1.2.3.)*

**Strategy 3.3.2:** Develop mutually beneficial research collaborations with NASA Centers and EROS.

**Outcome indicator:** *At least five planning trips to NASA Centers or EROS are supported each year from SDSGC and/or state NASA EPSCoR funds. (See also 3.2.2.)*

**Strategy 3.3.3:** Promote research collaboration among the state's academic institutions with an emphasis on programs that link faculty at institutions with limited research infrastructure and faculty at research-intensive institutions, including Tribal Colleges.

**Outcome indicator:** *An initial research needs and capabilities assessment of SDSGC academic institutions is completed by June 2006.*

**Strategy 3.3.4:** Encourage research partnerships between the state's academic institutions and private industry.

**Outcome indicator:** *An initial survey of state industries with potential aerospace capabilities is completed by May 2005. (See also 1.5.1.)*

**Strategy 3.3.5:** Facilitate research partnerships between the state's academic institutions and state and federal government agencies.

**Outcome indicator:** *At least five announcements of research opportunities at state and federal agencies are distributed annually to faculty at SDSGC academic institutions.*

**Objective 3.4:** (Facilities) Promote acquisition of new facilities and shared use of existing resources.

**Strategy 3.4.1:** In conjunction with SD NASA EPSCoR, provide funding for new equipment and facilities that support NASA-related research, especially if the equipment can be shared among SDSGC institutions.

**Outcome indicator:** *Full or partial funding for new equipment and facilities is awarded to SDSGC institutions through SD NASA EPSCoR or SDSGC.*

**Strategy 3.4.2:** Develop and maintain remote-sensing test sites that promote long-term interdisciplinary research and training collaborations among SDSGC institutions and attract collaborations from external partners.

**Outcome indicator:** *At least three test sites are developed using imagery from the NASA-USGS EO-1 satellite (Hyperion and Advanced Land Imager sensors); two of the sites are located to support Tribal College research projects.*

**Strategy 3.4.3:** Promote access to existing research facilities and resources in the state by SDSGC institutions.

**Outcome indicator:** *A physical or electronic catalog of the remote sensing library holdings at EROS is prepared and distributed to SDSGC institutions and other interested parties.*

**Outcome indicator:** *SDSGC members receive information on satellite imagery available through SDView.*

**Objective 3.5:** (Integrate research and education) Foster research groups and engineering design teams that integrate education, research, and development.

**Strategy 3.5.1:** Provide funding to college and pre-college research and design teams.

**Outcome indicator:** *At least two college or pre-college research or design teams receive SDSGC funds each year.*

**Strategy 3.5.2:** Encourage public and private partnerships to sponsor pre-college engineering design teams such as robotics teams.

**Outcome indicator:** *SDSGC industrial and state government affiliates will be contacted regarding the needs and benefits of pre-college engineering design programs.*

**Objective 3.6:** (Diversity) Increase the participation of women and underrepresented groups in statewide research programs and facilitate their subsequent entry into STEM careers.

**Strategy 3.6.1:** Work with admissions officers at SDSGC academic affiliates and with SDSGC's network of K-12 and informal education contacts to improve recruitment of qualified female students and students from underrepresented groups.

**Outcome indicator:** *SDSGC will sponsor activities that encourage women and students from underrepresented groups to enter STEM careers, including Women in Science Conferences, Flandreau Indian School Success Academy, NASA Explorer Schools, and Space Day at the Black Hills Pow Wow.*

**Strategy 3.6.2:** Assist in the placement of students from underrepresented groups in projects that provide hands-on research or design experience.

**Outcome indicator:** *SDSGC fellowship/scholarship funds for research or design experiences at SDSGC academic institutions, EROS, and NASA Centers will equal or exceed 10% to minorities and 40% to females.*

**Strategy 3.6.3:** Track progress of students from underrepresented groups in academic performance and research activities through first employment.

**Outcome indicator:** *A uniform system for tracking SDSGC scholars and fellows will be in place by June 2006. (See also 2.6.)*

**Objective 3.7:** (Evaluation) The Consortium will develop methods to document, measure, and assess the impact of the research infrastructure programs in conjunction with its implementation of an overall evaluation strategy (see 1.9).

**Strategy 3.7.1:** Develop and administer simple before-and-after surveys of faculty and students involved in research infrastructure activities to assess their knowledge and attitudes about the Consortium, NASA, and STEM careers.

**Outcome indicator:** *Adjustments are made to the research infrastructure program to strengthen activities that are working and drop or improve activities that are not having the intended impact.*

#### 4. Higher Education

**Goal:** To build interdisciplinary programs related to NASA's mission and goals at the state's institutions of higher education and to support related programs that serve to strengthen STEM education in South Dakota.

**Objective 4.1:** (Curriculum and NASA content) Contribute aerospace and earth science materials to the higher education community in South Dakota.

**Strategy 4.1.1:** Redesign the SDSGC webpage to provide more effective links to NASA educational resources and successful education programs in other Space Grant Programs, as well as links to data, imagery, and general curriculum development guidance.

