



# THE COLORADO SPACE GRANT PROGRAM STRATEGIC PLAN: 2001 – 2006



## 1.0 Introduction

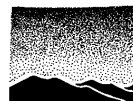
The Colorado Space Grant Program (Space Grant) completed its first ten years of operation with an extensive review by NASA and a self-evaluation. This Strategic Plan provides a road map for the third five-year period based on these evaluations, on experiences gained over the last ten years, and on the updated strategic vision of the National Space Grant Program.

## 1.1 History

Congress initiated the National Space Grant College and Fellowship Program with the passage on October 30, 1987, of the National Space Grant College and Fellowship Act. The Act — Public Law 100-147 — included such objectives as assuring the vitality of the Nation and the quality of life through the understanding, assessment, development and utilization of space resources. The law held that research and development of space science, space technology and space commercialization would contribute to the quality of life, national security and the enhancement of commerce. In recognizing these objectives, Congress urged a “broad commitment and intense involvement on the part of the Federal government in partnership with state and local governments, private industry, universities, organizations, and individuals concerned with the exploration and utilization of space.”

The original goals of the national program included: (1) the establishment of a national network of universities with interests and capabilities in aeronautics, space and related fields; (2) the formation of cooperative programs among universities, aerospace industry, and federal, state and local governments; (3) the broadening of interdisciplinary training, research and public service programs related to aerospace; (4) the recruiting and training of professionals, especially women and underrepresented minorities, for careers in aerospace science, technology and allied fields; and, (5) the development of a strong science, mathematics and technology base from elementary school through university levels.

The national program, began with less than \$1 million in NASA funds in 1989, grew to \$15 million in 1991 and was increased to \$19.1 million in 1998. In addition, the 52 state consortia have provided matching resources that more than double the Space Grant awards. The Space Grant network of affiliates within the 52 state consortia has grown to more than 700 partners from



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universities, colleges, industry, and museums. All 50 states, the District of Columbia, and the Commonwealth of Puerto Rico participate in the network.

## **1.2 Evaluation of the National Program Over the Second Five Years**

Following the second five-year grant period, NASA completed an extensive, in-depth evaluation of the 52 state consortia and the national program. Evaluation parameters consisted of state consortia statistics submitted annually, a measure of consortium responsiveness, and a detailed self-evaluation carried out by each consortium. The health of the national program and the health of the state consortia were judged to be good to excellent. In this evaluation the Colorado Space Grant Consortium was rated as excellent with improvements noted in all areas— placing it as one of the top programs in the nation.

## **1.3 Vision and Mission of the National Program**

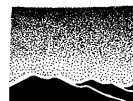
The Vision and Mission of the National Program has recently been updated as follows:

### **1.3.1 Vision**

The National Space Grant College and Fellowship program is a national network of colleges and universities working to expand opportunities for Americans to understand and participate in NASA's aeronautics and space programs by supporting and enhancing science and engineering education, research, and outreach programs.

### **1.3.2 Mission**

- Using our national network of scientists, engineers, and educators, enable the development of a diverse workforce of future scientists, engineers, technology professionals, and educators.
- Stimulate and nurture innovative programs to assure the development and transfer of practical applications in aerospace research and education.
- Cultivate a nationwide network of partners from universities, industry, museums, science centers, state and local agencies, to pursue state and national aerospace research, education, and economic development goals.
- Educate students at all levels by encouraging and supporting interdisciplinary and multi-disciplinary research experiences and education programs.



- Provide access to the excitement, knowledge, and technology from America's earth, air and space programs.
- Serve the general public by contributing to scientific literacy.

#### 1.4 The Colorado Space Grant Program

NASA selected the Colorado Space Grant Consortium (CSGC) in 1989. The CSGC, led by the University of Colorado at Boulder, consists of 14 Colorado colleges and universities and one foundation.

CSGC works to enhance the educational experience of students throughout the state based on cooperative relationships among universities, colleges, industry, research organizations, NASA, and other Space Grant programs — and to cultivate this rich cooperative environment to provide incentives, educational opportunities, and educational excellence in space science and engineering.

The Consortium was rated by NASA as one of the top Space Grant programs during the 1989 through 1999 period. We intend to build on this success to develop an even stronger and more active program for the next five years. The CSGC program features hands-on opportunities for undergraduate and graduate student research in space, space-related courses and seminars, and cooperative outreach projects to inspire pre-collegiate students to pursue an education in science or engineering.

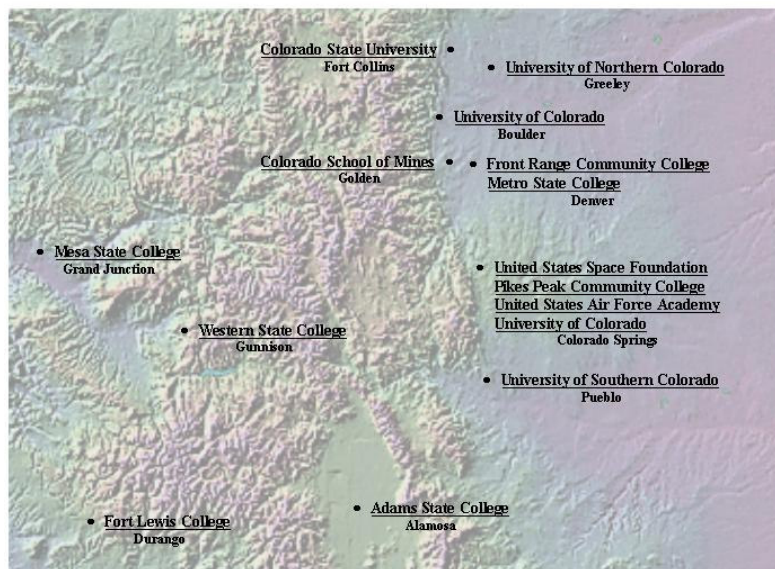
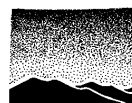


Figure 1: Students and Faculty from colleges and universities across Colorado form an effective, statewide educational network.



