Cover Page for Proposal Submitted to the National Aeronautics and Space Administration

NASA Proposal Number

TBD on Submit

NASA PROCEDURE FOR HANDLING PROPOSALS

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

SECTION I - Proposal Information

Principal Investigator	E-mail Address	Phone Number
Robert Winglee	**winglee@ess.washington.edu**	**206-685-8160**

Street Address (1)	Street Address (2)
PO Box 351310	**070 Johnson Hall**

City	State / Province	Postal Code	Country Code
Seattle	**WA**	**98195-1310**	**US**

Proposal Title : **Washington NASA Space Grant Consortium**

Proposed Start Date	Proposed End Date	Total Budget	Year 1 Budget	Year 2 Budget	Year 3 Budget	Year 4 Budget
06 / 01 / 2020	**05 / 31 / 2024**	**2,755,000.00**	**700,000.00**	**685,000.00**	**685,000.00**	**685,000.00**

SECTION II - Application Information

NASA Program Announcement Number	NASA Program Announcement Title
NNH19ZHA001C	**National Space Grant College and Fellowship Program - Opportunities in NASA STEM FY 2020 - 2024**

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

NASA , Headquarters , Office of STEM Engagement , Integration , Space Grant

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

Type of Application	Predecessor Award Number	Other Federal Agencies to Which Proposal Has Been Submitted
New	**NNX14AR60A**	

International Participation	Type of International Participation
No	

SECTION III - Submitting Organization Information

DUNS Number	CAGE Code	Employer Identification Number (EIN or TIN)	Organization Type
605799469	**1HEX5**		**2A**

Organization Name (Standard/Legal Name)	Company Division
University Of Washington, Seattle	**OFFICE OF SPONSORED PROGRAMS**

Organization DBA Name	Division Number
GRANT & CONTRACTS DIVISION	

Street Address (1)	Street Address (2)
4333 BROOKLYN AVE NE	

City	State / Province	Postal Code	Country Code
SEATTLE	**WA**	**98195**	**USA**

SECTION IV - Proposal Point of Contact Information

Name	Email Address	Phone Number
Robert Winglee	**winglee@ess.washington.edu**	**206-685-8160**

SECTION V - Certification and Authorization

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

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

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

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

Authorized Organizational Representative (AOR) Name	AOR E-mail Address	Phone Number

AOR Signature *(Must have AOR's original signature. Do not sign "for" AOR.)*	Date

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION VI - Team Members

Team Member Role	Team Member Name	Contact Phone	E-mail Address
PI	**Robert Winglee**	**206-685-8160**	**winglee@ess.washington.edu**
Organization/Business Relationship **University Of Washington, Seattle**		Cage Code **1HEX5**	DUNS# **605799469**
International Participation **No**	U.S. Government Agency		Total Funds Requested **0.00**

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION VII - Project Summary

Established in 1989, Washington NASA Space Grant Consortium (WSGC) was one of the first Space Grant consortiums in the country and is funded by NASA as a Designated Program. It is presently composed of 14 institutions within the state of Washington, comprising universities (including 1 HSI), community colleges (3 of which are AANAPISI), museums, and four private industry collaborators. Our mission, consistent with goals of the Federal Strategy for STEM education, is (1) to enhance higher education opportunities for students seeking to pursue careers in the fields of science, technology, engineering, and math (STEM) creating greater STEM literacy, (2) to enrich and improve STEM education at Washington's diverse pre-college, college, university, and community learning centers using NASA STEM opportunities, and (3) thereby strengthen the future workforce for NASA and our nation.

The above consortium ensures a state-wide network of organizations (Space Grant Objective 3) that encourages cooperative interdisciplinary programs (SG Objective 4 and 5) that support the development of a diverse and innovative workforce (SG Objectives 6 and 7). In order to have our research and education programs strongly tied with NASA areas of focus, WSGC programs, in addition to satisfying the above Space Grant objectives, include:

- **Support for educators working with middle and high school students to create immersive programs for their students associated with student challenges support by Science Mission Directorate (SMD) tied to past, present, or future NASA Science missions (SG Objective 1);**
- **Undergraduate research internships at NASA and in the private sector and graduate fellowships focused on NASA STEM related to areas of emphasis in Space Technology Mission Directorate (STMD), SMD and supporting efforts at Ames Research Center (ARC), Goddard Space Flight Center (GSFC), and Jet Propulsion Laboratory (JPL) (SG Objective 2);**
- **Studentships for entering students at community colleges and four-year universities to provide initial work experience for these students in the above research areas so that they have an initial foothold on NASA STEM research opportunities (SG Objective 2);**
- **A supersonic rocket research effort amongst college and university consortium members relevant to Aeronautics Research Mission Directorate (ARMD) and at ARC in creating innovations for supersonic aircraft and Human Exploration and Operations Mission Directorate (HEOMD) in understanding effects from low and high g accelerations (SG Objective 2);**
- **CubeSat developments to investigate advanced CubeSat technologies that include electric propulsion, high frequency communications and/or in situ-resource utilization in relation to areas of focus for STMD and at Marshall Space Flight Center (MSFC) and JPL (SG Objective 2);**
- **High Altitude Balloon program that will investigate the presence of life in extreme environments in relation to SMD astrobiology and HEOMD in terms of survivability of different organic materials (SG Objective 2).**

Consistent with Space Grant Objective 6 for NASA STEM engagement in building a diverse, skilled future STEM workforce, we seek to create an inclusive environment for all these activities that incorporates a geographically diverse pool of participants, with women participating in activities at ~50% and underrepresented minorities at ~20% — levels consistent with the National Center for Education Statistics.