**Outcome indicator:** *Reorganize the "Educational Opportunities (Higher Education)" section of SDSGC website to make it more user friendly; add a web counter to monitor access and an online feedback section. (See also 1.9.)*

**Strategy 4.1.2:** Distribute announcements of opportunities for education and curriculum enhancement in NASA-related fields to faculty at member institutions.

**Outcome indicator:** *At least ten NASA education announcements are distributed among appropriate SDSGC institutions each year.*

**Objective 4.2:** (NASA and EROS ties) Enhance faculty and undergraduate/graduate student development through planning visits, internships, and fellowships at NASA Centers and EROS.

**Strategy 4.2.1:** SDSGC higher education affiliates will continue to promote NASA leadership and educational opportunities made available through NASA Academy, USRP, GSRP, Microgravity University, and other NASA programs that integrate training with interdisciplinary research.

**Outcome indicators:** *At least two faculty or students from SDSGC affiliates will participate in NASA educational programs each year.*

**Objective 4.3:** (State government) Establish and maintain linkages between SDSGC and higher education and state government.

**Strategy 4.3.1:** Develop strong collaborations with State 2010 Research Centers and new Ph.D. programs (in areas related to NASA's mission).

**Outcome indicators:** *Directors of new research centers and new Ph.D. programs are informed of SDSGC fellowship/scholarship and other programs.*

**Strategy 4.3.2:** Provide co-funding for students in the state's Science and Technology Entrepreneurship Program (STEP) if their research and training interests align with NASA and SDSGC.

**Outcome indicator:** *At least two STEP fellows will receive supplemental funding through SDSGC each year. (See also 2.3.2.)*

**Objective 4.4:** (Industry involvement) Establish and maintain linkages between SDSGC and higher education and industry in South Dakota.

**Strategy 4.4.1:** Encourage educational partnerships between the state's academic institutions and private industry.

**Outcome indicator:** *An initial survey of state industries with potential aerospace capabilities is completed by May 2005. (See also 1.5.1.)*

**Strategy 4.4.2:** Participate in the state's annual GIS user's conference.

**Outcome indicator:** *At least one representative of SDSGC will attend the conference and promote partnerships between industry and academic affiliates.*

**Objective 4.5:** (Diversity) Increase the participation of women and underrepresented groups in all aspects of SDSGC's higher education program and facilitate their subsequent entry into STEM careers.

**Strategy 4.5.1:** Engage women and members of underrepresented groups in all aspects of the SDSGC higher education programs; advertise that fellowships encourage minority and women applicants.

**Outcome indicator:** *Participation by women and minorities will equal or exceed 10% to minorities and 40% to females. (See also 2.5.1.)*

**Objective 4.6:** (Evaluation) The Consortium will develop methods to document, measure, and assess the impact of the higher education programs in conjunction with its implementation of an overall evaluation strategy (see 1.9).

**Strategy 4.6.1:** Develop and administer simple before-and-after surveys for faculty and students to assess their knowledge and attitudes about the Consortium, NASA, and STEM careers.

**Outcome indicator:** *Adjustments are made to the higher education program to strengthen activities that are working and drop or improve activities that are not having the intended impact.*

## **5. K-12 (Precollege) Education**

**Goal:** To increase student awareness and access to education and career opportunities in aerospace, earth science, and supporting STEM disciplines.

**Objective 5.1:** (NASA dissemination) Disseminate information on NASA and SDSGC precollege activities and opportunities to teachers and students statewide.

**Strategy 1.6.1:** Develop and maintain electronic databases and mailing lists of contacts in precollege educators in STEM fields.

**Outcome indicator:** *Electronic databases available by November 2005 and updated quarterly thereafter.*

**Objective 5.2:** (Partnerships) Facilitate partnerships for grant applications that aim to strengthen precollege STEM education.

**Strategy 5.2.1:** Participate in preparation of proposals to NASA or other organizations that support precollege STEM education.

**Outcome indicator:** *SDSGC members will participate in at least one precollege education proposal by the end of 2006.*

**Objective 5.3:** (In-service teacher training) Increase teacher capacity to effectively incorporate aerospace and earth science into the curriculum.

**Strategy 5.3.1:** SDSGC and SDView will conduct a K-12 geospatial education needs assessment survey.

**Outcome indicator:** *SDView will publish the results of the survey.*

**Strategy 5.3.2:** Provide professional development workshops for educators on topics related to aerospace and earth science.

**Outcome indicator:** *At least 100 teachers will participate in workshops facilitated by SDSGC such as NASA AESP training, GIS/GPS training, E-missions, GEMS, StarLab Planetarium astronomy training, UMAC's Earth Science Tools for Educators workshop, and NASA Speaker's Bureau*

**Strategy 5.3.3:** Maintain "K-12 Educational Opportunities" section of the SDSGC website as a teacher resource directory.