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Faculty, graduate and undergraduate students from the fourteen member schools and one foundation illustrated in Fig. 1 coordinate their efforts to provide an effective state-wide educational program in space sciences and engineering. The three thrusts of the program — education, research, and outreach — are vigorous. Thousands of students have reaped the benefits of CSGC's space research and educational opportunities since the program's inception. The program has attracted top students, elicited contributions from numerous engineers and scientists, and gained international recognition as an innovative and effective training ground for students.

## **1.5 The Colorado Space Grant Vision, Mission, and Program**

### **1.5.1 Vision**

The Colorado Space Grant Consortium uses the excitement and opportunities provided by the nation's aeronautics and space program to inspire, educate, and develop America's future technological workforce by enabling a diverse community of students to participate in space-based projects, courses, and outreach activities.

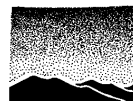
### **1.5.2 Mission**

CSGC prepares students for the workforce of tomorrow by involving them in research within the University and in collaboration with industry partners and government labs. Examples of this experience include:

- Design, build, and fly real space missions
- Analyze data from space missions and ground instruments
- Operate ground instruments, telescopes, and satellites
- Develop and demonstrate space and aerospace technologies
- Provide collaborative opportunities with industry partners

The CSGC educates students through classroom and distance learning courses, which cover a range of space and aeronautics knowledge and challenges, including:

- Multicampus Gateway Courses
- Independent study for Discovery Learning



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- Multidisciplinary and Special Topics Courses
  - Team projects, with hands-on student involvement

Recognizing the importance of a diverse and scientifically literate and prepared workforce, Space Grant students, staff, and faculty reach out to K-12 students and teachers and to the general public through:

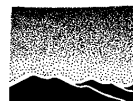
- Tours
- Workshops
- Community Presentations
- K – 12 Classroom Visits
- Mentoring
- Actively including underrepresented students

### **1.5.3 Program**

The CSGC provides students with a broadened perspective of engineering and space research, including an understanding of project and program management. Hundreds of students acquire hands-on experience each year as they develop payloads for flight, complete experiments with ground telescopes, study closed life support systems, and develop robots for potential use in space exploration. This education spans the full cycle of a mission, including the development of the mission concept, payload design, development, integration, test, flight, mission operations, data analysis, scientific analysis, and reporting of results. Students acquire a comprehensive perspective, preparing them for leadership roles in space science and engineering.

The CSGC student research projects attract students from a variety of disciplines. The goal is to involve students from a range of disciplines on each project, including natural sciences, engineering, environmental design, computer science, social science, policy, business, and journalism.

The program takes full advantage of the faculty and research facilities available in the consortium to provide mentors and opportunities for graduate and undergraduate students. With the success of the Space Grant program, this support base has been increasing. With participation from aerospace and engineering companies, other universities, NASA centers, and government laboratories, this support base is strong and broad.



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The CSGC has never viewed the research enterprise in isolation and believes that every effort must continue to be made to embed mechanisms for intertwining research, education, and outreach. We believe in the re-use of research activities to support the educational and outreach enterprises, and the ability of educational and industrial activities to offer new directions for research.

The emphasis of the Colorado Space Grant program is on interdisciplinary activities that integrate the three program thrusts — education, research, and outreach — into each project. To accomplish this, an outreach component is typically included as part of each project; students are a significant part of each project; and research (as research training, research application, or experiment development) is featured in each project.

This integrated program is enabled through networking. The consortium itself works as a network (involving fourteen colleges and universities plus one foundation) to enable a range of cooperative projects from student-developed rocket payloads, to a set of common transferable courses, to jointly sponsored teacher workshops involving K-12 Colorado teachers. This network is the basis for an extended network with NASA, industry, government labs, state and local government, and other consortia.

We look forward to working together to build on the existing program and to address the challenges and opportunities of the next five years. The Strategic Plan for this future, based on the Vision and Mission of the National Space Grant Program and the Colorado Space Grant Program, is described in this report.

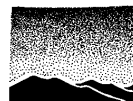
## **1.6 Organization of the Colorado Space Grant Strategic Plan**

The CSGC Strategic Plan is divided into three sections to correspond to the three Strategic Enterprises in the Strategic Plan for NASA's National Space Grant Program. These enterprises are:

- Research
- Education
- Outreach

Within each enterprise area, the Strategic Plan is described in terms of:

- The Mission of the National program



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- The Mission of the Colorado program
  - Goals for the Colorado Program
  - Proposed Action Plan for achieving these goals
  - A Task Schedule with a broad description of how to reach goals.
  - Evaluation Metrics for assessing the effectiveness of these programs

CSGC is committed to the successful implementation of this Plan, provided that funding, support, resources, facilities, and participation remain at the same or increased levels.