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION VIII - Other Project Information

Proprietary Information

Is proprietary/privileged information included in this application?

Yes

International Collaboration

Does this project involve activities outside the U.S. or partnership with International Collaborators?

No

Principal Investigator	Co-Investigator	Collaborator	Equipment	Facilities
No	**No**	**No**	**No**	**No**

Explanation :

NASA Civil Servant Project Personnel

Are NASA civil servant personnel participating as team members on this project (include funded and unfunded)?

No

Fiscal Year	Fiscal Year	Fiscal Year	Fiscal Year	Fiscal Year	Fiscal Year
Number of FTEs	Number of FTEs	Number of FTEs	Number of FTEs	Number of FTEs	Number of FTEs

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION VIII - Other Project Information

Environmental Impact

Does this project have an actual or potential impact on the environment?	Has an exemption been authorized or an environmental assessment (EA) or an environmental impact statement (EIS) been performed?
No	**No**

Environmental Impact Explanation:

Exemption/EA/EIS Explanation:

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit

Proposal Title : **Washington NASA Space Grant Consortium**

SECTION VIII - Other Project Information

Historical Site/Object Impact

Does this project have the potential to affect historic, archeological, or traditional cultural sites (such as Native American burial or ceremonial grounds) or historic objects (such as an historic aircraft or spacecraft)?

No

Explanation:

SECTION IX - Program Specific Data

Data Management Plan

The types of data that will be generated by the program will include student program eligibility data, student survey data, participant applications and interviews, and student publications. *The personally identifiable information (PII) that is collected includes but is not limited to the applicant's names, emails, addresses, phone numbers, educational history, essays, gender, ethnicity, race, veteran's status, and disability status. All personally identifiable information from participants will be stored on a firewall- and password-protected server at UW.*

Access is provided individually by department IT staff. All systems meet or exceed the best practices established by the US Department of Education Privacy Technical Assistance Center – Family Educational Rights and Privacy Act (FERPA) and compliant with UW privacy and security requirements:

https://www.washington.edu/research/myresearch-lifecycle/manage/compliance-requirements-non-financial/information-privacy-and-security/

Applicant data is archived off-line after the close of the application cycle. Access to the server is only granted to active WSGC employees with an active UW login. Before being provide this access, department IT staff provide screening to ensure only persons with the proper authority have access to the data.

All student publications, where available, will be posted on the WSGC website for open access. Physical data (i.e., observation notes, survey results) will be stored securely (in locked cabinets) with a digital copy stored on a secured server. Data obtained through a data entry from or electronic submission is collected using FERPA compliant services. This data is retained up until the data has been entered and verified into a secure file on our server. All records are retained on the schedule outlined in UW'S University General Records Retention Schedule:

https://finance.uw.edu/recmgt/gs

This timetable includes the requirements for the retention of environmental health and safety facilities service records, financial records, research and grant contract records, personnel and payroll records, student and curriculum records.

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION X - Budget

Cumulative Budget

Budget Cost Category	Funds Requested ($)				
	Year 1 ($)	Year 2 ($)	Year 3 ($)	Year 4 ($)	Total Project ($)
A. Direct Labor - Key Personnel	**10,286.00**	**10,595.00**	**10,913.00**	**11,240.00**	**43,034.00**
B. Direct Labor - Other Personnel	**145,156.00**	**150,844.00**	**156,760.00**	**162,906.00**	**615,666.00**
Total Number Other Personnel	**5**	**5**	**5**	**5**	**20**
Total Direct Labor Costs (A+B)	**155,442.00**	**161,439.00**	**167,673.00**	**174,146.00**	**658,700.00**
C. Direct Costs - Equipment	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
D. Direct Costs - Travel	**7,530.00**	**7,530.00**	**7,530.00**	**7,530.00**	**30,120.00**
Domestic Travel	**7,530.00**	**7,530.00**	**7,530.00**	**7,530.00**	**30,120.00**
Foreign Travel	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
E. Direct Costs - Participant/Trainee Support Costs	**247,807.00**	**245,862.00**	**246,030.00**	**244,310.00**	**984,009.00**
Tuition/Fees/Health Insurance	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Stipends	**247,807.00**	**245,862.00**	**246,030.00**	**244,310.00**	**984,009.00**
Travel	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Subsistence	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Other	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Number of Participants/Trainees					**0**
F. Other Direct Costs	**260,082.00**	**247,923.00**	**244,960.00**	**242,294.00**	**995,259.00**
Materials and Supplies	**20,412.00**	**12,253.00**	**9,290.00**	**6,624.00**	**48,579.00**
Publication Costs	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Consultant Services	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
ADP/Computer Services	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Subawards/Consortium/Contractual Costs	**226,170.00**	**222,170.00**	**222,170.00**	**222,170.00**	**892,680.00**
Equipment or Facility Rental/User Fees	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Alterations and Renovations	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Other	**13,500.00**	**13,500.00**	**13,500.00**	**13,500.00**	**54,000.00**
G. Total Direct Costs (A+B+C+D+E+F)	**670,861.00**	**662,754.00**	**666,193.00**	**668,280.00**	**2,668,088.00**
H. Indirect Costs	**29,139.00**	**22,246.00**	**18,807.00**	**16,720.00**	**86,912.00**
I. Total Direct and Indirect Costs (G+H)	**700,000.00**	**685,000.00**	**685,000.00**	**685,000.00**	**2,755,000.00**
J. Fee	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
K. Total Cost (I+J)	**700,000.00**	**685,000.00**	**685,000.00**	**685,000.00**	**2,755,000.00**
Total Cumulative Budget					**2,755,000.00**