**Outcome indicator:** *Website is updated at least monthly: add a web counter to monitor access and an online feedback section. (See also 1.9.)*

**Strategy 5.3.4:** Participate in NASA Explorer Schools Program.

**Outcome indicator:** *At least two South Dakota schools (at least one Tribal school) apply for the 2005 NASA Explorer Schools Program.*

**Objective 5.4:** (Science and education events) Support programs that expose K-12 students to hands-on experiences and to educational and career opportunities in the fields of aerospace, earth science and technology.

**Strategy 5.4.1:** Present annual South Dakota Space Days 2005 event. (See also 5.2.2.)

**Outcome indicator:** *At least 1,000 people will attend South Dakota Space Days at the Black Hills Pow Wow, Oct. 7, 2005, in Rapid City.*

**Strategy 5.4.2:** Support organizations that provide K-12 students with educational and career opportunities in the fields of aerospace, earth science, and technology.

**Outcome indicator:** *Over 3,000 students each year participate through Women in Science Conferences, K-12 science fairs, Aerospace Career and Education Camp, Flandreau Indian School Success Academy, Badlands Observatory's "Dark Skies, Bright Minds" educational program, RoboCamp, and related programs.*

**Objective 5.5:** (State standards) SDSGC will promote and support programs that align with state and national education standards.

**Strategy 5.5.1:** Provide support for the “E-missions” Program, GEMS (Great Explorations in Math & Science) Program, and similar curriculum enhancement projects.

**Outcome indicator:** *These teacher-training programs embrace state education standards in math, science, and language arts and will introduce at least 50 teachers to NASA and space science curricula.*

**Objective 5.6:** (Diversity) Inspire and motivate women, underrepresented minorities, and persons with disabilities into STEM careers.

**Strategy 7.6.1:** Support programs that inform, inspire, and motivate students from underrepresented groups about educational and career opportunities in the fields of aerospace, earth science, and supporting STEM disciplines.

**Outcome indicator:** *Over 1,000 females and students from underrepresented groups participate each year through Women in Science Conferences, K-12 science fairs, Aerospace Career and Education Camp, Flandreau Indian School Success Academy, Badlands Observatory’s “Dark Skies, Bright Minds” educational program, RoboCamp.*

**Objective 5.7:** (Evaluation) The Consortium will develop methods to document, measure, and assess the impact of the precollege education programs in conjunction with its implementation of an overall evaluation strategy (see 1.9).

**Strategy 5.7.1:** Develop and administer simple before-and-after surveys of participants’ knowledge and attitudes about the Consortium, NASA, and STEM careers.

**Outcome indicator:** *Adjustments are made to the precollege education program to strengthen activities that are working and drop or improve activities that are not having the intended impact.*

## 6. Public Service Activities

**Goal:** To enhance public scientific literacy in aerospace and earth science; to complement community efforts in STEM education; and to inspire citizens of diverse backgrounds through the excitement of scientific exploration and discovery.

**Objective 6.1:** (NASA dissemination) The SDSGC will increase public awareness of the Space Grant program and its activities and engage the public in the excitement of NASA missions.

**Strategy 6.1.1:** Redesign the SDSGC webpage to provide the public easier access to the latest information about NASA and SDSGC activities.

**Outcome indicator:** *Reorganize the “General Public” section of SDSGC website to make it more user friendly; add a web counter to monitor access and an online feedback section. (See also 1.9.3.)*

**Strategy 6.1.2:** SDSGC will sponsor *StarDate* on South Dakota Public Radio.

**Outcome indicator:** *NASA and SDSGC will be advertised daily during the work week in 2005.*



**Objective 6.2:** (Science and education events) The SDSGC will support activities of scientific discovery across the state.

**Strategy 6.2.1:** SDSGC will support NASA's commitment to renewing a spirit of exploration and discovery and will use the excitement of space exploration to promote this policy to the general public.

**Outcome indicator:** *SDSGC staff will produce and give formal and informal presentations to various civic and other public groups, and will generate press releases about Consortium activities.*

**Strategy 6.2.2:** SDSGC will host Space Days 2005 in conjunction with the Black Hills Pow Wow, Oct. 7, 2005, in Rapid City, SD.

**Outcome indicator:** *At least 1,000 students, parents, and teachers will hear from NASA speakers and experience hands-on demonstrations and exhibits from SDSGC academic, government, and industry affiliates.*

**Strategy 6.2.3:** SDSGC will participate in at least three local science day activities across the state, in Rapid City, Sioux Falls, and Brookings, and will award prizes for SDSGC-related student projects.

**Outcome indicator:** *Approximately 2,500 middle and high school students across the state will have been engaged with hands-on science activities and SDSGC will have awarded prizes at all three science fairs.*

**Objective 6.3:** (Diversity) SDSGC will seek to inspire and motivate women, underrepresented minorities, and persons with disabilities through the excitement of NASA missions.

**Strategy 6.3.1:** Support programs that inform, inspire, and motivate members of underrepresented groups about the excitement of NASA missions.

**Outcome indicator:** *Participants in South Dakota Space Days and science fairs will include at least 10% Native Americans and 40% females.*

**Objective 6.4:** (Evaluation) The Consortium will develop methods to document, measure, and assess the impact of the public service program in conjunction with its implementation of an overall evaluation strategy (see 1.9).