## **2.0 The Research Enterprise of the Colorado Space Grant Program**

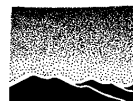
The philosophy of the CSGC is to support individual member institutions in their unique missions and strengths; provide the mechanisms by which these institutions can cluster and combine resources into natural collaborations; and support an intellectual climate where education, technology transfer, and research are inseparable.

The goal of the CSGC is to facilitate quality research collaboration at all levels and across all types of organizations, while creating opportunities for the research activities to contribute to the educational and public service enterprises.

CSGC expects to accomplish this goal by building on our continuing successes in cooperative research. These successes can be loosely grouped into four categories: individual efforts, collaboration among member institutions, industry cooperation, and research training for students. CSGC involves industries in the research enterprise whenever possible. CSGC has an established heritage of coupling research activities with education and public outreach, maximizing the return on the time and resources invested.

Our approach is to involve students in all of our research projects and to emphasize the participation of undergraduates. Our methods are to formalize the research collaboration process, to facilitate the identification and timely development of research capabilities to support specific research collaborations, and to provide opportunities for the dissemination of research results.

The CSGC proposes to support two types of student research activities: one unique to an institution (campus-unique), the other involving students and



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faculty from multiple institutions (multi-campus). Each campus has identified one or more research areas of interest. By examining the target areas for all members, the CSGC has initially identified three common interests and complementary areas of expertise. These include: prototyping and remote operation of ground telescopes; development and operation of robots; and the development and operation of one or more small satellites. These common projects serve as the basis for the proposed collaborative research activities.

This strategic plan supports the research mission of the CSGC. It supports the objectives of the research mission by encouraging excellence and cooperation. It avoids the difficulties of administration and coordination by recognizing the strengths and diversity of each institution, and encouraging them to build programs locally. This strategy acknowledges that each member has its own industrial contacts and partners; and that research relationships are generally delicate and best handled locally. It encourages each campus to take the lead in sharing and propagating the results with other campuses in areas of common interest. The CSGC believes that collaborative, interdisciplinary and multidisciplinary research will naturally result from this strategy. Furthermore, any logistical and administrative difficulties associated with defining and coordinating large, single-focus projects will be eliminated by providing opportunities for the members to interact on specialized projects which utilize and enhance local interests.

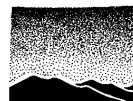
## 2.1 The National Program's Research Mission

- Stimulate and nurture **innovative programs** to assure the development and transfer of practical **applications** in aerospace research.
- Cultivate a nationwide **network** of partners from universities, industry, museums, science, centers, state and local agencies, to pursue state and national aerospace research, and economic development goals.
- **Educate** students at all levels by encouraging and supporting interdisciplinary and multi-disciplinary research experiences.

## 2.2 The Colorado Research Mission

Space Grant prepares students for the workforce of tomorrow by involving them in research within the University and in collaboration with industry partners and government labs. Examples of this experience include:

- Design, build, and fly real space missions
- Analyze data from space missions and ground instruments





- Operate ground instruments, telescopes, and satellites
- Develop and demonstrate space and aerospace technologies
- Provide collaborative opportunities with industry partners

**2.3 CSGC Goals, Action Plans, and Evaluation Metrics**

**2.3.1 Research Goal 1**

Increase the number of faculty involved in research so as to enhance opportunities for students.

**2.3.1.1 Action Plan for Goal 1**

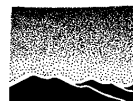
- Determine faculty involved in space research at member schools
- Disseminate information on research opportunities to faculty
- Encourage current research faculty to involve other researchers
- Provide resources to new and interested faculty

**2.3.1.2 Task and Schedule for Goal 1**

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Create first Faculty Survey	CU	May 02	
Provide annual money for seed money to new or untenured proposers	All	Annual Spring	
Distribute and receive surveys to and from faculty	All	Annual Sept	Annual Sept
Analyze survey	All/ CU	Annual Oct	Annual Nov/Dec

**2.3.1.3 Evaluation Metrics for Goal 1**

Number of faculty involved in research. Number of faculty provided resources.



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## 2.3.2 Research Goal 2

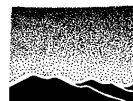
Increase research opportunities for all students.

### 2.3.2.1 Action Plan for Goal 2

- Encourage Consortium members to submit proposals.
- Encourage students to be part of the research team on projects led by other campuses.
- Encourage faculty to include hands-on student development projects in courses.
- Create hands-on research project(s) at member campuses.
- Provide projects with individual campus implementations.

### 2.3.2.2 Task and Schedule for Goal 2

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Define engineering design for faculty and programs	All	Annual June	Annual August
Submit project information to engineering design programs (i.e. Senior Design)	All	Annual August	
Write in an undergraduate component to all space-related grants	All	On-going	
Create student entrance portal to SGC web-site	CU	Dec 01	May 02
Add link to current University/Student space related portals	All	ASAP	Sept 02
Create a "How to propose to NASA and others" manual	CSM	Dec 01	Oct 02 draft
Advertise space-related grant programs	All	On-going	
Each participant writes a consortium related proposal for research	All	Oct 05	Sept 06
Submit written proposals and proposal opportunities to SGC website	All	On-going	



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### 2.3.2.3 Evaluation Metrics for Goal 2

The number of proposals submitted by consortium members. Number of students involved in cross-campus projects and in campus-unique projects. The number of students supported by Space Grant.