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
06 / 01 / 2020	**05 / 31 / 2021**	**Project**	**1**

A. Direct Labor - Key Personnel

Name	Project Role	Base Salary ($)	Cal. Months	Acad. Months	Summ. Months	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Winglee, Robert	**PI**	**16,604.00**			**.5**	**8,302.00**	**1,984.00**	**10,286.00**
							Total Key Personnel Costs	**10,286.00**

B. Direct Labor - Other Personnel

Number of Personnel	Project Role	Cal. Months	Acad. Months	Summ. Months	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	**Program Manager**	**4**			**25,068.00**	**8,047.00**	**33,115.00**
1	**Fiscal Specialist**	**2**			**8,476.00**	**7,721.00**	**16,197.00**
1	**Public Information Specialist**	**6**			**24,052.00**	**13,772.00**	**37,824.00**
1	**Academci Adviser**	**9**			**42,903.00**	**3,492.00**	**46,395.00**
1	**Assoc Dir**	**1**			**8,800.00**	**2,825.00**	**11,625.00**
5	Total Number Other Personnel					Total Other Personnel Costs	**145,156.00**
						Total Direct Labor Costs (Salary, Wages, Fringe Benefits) (A+B)	**155,442.00**

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
06 / 01 / 2020	**05 / 31 / 2021**	**Project**	**1**

C. Direct Costs - Equipment

Item No.	Equipment Item Description	Funds Requested ($)
	Total Equipment Costs	**0.00**

D. Direct Costs - Travel

	Funds Requested ($)
1. Domestic Travel (Including Canada, Mexico, and U.S. Possessions)	**7,530.00**
2. Foreign Travel	**0.00**
Total Travel Costs	**7,530.00**

E. Direct Costs - Participant/Trainee Support Costs

		Funds Requested ($)
1. Tuition/Fees/Health Insurance		**0.00**
2. Stipends		**247,807.00**
3. Travel		**0.00**
4. Subsistence		**0.00**
Number of Participants/Trainees:	Total Participant/Trainee Support Costs	**247,807.00**

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
06 / 01 / 2020	**05 / 31 / 2021**	**Project**	**1**

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	**20,412.00**
2. Publication Costs	**0.00**
3. Consultant Services	**0.00**
4. ADP/Computer Services	**0.00**
5. Subawards/Consortium/Contractual Costs	**226,170.00**
6. Equipment or Facility Rental/User Fees	**0.00**
7. Alterations and Renovations	**0.00**
8. Other: **Other services**	**13,500.00**
9. Other:	**0.00**
10. Other:	**0.00**
Total Other Direct Costs	**260,082.00**

G. Total Direct Costs

	Funds Requested ($)
Total Direct Costs (A+B+C+D+E+F)	**670,861.00**

H. Indirect Costs

	Indirect Cost Rate (%)	**Indirect Cost Base ($)**	Funds Requested ($)
Indirect Costs	**8.00**	**364,234.00**	**29,139.00**
Cognizant Federal Agency: **DHHS dated July 21, 2017:**		Total Indirect Costs	**29,139.00**

I. Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Costs (G+H)	**700,000.00**

J. Fee

	Funds Requested ($)
Fee	**0.00**

K. Total Cost

	Funds Requested ($)
Total Cost with Fee (I+J)	**700,000.00**

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
06 / 01 / 2021	**05 / 31 / 2022**	**Project**	**2**

A. Direct Labor - Key Personnel

Name	Project Role	Base Salary ($)	Cal. Months	Acad. Months	Summ. Months	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Winglee, Robert	**PI**	**17,102.00**			**.5**	**8,551.00**	**2,044.00**	**10,595.00**
							Total Key Personnel Costs	**10,595.00**