**Strategy 6.4.1:** Develop and administer simple before-and-after surveys of participants' knowledge and attitudes about the Consortium, NASA, and STEM careers.

**Outcome indicator:** *Adjustments are made to the public service program to strengthen activities that are working and drop or improve activities that are not having the intended impact.*

## 7. Workforce Development

**Goal:** To use the Consortium's statewide network of scientists, engineers, and educators to provide talented students a pathway to careers that will contribute to a highly-trained and diverse workforce for NASA and expand the nation's research and development capacity.

**Objective 7.1:** (Diversity) Model diversity in the Workforce Development Program, with an emphasis on Native Americans, which make up the state's largest minority.

**Strategy 7.1.1:** Expand participation and support of geospatial and geoscience workshops, training, and related projects at Tribal Colleges.

**Outcome indicator:** *Co-sponsor at least one Tribal College geospatial and geoscience initiative.*

**Objective 7.2:** (Recruitment) Increase participation in the SDSGC Workforce Development Program.

**Strategy 7.1.1:** Support NASA and SDSGC educational outreach programs and workshops.

**Outcome indicator:** *Co-sponsor at least five precollege programs that encourage participation in NASA and SDSGC Workforce Development initiatives.*

**Strategy 7.1.2:** Promote Workforce Development opportunities through existing programs that target Native American college and precollege students such as the NSF Bridges to Success Program, Summer Honors Program, Flandreau Indian School Success Academy, NASA Explorer Schools on Indian Reservations, and the NSF Opportunities for Enhancing Diversity in the Geosciences Program.

**Outcome indicator:** *At least 200 Native American college and precollege students each year are informed of Workforce Development Program opportunities.*

**Objective 7.3:** (Fellowships) Offer student support through fellowships and scholarships that encourage women and members of underrepresented groups to enter the NASA pipeline.

**Strategy 7.3.1:** The Consortium-wide annual Call for Fellowship/Scholarship Applications will be available to all SDSGC higher education members and affiliates and will provide applicants the opportunity to specify a “Workforce Development track.”

**Outcome indicator:** *Annual Call for Fellowship/Scholarship Applications distributed to all higher education members and affiliates; competitive review and selection of Workforce Development fellows.*

**Strategy 7.3.2:** Ensure a broad distribution of Workforce Development fellowship awards, with an emphasis on awards to qualified students at Tribal Colleges and Native American students at other universities.

**Outcome indicator:** *Awards reflect the diversity of the Consortium’s membership and statewide balance.*

**Objective 7.4:** (Mentoring and professional development) Provide mentoring and professional development experiences to Workforce Development student fellows, which will develop skills that contribute to the future workforce. (See also 2.4.)

**Strategy 7.4.1:** Require Workforce Development student fellows to present results at annual South Dakota Space Grant Consortium “Student Summit” and possibly other professional, K-12, or civic group outreach experience to relay their research outcomes and raise the level of awareness of NASA in the community. (See 2.4.1.)

**Outcome indicator:** *100% of all Workforce Development student fellows will present results each year.*

**Strategy 7.4.2:** Professional development training will be provided by faculty in the field of technical communication to SDSGC Workforce Development student fellows to better equip them to present themselves and their work to future employers. (See 2.4.2.)

**Outcome indicator:** *Opportunities will be offered to 100% of SDSGC Workforce Development student fellows to take advantage of professional development training.*

**Objective 7.5:** (NASA placement) Offer hands-on, tangible research experiences at NASA Centers to SDSGC Workforce Development student fellows.

**Strategy 7.5.1:** Provide NASA Center Personnel Officers and University Affairs Officers updated reports on SDSGC Workforce Development student fellows.

**Outcome indicator:** *At least two SDSGC Workforce Development student fellows will be placed at NASA Centers each year.*

**Objective 7.6:** (Industry placement) Increase industry participation in the SDSGC Workforce Development program and increase internships and job placement.

**Strategy 7.6.1:** Provide SDSGC industry affiliates (including EROS-SAIC) and other aerospace industry contacts with information on SDSGC Workforce Development student fellows to promote internships or job placement.

**Outcome indicator:** *At least two SDSGC Workforce Development student fellows will be placed in industry internships or jobs each year.*

**Objective 7.7:** (Longitudinal tracking) All students who have received significant fellowship or scholarship assistance through the SDSGC Workforce Development Program will be longitudinally tracked through first employment or beginning of advanced degrees. (See also 2.6.)

**Strategy 7.7.1:** Develop and implement online exit surveys and tracking system in collaboration with faculty and students of the Center of Excellence in Computer Information Systems at Dakota State University during the 2005-2006 academic year. (See also 1.9.3.)

**Outcome indicator:** *Use of a web-based system will improve SDSGC's ability to assess the impact of its Workforce Development Program and to maintain better contact with graduates of the program.*

**Objective 7.8:** (Evaluation) The Consortium will develop methods to document, measure, and assess the impact of the Workforce Development Program in conjunction with its implementation of an overall evaluation strategy (see 1.9).