### 2.3.3 Research Goal 3

Increase participation of underrepresented students in space research projects.

#### 2.3.3.1 Action Plan for Goal 3

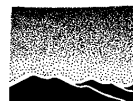
- Give presentations and demonstrations of research projects to classes and minority clubs.
- Identify research opportunities for these students.
- Identify faculty members and students to serve as advisors, mentors, and role models for underrepresented students.
- Increase number of research assistantships to these students

#### 2.3.3.2 Task and Schedule for Goal 3

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Identify student organizations with high minority representation	All	Annual	Dec 01
Promote attendance of minority students at SGC student symposium	CU/ All		Jan 02
Provide research assistantships for underrepresented students	All	Ongoing	
Give presentation to minority programs each semester	All	Annual	

### 2.3.3.3 Evaluation Metrics for Goal 3

Number of underrepresented students involved. Number of faculty and student mentors. Number of research assistantships to underrepresented students.



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## 2.3.4 Research Goal 4

Increase communication with consortium members about research projects.

### 2.3.4.1 Action Plan for Goal 4

- Facilitate regular teleconferences with member schools
- Develop and maintain research website
- Student research symposium
- Provide a database of research opportunities and research experiences.

### 2.3.4.2 Task and Schedule for Goal 4

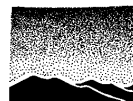
TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Conduct CSGC symposium	CU	Annual Apr	
Develop research web site	CU	Jan 02	May 02
Rotate location of Symposium (CU, CSM, CSU, UCCS)	CU, CSM, CSU, UCCS	CSM 03 CSU 04 UCCS 05 CU 06	
Conduct first teleconference meeting	All		Dec 01
Conduct quarterly teleconference meeting	All	Quarterly after Dec 01	
Investigate capability of net-meeting	USC		Dec 01

### 2.3.4.3 Evaluation Metrics for Goal 4

Number of regular teleconferences with member schools. Level of participation in the annual student research symposium. Create and maintain research website.

## 2.3.5 Research Goal 5

Identify and coordinate research projects for multiple members.



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### 2.3.5.1 Action Plan for Goal 5

- Establish the Consortium Research Council
- Build a database of faculty interests and skills and resources at member schools.
- Actively seek collaborative research opportunities.

### 2.3.5.2 Task and Schedule for Goal 5

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Discuss Consortium Research Council (CRC) at first telecom	All		Dec 01
Create CRC	All		Oct 02

### 2.3.5.3 Evaluation Metrics for Goal 5

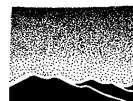
Number of multi-campus research projects. Number of students and faculty involved in research projects. Number of proposals submitted and won. Existence of Council and opportunity database.

### 2.3.6 Research Goal 6

Increase industry participation with undergraduate and graduate research projects, and broaden this industry involvement at member campuses.

#### 2.3.6.1 Action Plan for Goal 6

- Aggressively seek industry support in the form of industry lecturers, seminar speakers, advisors, donated equipment, and funding.
- Involve representatives from industry on the CSGC advisory board.
- Form Space Grant industry partnerships to develop joint proposals for new activities.
- Seek industry provided tours for college/university classes and groups.
- Develop methods to get industry representatives to the more rural campuses



### 2.3.6.2 Task and Schedule for Goal 6

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Discuss participation of industry reps in CSGC meetings	All		Dec 01
Review NASA SBIR/STTR programs for topics of interest; identify potential industry collaborators	CSM		Dec 01
Provide funds for travel/honoraria for invited speakers from Industry (or encourage members to allocate funds)	All	Ongoing	
Encourage participation at Colorado Conferences (CORE, Space Foundation)	All	Annual	
Add industry speaker and participation at CSGC symposium	All		Spring 02
Create a exhibition kit for Colorado Conferences	CU/ All		Oct 02

### 2.3.6.3 Evaluation Metric for Goal 6

Number of research projects at Consortium campuses.

### 2.3.7 Research Goal 7

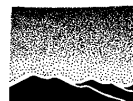
Identify opportunities for sabbatical interchanges.

#### 2.3.7.1 Action Plan for Goal 7

- Identify opportunities for industry on research site
- Identify opportunities for faculty on research site
- Find resources

### 2.3.7.2 Task and Schedule for Goal 7

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Identify opportunities for Federal Government/State University exchanges	CSM		May 02
Promote the NASA ASEE-Summer Faculty Program among CSGC Universities	All	Annual	



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### 2.3.7.3 Evaluation Metric for Goal 7

- Number of sabbatical interchanges.

## 3.0 The Education Enterprise of the Colorado Space Grant Program

CSGC has demonstrated that undergraduate student education and research opportunities go hand-in-hand. Many of CSGC's programs are based on this successful pairing of education and research. The excitement of space and the opportunities CSGC offers for students to gain hands-on experience are excellent ways to attract underrepresented students; to foster students' interest in space careers and research; and to promote public awareness. Today's students are tomorrow's scientists, engineers and educators. CSGC programs provide opportunities, which include student papers, design and development projects, design reviews, and presentations, enabling students to gain the experience and confidence that they need to prepare for careers in space science and technology.