B. Direct Labor - Other Personnel

Number of Personnel	Project Role	Cal. Months	Acad. Months	Summ. Months	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	**Academci Adviser**	**9**			**44,619.00**	**3,632.00**	**48,251.00**
1	**Public Information Specialist**	**6**			**25,014.00**	**14,322.00**	**39,336.00**
1	**Program Manager**	**4**			**26,070.00**	**8,368.00**	**34,438.00**
1	**Assoc Dir**	**1**			**9,064.00**	**2,910.00**	**11,974.00**
1	**Fiscal Specialist**	**2**			**8,815.00**	**8,030.00**	**16,845.00**
5	Total Number Other Personnel					Total Other Personnel Costs	**150,844.00**
						Total Direct Labor Costs (Salary, Wages, Fringe Benefits) (A+B)	**161,439.00**

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
06 / 01 / 2021	**05 / 31 / 2022**	**Project**	**2**

C. Direct Costs - Equipment

Item No.	Equipment Item Description	Funds Requested ($)
	Total Equipment Costs	**0.00**

D. Direct Costs - Travel

	Funds Requested ($)
1. Domestic Travel (Including Canada, Mexico, and U.S. Possessions)	**7,530.00**
2. Foreign Travel	**0.00**
Total Travel Costs	**7,530.00**

E. Direct Costs - Participant/Trainee Support Costs

		Funds Requested ($)
1. Tuition/Fees/Health Insurance		**0.00**
2. Stipends		**245,862.00**
3. Travel		**0.00**
4. Subsistence		**0.00**
Number of Participants/Trainees:	Total Participant/Trainee Support Costs	**245,862.00**

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
06 / 01 / 2021	**05 / 31 / 2022**	**Project**	**2**

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	**12,253.00**
2. Publication Costs	**0.00**
3. Consultant Services	**0.00**
4. ADP/Computer Services	**0.00**
5. Subawards/Consortium/Contractual Costs	**222,170.00**
6. Equipment or Facility Rental/User Fees	**0.00**
7. Alterations and Renovations	**0.00**
8. Other: **Other services**	**13,500.00**
9. Other:	**0.00**
10. Other:	**0.00**
Total Other Direct Costs	**247,923.00**

G. Total Direct Costs

	Funds Requested ($)
Total Direct Costs (A+B+C+D+E+F)	**662,754.00**

H. Indirect Costs

	Indirect Cost Rate (%)	**Indirect Cost Base ($)**	Funds Requested ($)
Indirect Costs	**8.00**	**278,073.00**	**22,246.00**
Cognizant Federal Agency: **DHHS dated July 21, 2017:**		Total Indirect Costs	**22,246.00**

I. Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Costs (G+H)	**685,000.00**

J. Fee

	Funds Requested ($)
Fee	**0.00**

K. Total Cost

	Funds Requested ($)
Total Cost with Fee (I+J)	**685,000.00**

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
06 / 01 / 2022	**05 / 31 / 2023**	**Project**	**3**

A. Direct Labor - Key Personnel

Name	Project Role	Base Salary ($)	Cal. Months	Acad. Months	Summ. Months	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
Winglee, Robert	**PI**	**17,616.00**			**.5**	**8,808.00**	**2,105.00**	**10,913.00**
							Total Key Personnel Costs	**10,913.00**

B. Direct Labor - Other Personnel

Number of Personnel	Project Role	Cal. Months	Acad. Months	Summ. Months	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	**Academci Adviser**	**9**			**46,404.00**	**3,777.00**	**50,181.00**
1	**Public Information Specialist**	**6**			**26,015.00**	**14,896.00**	**40,911.00**
1	**Program Manager**	**4**			**27,114.00**	**8,702.00**	**35,816.00**
1	**Assoc Dir**	**1**			**9,336.00**	**2,997.00**	**12,333.00**
1	**Fiscal Specialist**	**2**			**9,168.00**	**8,351.00**	**17,519.00**
5	Total Number Other Personnel					Total Other Personnel Costs	**156,760.00**
						Total Direct Labor Costs (Salary, Wages, Fringe Benefits) (A+B)	**167,673.00**

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
06 / 01 / 2022	**05 / 31 / 2023**	**Project**	**3**

C. Direct Costs - Equipment

Item No.	Equipment Item Description	Funds Requested ($)
	Total Equipment Costs	**0.00**

D. Direct Costs - Travel

	Funds Requested ($)
1. Domestic Travel (Including Canada, Mexico, and U.S. Possessions)	**7,530.00**
2. Foreign Travel	**0.00**
Total Travel Costs	**7,530.00**

E. Direct Costs - Participant/Trainee Support Costs

		Funds Requested ($)
1. Tuition/Fees/Health Insurance		**0.00**
2. Stipends		**246,030.00**
3. Travel		**0.00**
4. Subsistence		**0.00**
Number of Participants/Trainees:	Total Participant/Trainee Support Costs	**246,030.00**

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
06 / 01 / 2022	**05 / 31 / 2023**	**Project**	**3**

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	**9,290.00**
2. Publication Costs	**0.00**
3. Consultant Services	**0.00**
4. ADP/Computer Services	**0.00**
5. Subawards/Consortium/Contractual Costs	**222,170.00**
6. Equipment or Facility Rental/User Fees	**0.00**
7. Alterations and Renovations	**0.00**
8. Other: **Other services**	**13,500.00**
9. Other:	**0.00**
10. Other:	**0.00**
Total Other Direct Costs	**244,960.00**