**Strategy 7.8.1:** Develop and administer simple before and after surveys of students' knowledge and attitudes about the Consortium, NASA, and STEM careers.

**Outcome indicator:** *Adjustments are made to the Workforce Development Program to strengthen activities that are working and drop or correct activities that are not having the intended impact.*







# **Appendix B**

## **South Dakota Space Grant Consortium Roles and Responsibilities of Members**

July 22, 2005

The South Dakota Space Grant Consortium (SDSGC, or the Consortium) was established March 1, 1991, under funding from the National Aeronautics and Space Administration's (NASA's) National Space Grant College and Fellowship Program.

As the link between NASA and the citizens of South Dakota, the mission of the SDSGC is to instill the spirit of exploration and discovery in students and educators and in the general public, with a special focus on the fields of science, technology, engineering, and mathematics (STEM) that are essential for the development of the nation's workforce.

This document outlines the organizational structure and governance of the Consortium and defines membership categories and the roles and responsibilities of members. Policies for adding and removing member organizations or official designees are addressed in Appendix I and II.

### **I. Membership**

Membership in the Consortium is open to all institutions of higher education in the state and to other organizations with an interest in NASA-related research and education topics. At present, there are 35 institutional and affiliate members, including representatives from K-12 and informal education, industry, business, and state and federal government.

### **II. Director**

The SDSGC Director serves at the lead institution and will exercise the following responsibilities:

1. Implement the goals and objectives of the Consortium;
2. Develop and administer the annual budget according to the Cooperative Agreement with NASA;
3. Administer the statewide programs of the SDSGC, including SD NASA Experimental Program to Stimulate Competitive Research (EPSCoR);
4. Hire, direct, and supervise Consortium staff at the SDSGC Headquarters Office;
5. Call meetings/teleconferences of the SDSGC Management Team in addition to Consortium-wide quarterly meetings;
6. Serve as the Consortium's chief spokesperson and public relations officer;
7. Appoint committees as needed to assist Consortium programs;
8. Fulfill reporting requirements to NASA on behalf of the Consortium;
9. Develop new SDSGC proposals and renewal of agreements;
10. Represent SDSGC at national and regional meetings of the National Council of Space Grant Directors.

### **III. Lead Institution and Consortium Office**

The lead institution hosts the SDSGC Director and the SDSGC Headquarters Office. The lead institution provides adequate physical space and communications infrastructure to conduct consortium business; this includes a SDSGC Office and space for the Director, Deputy Director, and Manager of Special Projects. The SDSGC Office responds to requests from Consortium members, affiliates, NASA, and the public, and oversees the maintenance of a Space Grant website. The lead institution and Consortium Office are responsible for management of the Cooperative Agreement with NASA, including submission of the annual budget requests and work plan, submission of annual financial and technical reports, and submission of Consortium Management Information System (CMIS) database information.

### **IV. Institutional Members**

Institutional members include the lead institution (South Dakota School of Mines and Technology), South Dakota State University, Augustana College, and the U.S. Geological Survey's National Center for Earth Resource Observation and Science (EROS). Institutional members, other than the lead institution, have a designated SDSGC Associate Director. All institutional members have permanent representation on the Management Team. With the exception of EROS, institutional members are eligible to receive annual operating funds from the Consortium budget to support the Associate Director's position and related costs.

Primary responsibilities of the Associate Directors include:

1. Serve on the Consortium Management Team;
2. Develop and administer the annual budget for the institutional member, including the provision of 1:1 non-federal cost-sharing funds;
3. Assist with implementation of Consortium programs in their institutions and local communities;
4. Act as the primary point of contact for the dissemination of NASA and SDSGC information about funding opportunities for faculty and students at their institutions and to educators and the general public in their area;
5. Advertise Consortium fellowship/scholarship and research opportunities and encourage students and faculty members on their campuses to apply for these grants and scholarships;
6. Help recruit members from underrepresented groups to apply for support under Consortium programs;
7. Submit annual work plan, financial and technical reports, and CMIS database information to the Consortium office;
8. If possible, attend national and regional Space Grant meetings.



## V. Management Team

The SDSGC Management Team supervises the planning and conduct of the SDSGC.

### Membership:

The Management Team consists of the Director and Deputy Director from the lead institution, the Associate Directors from each of the institutional members, and two rotating members appointed from the Consortium's affiliate organizations. Currently, the Management Team also includes the Manager of Special Projects for Workforce Development.

### Rotating Members:

Representatives of any affiliate member organization may apply to fill one of the two rotating positions on the Management Team. Rotating members serve for two years and the appointments are staggered so that one position becomes open each year. New rotating members are selected from the applicants by majority vote of the existing Management Team. Rotating members may not be re-elected for consecutive terms unless there are no other applicants in that year.

### Meetings:

The Management Team will meet a minimum of four times per year during consortium-wide quarterly meetings and will conduct monthly Management Team teleconferences.