### 3.1 The National Program's Education Mission

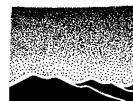
- Using our national network of scientist, engineers, and educators, enable the development of a diverse workforce of future scientist, engineer, technology professionals, and educators.
- Stimulate and nurture innovative programs to assure the development and transfer of practical applications in aerospace education.
- Cultivate a nationwide network of partners from universities, industry, museums, science centers, state and local agencies, to pursue state and national aerospace education.
- Educate students at all levels by encouraging and supporting interdisciplinary and multi-disciplinary research experiences and education programs.

### 3.2 The Colorado Education Mission

The CSGC Education Vision is to:

*Motivate and educate through exposure to and involvement with space-related topics.*

The Colorado Space Grant Consortium educates students through classroom and distance learning courses, which cover a range of space and aeronautics knowledge and challenges, including:



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- Multicampus Gateway Courses
  - Independent study for Discovery Learning
  - Multidisciplinary and Special Topics Courses
  - Team projects, with hands-on student involvement

### **3.3 CSGC Goals, Action Plans, and Evaluation Metrics**

#### **3.3.1 Education Goal 1**

Provide quality educational opportunities through individual and team experiences via:

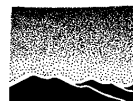
- 1.1 Classroom, laboratory and distance learning
- 1.2 Research and design projects
- 1.3 Student Conferences and Symposia
- 1.4 New courses and up-to-date curricula
- 1.5 Promotion of discovery learning

##### **3.3.1.1.1 Action Plan for Goal 1.1: Classroom, Laboratory, and Distance Learning**

Member schools should work with their administrations to offer a general education space course for non-technical majors, and one or more of the following: an introductory astronautics course, a laboratory course, a “Gateway” course for majors, and a seminar course. These courses would be available in either a traditional classroom or by distance learning techniques.

Each member will review the courses now being offered by CSGC schools and decide which ones are suitable to their campus’ needs and capabilities. Courses should be similar enough that students can transfer credit from one school to another without difficulty. “Gateway” courses for non-technical majors, as well as specialized courses, should be offered – with results shared among other institutions according to their interests.

CSGC will promote distance learning and multi-media courses. CSGC will encourage the development and presentation of courses via television and Internet, e.g., the “Gateway” general education and continuing education





courses. CSGC will utilize distance-learning technologies for interactions between directors, faculty, industry, and students.

**3.3.1.1.2 Task and Schedule for Goal 1.1: Classroom, Laboratory, and Distance Learning**

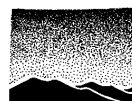
TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Space course to fulfill General Ed requirement	All	10/01/01	Ongoing
Add special technical courses	All		
Seminars			
Develop plans for how to develop distance education courses.			
Determine transferability between courses	UCCS	07/01/02	12/21/02

**3.3.1.1.3 Evaluation Metric for Goal 1.1: Classroom, Laboratory, and Distance Learning**

A catalog listing of courses offered by all CSGC schools and track enrollment. Number of such courses successfully presented. Numbers of schools and students impacted. Evaluation of the utility of these listing for meetings, courses, and student exchanges.

**3.3.1.2.1 Action Plan for Goal 1.2: Research and Design Projects**

Experience in research can be an integral part of a student’s education. With this in mind CGSC will assist member institutions to achieve research goals 2 and 7 by increasing educational research opportunities for all students and by creating hands-on experiences at member campuses.



### 3.3.1.2.2 Task and Schedule for Goal 1.2: Research and Design Projects

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Identify students for research scholarships			
Encourage undergraduate students to write papers			
Support student thesis and research projects			
Do special projects such as balloon experiments to give students hands on experience.			

### 3.3.1.2.3 Evaluation Metrics for Goal 1.2:

The number of students involved in CSGC supported projects.

### 3.3.1.3.1 Action Plan for Goal 1.3: Student Conferences and Symposia

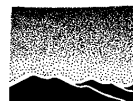
CSGC will sponsor annual undergraduate student space research symposia and will encourage students from all member schools to participate. CSGC will encourage students to attend and give presentations at regional and national conferences and other public settings. Whenever possible, CSGC will provide financial support for students to attend conferences and symposia.

### 3.3.1.3.2 Task and Schedule for Goal 1.3: Student Conferences and Symposia

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Encourage student research projects	ALL	FEB 02	APR 06
Take students to Space Grant conferences and symposia to give papers	ALL	APR 02	APR 06
Show students how to write research papers. Give examples and outlines.	ALL	FEB 02	APR 06
Take students to annual CSGC Symposium	ALL	FEB 02	APR 06

### 3.3.1.3.3 Evaluation Metrics for Goal 1.3: Student Conferences and Symposia

Number of student presentations. Number of students attending conferences and symposia.



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### 3.3.1.4.1 Action Plan for Goal 1.4: New Courses and Up-to-Date curricula

CSGC will encourage and sponsor the development of new aeronautics and space courses and the continuing maintenance of existing, successful courses.

### 3.3.1.4.2 Task and Schedule for Goal 1.4: New Courses and Up-to-Date curricula

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Maintain, update successful courses	ALL	04/06/02	04/06/02
Develop new courses as needed	ALL	04/06/02	04/06/06

### 3.3.1.4.3 Evaluation Metrics for Goal 1.4: New Courses and Up-to-Date curricula

Number of new and updated courses.