G. Total Direct Costs

	Funds Requested ($)
Total Direct Costs (A+B+C+D+E+F)	**666,193.00**

H. Indirect Costs

	Indirect Cost Rate (%)	**Indirect Cost Base ($)**	Funds Requested ($)
Indirect Costs	**8.00**	**235,093.00**	**18,807.00**
Cognizant Federal Agency: **DHHS dated July 21, 2017:**		Total Indirect Costs	**18,807.00**

I. Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Costs (G+H)	**685,000.00**

J. Fee

	Funds Requested ($)
Fee	**0.00**

K. Total Cost

	Funds Requested ($)
Total Cost with Fee (I+J)	**685,000.00**

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
06 / 01 / 2023	**05 / 31 / 2024**	**Project**	**4**

A. Direct Labor - Key Personnel

Name	Project Role	**Base Salary ($)**	Cal. Months	Acad. Months	Summ. Months	Requested Salary ($)	**Fringe Benefits ($)**	Funds Requested ($)
Winglee, Robert	**PI**	**18,144.00**			**.5**	**9,072.00**	**2,168.00**	**11,240.00**
							Total Key Personnel Costs	**11,240.00**

B. Direct Labor - Other Personnel

Number of Personnel	Project Role	Cal. Months	Acad. Months	Summ. Months	Requested Salary ($)	Fringe Benefits ($)	Funds Requested ($)
1	**Academci Adviser**	**9**			**48,260.00**	**3,928.00**	**52,188.00**
1	**Public Information Specialist**	**6**			**27,055.00**	**15,491.00**	**42,546.00**
1	**Program Manager**	**4**			**28,198.00**	**9,052.00**	**37,250.00**
1	**Assoc Dir**	**1**			**9,616.00**	**3,087.00**	**12,703.00**
1	**Fiscal Specialist**	**2**			**9,534.00**	**8,685.00**	**18,219.00**
5	Total Number Other Personnel					Total Other Personnel Costs	**162,906.00**
						Total Direct Labor Costs (Salary, Wages, Fringe Benefits) (A+B)	**174,146.00**

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
06 / 01 / 2023	**05 / 31 / 2024**	**Project**	**4**

C. Direct Costs - Equipment

Item No.	Equipment Item Description	Funds Requested ($)
	Total Equipment Costs	**0.00**

D. Direct Costs - Travel

	Funds Requested ($)
1. Domestic Travel (Including Canada, Mexico, and U.S. Possessions)	**7,530.00**
2. Foreign Travel	**0.00**
Total Travel Costs	**7,530.00**

E. Direct Costs - Participant/Trainee Support Costs

		Funds Requested ($)
1. Tuition/Fees/Health Insurance		**0.00**
2. Stipends		**244,310.00**
3. Travel		**0.00**
4. Subsistence		**0.00**
Number of Participants/Trainees:	Total Participant/Trainee Support Costs	**244,310.00**

PI Name : **Robert Winglee**	NASA Proposal Number
Organization Name : **University Of Washington, Seattle**	TBD on Submit
Proposal Title : **Washington NASA Space Grant Consortium**	

SECTION X - Budget

Start Date :	End Date :	Budget Type :	Budget Period :
06 / 01 / 2023	**05 / 31 / 2024**	**Project**	**4**

F. Other Direct Costs

	Funds Requested ($)
1. Materials and Supplies	**6,624.00**
2. Publication Costs	**0.00**
3. Consultant Services	**0.00**
4. ADP/Computer Services	**0.00**
5. Subawards/Consortium/Contractual Costs	**222,170.00**
6. Equipment or Facility Rental/User Fees	**0.00**
7. Alterations and Renovations	**0.00**
8. Other: **Other services**	**13,500.00**
9. Other:	**0.00**
10. Other:	**0.00**
Total Other Direct Costs	**242,294.00**

G. Total Direct Costs

	Funds Requested ($)
Total Direct Costs (A+B+C+D+E+F)	**668,280.00**

H. Indirect Costs

	Indirect Cost Rate (%)	**Indirect Cost Base ($)**	Funds Requested ($)
Indirect Costs	**8.00**	**20,900.00**	**16,720.00**
Cognizant Federal Agency: **DHHS dated July 21, 2017:**		Total Indirect Costs	**16,720.00**

I. Direct and Indirect Costs

	Funds Requested ($)
Total Direct and Indirect Costs (G+H)	**685,000.00**

J. Fee

	Funds Requested ($)
Fee	**0.00**

K. Total Cost

	Funds Requested ($)
Total Cost with Fee (I+J)	**685,000.00**

Table of Contents.

1. Consortium Profile

Washington NASA Space Grant Consortium (WSGC) serves a state with a tremendous gap between the percentage of jobs being created in the science, technology, engineering, and math (STEM) fields and the percentage of its population qualified to fill those positions. Washington — a hub for new developments in software, aviation, aerospace, and medical research — was ranked in 2013 as "the most innovative state in the country."[1] In the Kauffman Foundation New Economy Index of Leaders of Innovation, Washington stands second only to Michigan in the percentage of our workforce that are engineers; yet, it is also the largest per-capita importer of college-degreed professionals.[2] Washington's population is growing at about 1.6% annually with a population of 7.3 million (2016), with 69.3% white, 12.5% Hispanic, 8.1% Asian and 2% Native Americans.