### Quorum:

A quorum exists when 50% of the Management Team is in attendance at a meeting or teleconference.

### Voting:

Each Management Team member has one vote. All matters requiring the Management Team's approval will be agreed upon by a simple majority vote of those present and voting, unless otherwise noted (2/3 vote). Each team member can designate a surrogate member if he or she is unable to attend a meeting where a vote will be taken.

### Responsibilities:

1. Develop short and long-term planning and goals and conduct an annual review and update of SDSGC's Strategic Plan;
2. Adopt the annual budget;

3. Approve program expenditures for fellowship/scholarship and Program Initiation Grant awards;
4. Approve guidelines for all fellowship/scholarship and grant applications, review submitted applications, and recommend awards;
5. Review other requests to the Consortium for financial or technical support;
6. Serve, as required, on the Technical Advisory Committee and/or Steering Committee of the South Dakota NASA EPSCoR Program and, thereby, ensure coordination between the Space Grant and NASA EPSCoR programs in the state;
7. Vote on applications for the rotating two-year positions on the Management Team;
8. Vote on changes in the Consortium, including addition or removal of member/affiliate organizations, changing the Director (2/3 vote), or changing the lead institution (2/3 vote).

## **VI. Affiliate Members**

Affiliate members make up the statewide network that enables the Consortium to implement relevant NASA's research and education programs and to assist in addressing the needs of the state in the areas of science and technology education, workforce development, and economic growth. Affiliate members include institutions of higher education, Tribal Colleges, vocational and technical colleges, industry, K-12 education groups, informal education and science organizations, state and federal government agencies, and other organizations with interests in science, technology, and education that align with NASA's mission. Each affiliate member maintains contact with the Consortium Management Team through a designated Space Grant representative. Affiliate member representatives are also eligible to apply for a rotating two-year position on the Management Team. Affiliate members receive no regular Consortium funds, but they are eligible to apply for a variety of special programs, many of which provide funding to the organization or to individuals.

### Benefits of membership:

1. Affiliate members provide input into the design and implementation of the programs of the SDSGC, its Strategic Plan, and relations between the Consortium, NASA Headquarters, and the national Space Grant network;
2. Affiliate member representatives are encouraged to participate in SDSGC quarterly meetings;
3. Affiliate member representatives are eligible to apply for one of two rotating, two-year positions on the Management Team;
4. Affiliate members may be selected to serve on the Technical Advisory Committee of the South Dakota NASA EPSCoR Program and, thereby, provide guidance on the state's research initiatives and ensure coordination between the Space Grant and NASA EPSCoR programs in the state;
5. Affiliate members are encouraged to participate in and support SDSGC's annual South Dakota Space Days and other events or activities, as relevant;

6. Representatives receive electronic updates from SDSGC on Consortium programs and science, technology, engineering, and mathematics (STEM) education and research opportunities from NASA and other organizations;
7. Affiliate member organizations are listed on the SDSGC website ([www.sdsmt.edu/space](http://www.sdsmt.edu/space)) along with links to each member's website and the name and contact information for the Space Grant representative at the organization;
8. Higher education affiliates are eligible for participation in Consortium programs including:
  - a. SDSGC's fellowship and scholarship programs;
  - b. Support for student and faculty internships and other summer programs at NASA Centers, EROS, industry affiliates, and related science and technology programs;
  - c. Faculty and student participation in the South Dakota NASA EPSCoR Program;
  - d. Collaboration with institutional members in areas of student programs, curriculum development, interdisciplinary research and education, mentoring of precollege groups, and faculty mentoring;
  - e. Faculty are eligible to submit proposals for SDSGC Program Initiation Grants or for support of research and travel relevant to the SDSGC mission;
9. Industrial affiliates receive benefits including:
  - a. Access to a diverse group of science and technology undergraduate and graduate students to conduct research and design projects and to fill internships and employment opportunities;
  - b. Participation in and support of SDSGC's annual South Dakota Space Days and other activities;
  - c. Electronic updates on state or federal initiatives promoting university-industry partnerships and technology-based economic development.

Responsibilities:

1. Each affiliate member maintains contact with the Consortium through a designated Space Grant representative. Expectations of the Space Grant representative include:
  - a. Assist with implementation of Consortium programs in their organizations and local communities;
  - b. Act as the primary point of contact for the dissemination of information about NASA and SDSGC programs in their organizations;
  - c. Promote interest in STEM disciplines and enhance public understanding of NASA mission, programs, and research and education opportunities through the dissemination of materials and information;
  - d. Help recruit members from underrepresented groups to participate in Consortium programs and to pursue careers in science and technology fields;
  - e. Seek to leverage Consortium funds by identifying potential cash or in-kind matching funds in their organizations or communities;
2. Affiliate members are encouraged, but not required, to provide cash or in-kind support of Consortium activities;
3. All affiliates members must respond to a short annual survey in which they provide data for program evaluation and improvement, report activities for the project year, indicate

changes in the SDSGC contact, indicate changes in organizational status or interest with respect to Consortium participation, and report and document estimates of cost-sharing.