### 3.3.1.5.1 Action Plan for Goal 1.5: Promotion of Discovery Learning

CSGC will provide for discovery learning with independent study opportunities, design courses and laboratories, and student research projects.

### 3.3.1.5.2 Task and Schedule for Goal 1.5: Promotion of Discovery Learning

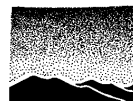
TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Hands on experiences for students	ALL	Jan 02	DEC 06
New lab experiences/design courses	ALL	Jan 03	Dec 06
Independent Study Opportunities	ALL	Jun 03	Jun 06

### 3.3.1.5.3 Evaluation Metrics for Goal 1.5: Promotion of Discovery Learning

Number of discovery learning opportunities provided, including number of students involved, number of design courses offered, etc.

## 3.3.2 Education Goal 2

Increase student assistance through:



- Increased fellowships and scholarships
- Increased project support
- Enhanced infrastructure support
- Increased faculty involvement

**3.3.2.1 Action Plan for Goal 2**

The CSGC will continue its existing financial aid programs by identifying increased numbers of eligible students and providing them fellowships, hourly pay, credit, tuition assistance and/or academic credit.

The CSGC will work to identify and support educational projects and to provide increased resources, faculty support, and infrastructure to enable these projects to succeed.

**3.3.2.2 Task and Schedule for Goal 2**

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Provide increased numbers of students with support	ALL	Jan 02	Dec 06
Provide additional resources for student programs	ALL	Jan 02	Dec 06

**3.3.2.3 Evaluation Metrics for Goal 2**

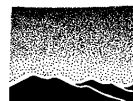
Number of students supported through the CSGC and a listing of involved faculty, number of projects, and new infrastructure.

**3.3.3 Education Goal 3**

Promote involvement of diverse groups by recruitment, awareness of opportunities, and providing a positive environment.

**3.3.3.1 Action Plan for Goal 3**

The CSGC will encourage participation in fellowship and scholarship programs by all groups. This encouragement includes: recruitment presentations and demonstrations to freshman groups and to minority organizations; having Space Grant faculty and staff serve as advisors and mentors for students from underrepresented groups; and cooperating with



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campus minority groups to improve our recruiting approach and to provide a more positive environment for minority students.

Each consortium member will work to provide a more positive environment for underrepresented groups at their campuses. Successful approaches will be shared at consortium meetings.

### 3.3.3.2 Task and Schedule for Goal 3

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Recruitment presentations to new students and minority groups	ALL	Jan 02	DEC 06
Serve as advisors to underrepresented students	ALL	JUL 02	DEC 06
Cooperated with campus minority groups	ALL	JAN 03	DEC 06

### 3.3.3.3 Evaluation Metrics for Goal 3

Number of underrepresented students involved in CSGC programs.

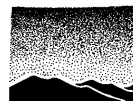
### 3.3.4 Education Goal 4

Encourage and support collaborative educational efforts between disciplines, and among campuses.

#### 3.3.4.1 Action Plan for Goal 4

Space science, by its very nature, involves many disciplines and attracts a variety of students. Interdisciplinary courses help make space science available to a variety of students, including those with non-technical majors. Such courses increase awareness of space applications in a variety of fields that will readily transfer into their lives. Most students are non-technical majors – yet these students become parents and teachers who are in a position to relay the excitement of space to their children and classrooms. CSGC will encourage the development of an interdisciplinary course for non-technical students at member campuses.

CSGC will also continue to develop and augment a suite of interdisciplinary courses offered across the consortium and encourage the transfer of credit for courses taught at one campus to be received at another.



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### 3.3.4.2 Task and Schedule for Goal 4

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Identify projects and advertise			
Encourage student to bring in other students. This has worked at UCCS.			
Offer non-tech course at each campus	ALL	JAN 03	
Offer interdisciplinary technical courses	ALL	JAN 02	

### 3.3.4.3 Evaluation Metrics for Goal 4

Number of interdisciplinary and multi-campus education efforts. Number of transferable courses offered. Number of collaborative educational efforts among member institutions.

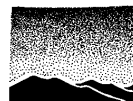
### 3.3.5 Education Goal 5

Encourage the establishment of space-related general education courses at member schools that would fulfill science requirements for pre-service teachers.

Encourage the inclusion of space-related topics into existing general education courses.

#### 3.3.5.1 Action Plan for Goal 5

- Encourage the development of new introductory space-related courses.
- Encourage the incorporation of space-related topics into existing courses.
- Help student teachers develop courses that they can later use in their own teaching.
- Assist student teachers in the incorporation of space topics into their current lesson plans.
- Provide pre-service teachers awareness of and access to course development materials including on-line resources.



- Facilitate hands-on activities for pre-service teachers and the students that they will teach.

### 3.3.5.2 Task and Schedule for Goal 5

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Space Foundation does this			
Space Grant students train K-12 teachers.			
Work with outreach team to accomplish tasks from 4.3.1.1.2	ALL	JAN 02	JUN 02

### 3.3.5.3 Evaluation Metrics

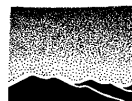
*(Note: not all member schools have education programs for pre-service teachers)*

- Number of students enrolled.
- Number of courses developed.
- Number of new space-related modules incorporated into existing courses.