Despite some improvement in educational accomplishments, the percentage of underrepresented minority students earning bachelor's degrees is still low. In 1982, only 6% of American Indian students completed college degrees, compared to 7% of Latinx students, 12% of African Americans, and 23% of white students.[3] Twenty-three years later, 15% of American Indian students who enter college earned a bachelor's degree within 6 years. This compares to 24% of Latinx students, 31% of African Americans, 49% of white students, and 51% for Asians.[4]Underrepresented minorities (URMs) face several barriers, including lack of financial support, racism, inadequate precollege preparation,[5,6] and cultural bias from higher education institutions.[7,8] By the same token, research shows that there are distinct factors that contribute to success. These include high academic aspirations, good study habits, quality interactions with faculty and staff, preservation of American Indian cultural traditions, and support from family.[9,10]

WSGC addresses these issues by incorporating a geographically diverse set of higher education institutions that are in close proximity to key populations in Washington and within these institutions creating smaller communities that provide academic and financial support. In addition, these students are given the opportunity to be immersed in hands-on experiences centered on NASA STEM. Because of the latter, students increase their aspirations and improve their study habits because they have a clearer understanding of the potential applications of the basic material taught in classes.

To this end WSGC includes 7 four-year universities or colleges — four public: University of Washington (UW), Central Washington University (CWU), Washington State University (WSU), and Western Washington Univ (WWU); three private: Heritage University (HU), University of Puget Sound (UPS), and Whitworth University (WU); and six community colleges: Seattle Central College (SCC), North Seattle College (NSC), Everett Community College (EvCC), Bellevue College (BC), Peninsula College (PC), and Pierce College Fort Steilacoom (PCFS). The consortium members also include Pacific Science Center (PSC) as an affiliate and the Museum of Flight as a collaborating institution. This consortium includes one Hispanic serving institution (HSI: HU), and three Asian American and Native American Pacific Islander Serving Institutions (AANAPISI: BC and SCC). Our leadership reflects the diversity that we seek among our students, with an Executive Committee comprised of five women and six persons of color, including two African Americans, a Native American, and two Asians.

All the following projects align with (1) Federal Strategy for STEM education, (2) NASA's Strategy, and (3) OSTEM Performance and Evaluation Strategy by enabling contributions to NASA's research efforts, building a diverse and skilled STEM workforce, and by collaboratively using immersive transdisciplinary opportunities centered in NASA STEM.

A. NASA Internships and Fellowships (NIF)

The purpose of our NIF programs is to prepare a diverse new generation of scientists and engineers for work at NASA and related organizations. Internships and fellowships provide unique opportunities to work on cutting edge research and motivate students to commit to STEM careers. All awards are made through competitive processes. Selection is conducted by faculty committees and based on academic excellence and commitment to NASA-related STEM disciplines. Applicants for graduate fellowships are also evaluated on their research, its relevance to NASA's science and technology goals, and their future academic promise. The combined product has been very successful with 93% of WSGC awardees from 2006 through 2017 being retained in STEM through their next step. Supported STEM disciplines for undergraduates and graduate students represent a broad range of NASA interests including astronomy, biology, and physics; Earth, space, and environmental sciences; aeronautics and astronautics; computer science and engineering; electrical, mechanical, chemical, and systems engineering. Specific areas of supported internship research at the four participating units (UW, WWU, SCC, and WU) will include but not be limited to:

- Biology and astrobiology: Understanding life on Earth and in space (SMD: Ames, JPL);
- Exoplanets: Finding worlds beyond our own (SMD: Ames, JPL);
- Autonomy and robotics: Complementing humans in space (HEOMD: Ames);
- Lunar science: Rediscovering our moon (SMD: Ames, JPL);
- Planetary atmospheres and geology: Solar system characteristics and origin of life (SMD: Ames, JPL);
- Primitive solar systems bodies: Lunar science; Preparing for returned sample Investigations (SMD: Ames, JPL);
- Atmospheric composition and dynamics: Land and solid earth processes; water and carbon cycles and climate science (SMD: JPL, MSFC);
- Astronomy: Origin, evolution, and structure of the universe; gravitational astrophysics (SMD: JPL);
- Extra-solar planets and star and planetary formation (JPL);
- Solar and space physics and spacecraft charging (SMD: MSFC, JPL, GSFC);
- In-space propulsion (STMD: GRC, MSFC);
- Space biology (HEOMD: KSC).

Graduate fellowship research questions that would be addressed at UW and WU include geothermal fluxes in Antarctica and estimates for potential sea rise and impacts to coastlines, cloud formation and potential precipitation changes, and modified wildfire dangers. Astrobiology applications investigate properties of extremophiles, and their potential occurrence during Earth history that lead to identification of potential bio-signatures of ice and brines on Mars and Earth. CubeSat applications include validation of potential plasma propulsion systems and communications systems that fit within the CubeSat configuration, algorithms for control systems, and the development of very small sensors. Planetary science and space technology applications investigate the origin of asteroids, the properties and development of planetary atmospheres, the identification and utilization of in-situ resources and instrumentation for sample return or the landing of spacecraft on the icy solar system objects. The development of planetary atmospheres has applications to the identification of extra-solar planets.