## **VII. Amendment**

These Roles and Responsibilities of Members may be amended by a 2/3 vote of the SDSGC Management Team at any meeting at which a quorum is present. To insure proper consideration, all proposed amendments must be submitted to the Consortium Director at least two weeks prior to a quarterly meeting or monthly teleconference.

## Appendix I

### Policies for Adding and Removing Members

#### Change of Director and Lead Institution

If the SDSGC Director retires, moves, or resigns, or it becomes necessary to change the lead institution, the SDSGC Management Team will follow NASA's guidelines for such changes included here as Appendix II. A 2/3 vote of the Management Team is required on matters related to changes in the Director and lead institution.

#### Change of Associate Director

If an Associate Director retires, moves, or resigns, the institution must submit a letter to the Consortium Director designating a new Associate Director. The letter must be signed by the chief executive officer, college president, or equivalent officeholder and must include the following information:

- a) Name, title, and mailing address (including e-mail) of proposed Space Grant Associate Director
- b) Curriculum vitae of proposed Associate Director
- c) Statement describing designee's interests in NASA-related research and education and the potential contribution of the designee to Consortium management
- d) Statement of compliance with the roles and responsibilities of institutional members as outlined in sections IV and V of this document, including commitment of appropriate release time for the Associate Director to participate in Consortium meetings, travel, and other activities; agreement to provide non-federal matching funds to meet the NASA requirement of 1:1 cost-sharing; and agreement to meet annual technical and financial reporting requirements

#### Addition and Removal of Institutional Members

##### Addition:

Organizations may be considered for institutional membership by addressing a letter to the Consortium Director. The letter must be signed by the chief executive officer, college president, or equivalent officeholder and must include the following information:

- a) Name of organization
- b) Type of organization
- c) Name, title, and mailing address (including e-mail) of chief executive officer or president of the organization
- d) Name, title, and mailing address (including e-mail) of proposed Space Grant representative (Associate Director)
- e) Statement of organizational mission and description of the organization's involvement in NASA-related research and education topics

- f) Statement describing the potential contribution of the organization to the Consortium
- g) Statement of compliance with the roles and responsibilities of institutional members as outlined in sections IV and V of this document, including designation of an Associate Director and commitment of appropriate release time for Consortium activities, agreement to provide non-federal matching funds to meet the NASA requirement of 1:1 cost-sharing, and agreement to meet annual technical and financial reporting requirements

The Management Team may consider applications for institutional membership at any meeting at which a quorum is present. Applications that receive a 2/3 vote will be admitted to the Consortium as institutional members.

#### Removal:

An institutional member can be removed from the Consortium by a 2/3 vote of the SDSGC Management Team. The Management Team may recommend removal of an institutional member under the following circumstances: 1) the organization requests to withdraw; 2) the organization reneges on its contractual agreement with the Consortium or fails to fulfill its annual technical and financial reporting requirements; 3) the Management Team determines that for two consecutive years the annual activity of the member no longer justifies status as an institutional member; or 4) the organization is found in violation of these Roles and Responsibilities or is engaging in conduct detrimental to the best interests of the Consortium. Such removal may occur only after the member has been given adequate written notice of the pending action and an opportunity to respond to the Management Team in a written or oral defense.

#### **Addition and Removal of Affiliate Members**

##### Addition:

Organizations may be considered for affiliate membership by addressing a letter to the Consortium Director. The letter must be signed by the chief executive officer, college president, or equivalent officeholder and must include the following information:

- a) Name of organization
- b) Type of organization
- c) Name, title, and mailing address (including e-mail) of chief executive officer of the organization
- d) Name, title, and mailing address (including e-mail) of proposed Space Grant representative
- e) Statement of organizational mission and description of the organization's involvement in NASA-related research and education topics
- f) Statement describing the potential contribution of the organization to the Consortium

- g) Statement of compliance with the roles and responsibilities of affiliate members as outlined in section VI of this document, including the annual member survey and reporting requirements

The Management Team may consider applications for affiliate membership at any meeting at which a quorum is present. Applications that receive a majority vote will be admitted to the Consortium as affiliate members.

Removal:

An affiliate member can be removed from the Consortium by a 2/3 vote of the SDSGC Management Team. The Management Team may recommend removal of an affiliate member under the following circumstances: 1) the organization requests to withdraw; 2) the organization fails to respond to the annual affiliate survey for two consecutive years; 3) the Management Team determines that for two consecutive years the annual activity of the affiliate no longer justifies membership; or 4) the organization is found in violation of these Roles and Responsibilities or is engaging in conduct prejudicial to the best interests of the Consortium. Such removal may occur only after the member has been given adequate written notice of the pending action and an opportunity to respond to the Management Team in a written or oral defense.

## Appendix II

### **Guidelines for Space Grant Director/Lead Institution Changes**

(as provided by NASA Headquarters in April 2004)

Inevitably, Space Grant directors retire, move, or resign. In addition, lead institutions may need to be changed. The purpose of this communication is to establish guidelines for orderly program change that is in the best interests of the program and its participants. Among the most critical factors of consortium success are the choice of program director and the degree of support the consortium has from the lead institution.