## 4.0 The Outreach Enterprise of the Colorado Space Grant Program

If we are to increase the national pool of scientists and engineers we must nurture the interest of young women and minorities, and we must educate the public. To meet these goals, our outreach program has been enhanced to make students at K-12 schools throughout Colorado aware that space science and engineering is within their reach; to collaborate with organizations which attract women and minorities; to promote public understanding of the opportunities in space science, engineering and technology; and to make every teacher in Colorado aware of Space Grant.

The Colorado Space Grant Consortium provides a rich and diverse atmosphere for cooperative efforts among individuals at a variety of statewide institutions, each with different contacts and perspectives. CSGC has a presence in rural as well as urban settings, adding to the consortium's diversity. We plan to extend this network of cooperative institutions with the addition of new affiliates, new industries, K-12 schools, and new federal, state, and local government affiliations. The Colorado Office of Space Advocacy, an affiliate of CSGC, provides an opportunity to cooperate with the large and active



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Colorado aerospace industry. CSGC will continue to develop interactions with these and other groups. This strong state-wide network extends to the National, Regional, and other state consortia, NASA Centers, NASA programs, and the Space Foundation.

#### **4.1 The National Program's Outreach Mission**

The Colorado Space Grant program is driven and inspired by the National Program's goals which are outlined here:

- Provide access to the excitement, knowledge, and technology from America's earth, air and space programs.
- Serve the general public by contributing to scientific literacy.

#### **4.2 The Colorado Outreach Mission**

Recognizing the importance of a diverse and scientifically literate and prepared workforce, Space Grant students, staff, and faculty reach out to K-12 students and teachers and to the general public through:

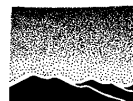
- Tours
- Workshops
- Community Presentations
- K – 12 Classroom Visits
- Mentoring
- Actively including underrepresented students

#### **4.3 CSGC Goals, Action Plans, and Evaluation Metrics**

##### **4.3.1 Outreach Goal 1.1**

Enhance K-12 teacher education through teacher training and development programs.

The CSGC's education programs are designed to leverage on existing teacher education programs; to reach larger teacher audiences; to follow national standards and systemic initiatives; and to build on the demonstrated interests in space science and technology. These programs build on current events, using publicity generated by NASA, other government labs, and industry, and take advantage of technology, such as the Internet, to train teachers and distribute information.





#### 4.3.1.1.1 Action Plan for Goal 1.1: Teacher Training

Incorporate space into K-12 teacher education programs offered by CSGC colleges and universities. Identify and create a database for all the existing K-12 teacher training programs within the CSGC schools and determine how space could be integrated into these programs.

#### 4.3.1.1.2 Task and Schedule for Goal 1.1: Teacher Training

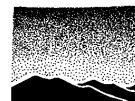
TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Subcommittee looks at K-12 standards, to find out how study of space is incorporated therein. This information is then disseminated to all consortium members to be used as leverage (if needed) in conversations with teacher education programs about incorporating space study into pre-service teacher education curriculum.	FLC, Adams, Mesa	Jan 2002	Feb 2002
Each institution's director contacts the teacher education director or coordinator at their school to find out <ul style="list-style-type: none"> <li>◆ If study of space is incorporated into pre-service teacher education curriculum</li> <li>◆ If so, what form this takes</li> <li>◆ If not, whether there is openness to including it (especially in light of K-12 standards)</li> </ul>	Each institution (phone call or e-mail)	Feb 2002	March 2002
One person coordinates this effort, and compiles this information into a database. Results become an agenda item for discussion at the summer 2002 meeting of the Consortium.	FLC	Jan 2002	June 2002
Subcommittee looks at K-12 standards, to find out how study of space is incorporated therein. This information is then disseminated to all consortium members to be used as leverage (if needed) in conversations with teacher education programs about incorporating space study into pre-service teacher education curriculum.	FLC, Adams, Mesa	Jan 2002	Feb 2002

#### 4.3.1.1.3 Evaluation Metric for Goal 1.1: Teacher Training

Number of teacher education programs with a space component.

#### 4.3.1.2.1 Action Plan for Goal 1.2: Training Opportunities

Enhance K-12 teachers' knowledge and understanding of science and technology, particularly space science and technology. Inform school districts about the availability of programs to help teachers learn about space, including the Colorado Space Education Initiative, Citizen Explorer Workshops, GLOBE, the Colorado Alliance for Science, and the Space Foundation's



“Getting Comfortable Teaching With Space.” Continue to look for new programs for K-12 students.

**4.3.1.2.2 Task and Schedule for Goal 1.2: Training Opportunities**

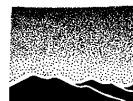
TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Approach K-12 School district math/science coordinators or other appropriate individuals via letter or e-mail, to inform them about programs for teachers and students. Ask them to identify interested people within the district for further contact.	ALL	Jan 2002	May 2002
Follow up with people identified above, providing information and materials about programs.	ALL	May 2002	Jan 2003
Send a representative to present at the Fall Colorado Science Teacher's convention. (Identified by lead)	CU Lead	Plan April 2002	Attend Fall 2002
Send a representative to present at the June Technology in Education Conference in Aspen. (Identified by lead)	CU Lead	Plan Jan 2002	Attend June 2002
Prepare a circular about all programs, to be sent to all teachers in the state, with contact information that will lead such teachers to consortium directors	ASU	April 2002	Aug 2002
Send someone from the Western Space Grant Consortium to present at the NATIONAL meeting of K-12 Science teachers in Salt Lake City.	CU	immediate	ongoing
Each institution's director watches for new space-related K-12 programs and reports them to the consortium	ALL	ongoing	

**4.3.1.2.3 Evaluation Metric for Goal 1.2: Training Opportunities**

Number of school districts contacted and number of K-12 teachers contacted.