WSU expertise addresses topics relevant to HEOMD: Space Biology such as: (1) Muscle atrophy and serum factors involved in reducing muscle atrophy — which could help lead to understanding why astronauts lose muscle mass during space missions, (2) Regulation of hydrogen sulfide and nitric oxide in physiological and pathophysiological processes — which could lead to a possible remedy for the oxidative stress associated with astronauts' exposure to space radiation, and (3) Plant physiology and photosynthesis under varying environmental conditions — which could provide a better understanding of growing food in the space station.

Our internship program also incorporates training for the students with respect to organization of data, abstract development, oral presentations, and poster development. They then give a poster presentation at the being of Fall. Through these activities, the students not only attain research experience but gain experience in professional presentations, which aids them in the next applications, whether it is for other NASA internships or for graduate school.

A. SMART Goal: To have internships and fellowships at four WSGC institutions (SCC, UW, WWU, and WU) that are competitively awarded.

A. SMART Objective: Provide immersive experiences for undergraduate and graduate students in topic areas of focus for NASA, through the placement of students at NASA, the private sector, and university research laboratories.

A. SMART Metric: Award WSGC NIF direct student awards to underrepresented minority students at or above 20% and to women undergraduates at or above 50%, consistent with The National Center for Education Statistics report.

***A. SMART Target Number*:** Provide 40 university internships, 4 private sector internships, 4 NASA internships, and 23 graduate fellowships.

A. SMART Deadline: Applications will open in March and be offered by end of May each year. Results from internships and fellowships will be presented at a consortium wide poster session/reception at the start of each academic year (Sept./Oct.).

These efforts fulfill Space Grant Objective 2: solving Mission Directorate challenges, SG Objective 3: state-wide network of organizations, SG Objective 4: cooperative programs amongst universities, aerospace industry, and NASA, SG Objective 5: encouraging interdisciplinary programs that support research and development for NASA STEM, SG Objective 6: a diverse workforce, and SG Objective 7: innovative program advancing aerospace knowledge.

B. Multi-Disciplinary SMD, HEOM, STMD Studentships

Internships by definition require a significant number of hours. However, many of the WSGC scholars do not have the experience to be competitive for these types of awards. For example, first-year students, and to a lesser extent sophomores, in general do not have significant research opportunities. The problem is further compounded at community colleges, where the availability of research opportunities is significantly lower than at four-year universities, and maintaining a livable income is typically a higher priority/need than research experience. To this end, WSGC proposes the competitive awarding of studentships that will require a minimum of 10-20 hours of work experience per quarter associated with research and/or education opportunities described in Section A or as new NASA opportunities develop, and thereby provide initial and highly valuable workforce development over diverse populations across the state of Washington.

Through these efforts, WSGC will have a larger number of institutions providing research opportunities to undergraduates across the region. Participating institutions will be Bellevue College, Peninsula College, Seattle Central College, Washington State University, Western Washington University, the University of Puget Sound, PacSci, and the University of Washington. Through these activities, students will gain the experience to make them more competitive when applying for NASA Internships.

In addition to workforce development, these initial awards provide an important means for enabling retention of students in STEM with the students being able to see the theory of the classroom being brought to action. They also help create a feeling of small community within the larger community of at their institution by providing meet-and-greet events, tutoring, and mentoring activities. In so doing they are able to use the infrastructure of WSGC to aid them in their studies, including tutoring, mentoring through the often-complicated university system and social activities. We seek through these activities to maintain a 90% retention rate in STEM in their next career steps.

B. SMART Goal: To have studentships at nine WSGC institutions: (BC, CWU, PC, SCC, WWU, WU, UW, UPS, and PSC) that are competitively awarded.

B. SMART Objective: Provide initial workforce development that would aid students in gaining more immersive experiences for undergraduates in topic areas of focus for NASA.

B. SMART Metric: Award WSGC student awards to underrepresented minority students at or above 20% and to women undergraduates at or above 50%, consistent with The National Center for Education Statistics report.

***B. SMART Target Number*:** Provide 59 studentships.

B. SMART Deadline: Applications will be open Winter each year, with selections made in spring for support of students in the following academic year.

These efforts fulfill Space Grant Objective 2: solving Mission Directorate challenges, SG Objective 3: state-wide network of organizations, SG Objective 4: cooperative programs amongst universities, aerospace industry, and NASA, and Objective 5: encouraging interdisciplinary programs that support research and development for NASA STEM, and SG Objective 6: a diverse workforce.

C. Activities Relevant to Aeronautics Research Mission Directorate Research & Armstrong Flight Research Center: Supersonic Rocket Research Program (SRRP)

The first supersonic flight of the Concorde was 1969. It reduced flight times across the Atlantic to nearly half that of regular commercial flights. But it had its drawbacks — its sonic boom was so loud that flight at supersonic speeds was only permitted over the ocean, and its fuel consumption was substantially higher than regular planes. As a result, the Concorde's commercial viability was limited and flights ceased in 2003.