#### **Appointment of an Interim Director**

If a consortium director leaves his/her position, or proposes to do so, the National Space Grant program manager should be notified as soon as possible. The chief academic officer of the lead institution will recommend to NASA, for approval, the appointment of an interim director. The interim director should be appointed for a period not to exceed 6 months. The permanent appointment of a director is subject to the conditions described below.

#### **Consortium-wide Meeting**

Within six months after giving notice of the proposed change, the interim director or lead governing body of the consortium must convene a consortium-wide meeting to discuss proposed changes. This meeting shall include the governing bodies of the consortium (including but not limited to affiliate representatives, campus representatives, advisory councils, board of directors, operating committees, etc.). Representatives from non-affiliate institutions that have expressed interest in joining the consortium may also be invited. The National Space Grant staff at NASA Headquarters should also be invited.

The purpose of this meeting is to discuss consortium changes, including changes of the director and lead institution, reach a consensus on those proposed changes, and agree upon the contents of the formal request to NASA Headquarters.

#### **Request for Consortium Changes**

The formal request to the National Space Grant staff for changes in the consortium must include the following elements:

- Vita of recommended consortium director.
- If the consortium-wide meeting results in recommendations for changes to the current program plan (including, but not limited to, budget distribution or allocation, FTE of consortium director, program assistants and/or CMIS point of contact), a new program plan must be submitted.
- Statement from the lead institution, even if the lead site is not changing, describing matching funds, institutional resources, and general support for program leadership, including office space for management and other consortium activities.
- Minutes from the consortium consensus meeting, including minority reports, if any.



Final approval of the changes resides with the National Space Grant staff. Even if multi-year awards have been promised, approval will be delayed if the above conditions are not met.

**Elements to Consider**

The following items should be considered by lead and affiliate personnel in contemplating change of leadership:

- It is imperative that members of underrepresented groups –women, minorities, and persons with disabilities—be sought and considered for the position of consortium director, advisory council membership, and other leadership positions.
- If the proposed director holds an academic appointment, it is preferable that he/she be tenured. This breadth of experience and knowledge greatly benefits a consortium.
- Adequate space should be available to conduct consortium business, including director’s office space and space for student activities.
- If the home institution is academic, office space should be centrally located on the campus.

**Appendix C**  
**G. EVIDENCE OF CONSORTIUM CONCURRENCE**

*Note: This **PDF version** of Appendix C does not include electronic signatures or signed letters of support for security purposes. The signatures and letters of support are included in the original and two hard copies of Appendix C submitted to NASA Headquarters on September 15, 2005.*

**Consortium Concurrence Statement:**

As a member or affiliate of the South Dakota Space Grant Consortium, I am in agreement with the contents of the Program Improvement and Results (PIR) Report and the attached *Strategic Plan* and *Roles and Responsibilities of Members* that have been developed to improve Consortium operations.

---

Edward F. Duke - Director, SDSGC  
SD School of Mines & Technology

---

Kevin J. Dalsted - Assoc. Director, SDSGC  
SD State University

---

Daniel L. Swets - Assoc. Director, SDSGC  
Augustana College

---

Gregg R. Johnson, Science Director  
EROS

---

James Rattling Leaf – Land & Nat. Res. Dev.  
Sinte Gleska University

---

Kristie Maher – Executive Director  
SD Discovery Center & Aquarium

---

Ron Dyvig – Director  
Badlands Observatory

---

Margie Rosario  
Imagination Station

---

Edward G. Gibson  
Science Applications International Corp. - TSSC CM

---

Diane Philen  
Lower Brule Community College

---

Andy Johnson, Assoc. Dir. CAMSE  
Black Hills State University

---

Mike Fredenberg, Math & Science Dept. Chair  
Oglala Lakota College

---

Becky Morton  
Horizons, Inc.

---

Peter Hendricksen, President  
Black Hills Astronomical Society

---

Bill Figg, Asst. Prof.  
Dakota State University

---

Sherri S. Steffen, Director  
Teaching SMART

---

Laura Jensi, VP for Research  
University of South Dakota

---

William C. Tallman, Meteorologist in Charge  
National Weather Service Forecast Office

---

Steven A. Hoffman, Exec. Dir. and CEO  
Washington Pavilion of Arts & Science  
Kirby Science & Discovery Center

---

Don K. Lefevre, CEO  
Cynetics Corp.

---

Vaughn E. Turner  
Honeywell Technology Solutions, Inc.

---

(See attached Concurrence Letter)  
Raymond D. Summers, Executive Director  
The Journey Museum

---

(See attached Concurrence Letter)  
Bruce E. Lindholm, Program Manager  
SD Office of Air, Rail and Transit

---

(See attached Concurrence Letter)  
Tom Zeller, President  
RESPEC

---

(See attached Concurrence Letter)  
LuAnn Strait, Dean of Institutional Relations  
Lake Area Technical Institute

---

(Pending)  
Raven Industries/Aerostar International