**4.3.1.3.1 Action Plan for Goal 1.3: Teacher Workshops and Activities**

Conduct K-12 educational activities in accordance with the developing National Standards and the NSF State Systemic Initiatives program. Determine measures of effectiveness. Target large populations, including individuals with non-technical and non-traditional backgrounds, and underrepresented groups. Support activities offering transfer credit to four-year colleges and universities. Expand programs for K-12 teachers to include private school teachers and pre-service teachers in our universities. Provide mentoring of challenged K-12 students by Space Grant students.



### 4.3.1.3.2 Task and Schedule for Goal 1.3: Teacher Workshops and Activities

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Set up a database (from information in annual reports) of what we are already doing and whether K-12 standards are being addressed in our activities.	CU	Oct 2002	Feb 2003
Set up a subcommittee to determine measures of effectiveness with which to assess our activities.	ALL	Feb 2003	April 2003
Develop a mentoring program through which students who are receiving Space Grant Fellowships are expected to serve as mentors to under-served K-12 students. This can initially take the form of classroom visits (role model activity). Later we can assess whether it is possible to expand this to more active "mentoring" roles.	CU Lead	Jan 2002	ongoing

### 4.3.1.3.3 Evaluation Metrics for Goal 1.3: Teacher Workshops and Activities

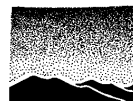
Number of K-12 activities offered, number and demographics of individuals impacted.

## 4.3.2 Outreach Goal 2

Provide information and experiences to the general public on space science, engineering and policy. Present targeted information to civic and community groups. Increase space-related activities at museums, libraries, planetaria, the Colorado State Fair, and other public facilities. Promote an awareness of career opportunities in space science and technology.

### 4.3.2.1 Action Plan for Goal 2

The programs of the Colorado Space Grant Consortium reach people who are voters, students, taxpayers, teachers, professionals, those trying to get re-trained, and children. The public service events sponsored by the CSGC are designed to expand public awareness through a number of venues including presentations, WWW home pages, displays at museums and libraries, and traveling exhibits. CSGC is reaching the public to instill an awareness of space – its spin-offs, benefits, and educational opportunities. CSGC will accomplish this by building upon existing programs and taking advantage of opportunities for high-visibility, high-impact events, such as the State Fair and the Summit of Eight. CSGC will also work with museums and other public facilities to develop exhibits on Mission to Planet Earth.



Increase awareness of Space Grant programs in Colorado by expanding and revising our Internet resources and by reaching out to students outside of our local communities.

**4.3.2.2 Task and Schedule for Goal 2**

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Create a database of what we are already doing toward this end, using data from our annual reports.	CU	Jan 2002	Ongoing
Identify opportunities for "high visibility" events and bring these to our annual meetings. Attempt to establish a Space Grant presence at these events.	ALL	Ongoing	Ongoing
Expand our webpages as a means of continuing to disseminate information about our programs	ALL	ongoing	Ongoing
Design and build exhibits for museums and events, perhaps in partnership with industry.	ALL	ongoing	ongoing

**4.3.2.3 Evaluation Metric for Goal 2**

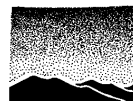
Number of programs. Estimated number of people reached.

**4.3.3 Outreach Goal 3**

Extend the Colorado Space Grant Cooperative Network.

**4.3.3.1 Action Plan for Goal 3**

Cooperation within and among consortia and effective use of diverse resources within the Space Grant network will enhance Colorado and national capabilities in aeronautics, astronautics, and space-related science and technology. Emphasis will be placed on acquiring more partnerships with local groups, industry, NASA Field Centers, and with state and local government agencies. To increase its leveraging capacity, the CSGC will seek to broaden the base of institutions and individuals with whom interaction occurs. CSGC will endeavor to include academic, industrial, or government institutions (as academic, industrial or government affiliates) in cooperations which provide mutual benefit to both these institutions and to the CSGC. As part of this extension, we will seek to develop affiliations with additional community colleges in Colorado. As part of the interaction with government, we will seek to continue to receive matching funds from the State of Colorado. We are strengthening our cooperations with the Rocky Mountain Space Grant Consortium, including the University of Denver by sharing equipment,



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attending the same conferences, and by participating in several of the same funded programs.

#### 4.3.3.2 Task and Schedule for Goal 3

TASKS: WHAT or HOW	WHO	WHEN	
		Start	End Date
Each consortium director contacts local space/technology industries, federal government agencies and institutions (NOAA, NIST, Space Command, etc), and community colleges in an attempt to expand our network. Report on these activities at meetings.	Every one	ongoing	ongoing

#### 4.3.3.3 Evaluation Metrics for Goal 3

Document the extent of this network and the number of affiliates.