In the intervening time there have been major developments in carbon composites that allow for lighter and more heat resistant aircraft. In 2018, NASA, in collaboration with Lockheed Martin, announced a $250M dollar program for the development of a supersonic plane with a low sonic boom. This plane, called the X-59 QueSST[11], with its sleek design is expected to produce no more noise on the ground than that of a slamming car door.

While WSGC does not have access to the advanced facilities of Lockheed Martin, we do have ready access to supersonic systems. We are able to do so because the same innovations in materials that have led to the development of the X-59 have led to the potential of student-built supersonic rockets that use only commercially available components. At the University of Washington, the lead institution for WSGC, we have developed a series of systems that have reached speeds as high as Mach 2.2. These systems are shown in Figure 1. Mach 1.6 was attained on a 2" minimum diameter rocket using a K850 rocket motor. The 3" in minimum diameter rocket on an M1250 presently holds the group record at Mach 2.2. Heavier and/or larger payloads can be carried on two-stage or cluster rocket systems shown on the right hand side of Figure 1.

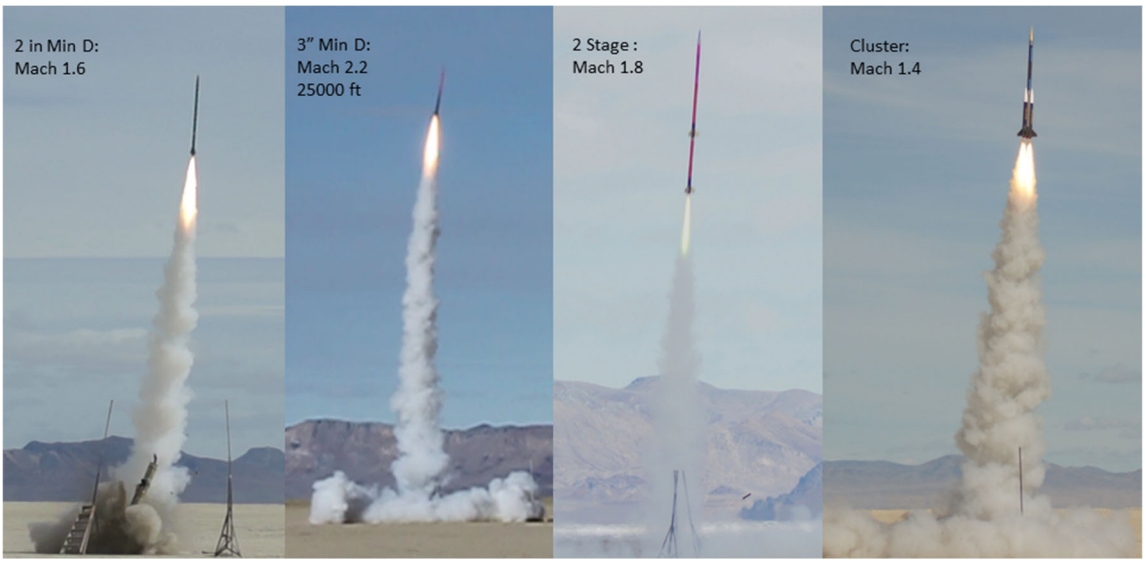

Figure 1. Different styles of systems that can reach supersonic speeds using only commercially available materials. Images show launches at Black Rock, NV.

The ability to study supersonic systems provides an important opportunity for students to fully understand the large forces that are present on supersonic materials and the methodologies to reduce drag. We have, over the last period of performance, developed rocket capabilities at several of the participating members of WSGC. Most of these efforts, except for the lead institution, have been at speeds substantially less than the sound speed.

The development of this type of infrastructure is relevant to NASA Armstrong Flight Research Center for the development of the X-59, Ames Research Center for innovations in commercial supersonic aircraft, as well as for studying the impact on biological specimens subjected to low g that occurs at apogee for the slower accelerating multi-stage systems or the hypergravity associated with the single stage systems. Using these rocket systems, insight into the changes of the shock wave due to changes in the atmospheric conditions with respect to both altitude and weather conditions can be studied.

The Northwest has the advantage that rocket launch areas are available in Brothers, OR, with a ceiling of 50,000 feet and Black Rock, NV, with a ceiling of 100,000 feet. We have a long history of working with the FAA for flight waivers for these ceilings and the Bureau of Land Management for access to the launch area. To attain measurements of the shock wave properties, we would deploy acoustic instrumentation on a latex weather balloon downstream of the launch

area. The use of weather balloons mirrors the diagnostics used by NASA to measure shock wave properties. WSGC has been launching this type of weather balloon on student projects for over 10 years, so setting up the experiment fits within the expertise of WSGC.

To facilitate the creation of an immersive experience for students from across the region, the lead institution will run a workshop each year to provide training of students in the methodology needed to successfully develop a supersonic rocket system. As teams progress through the program they will investigate changes in performance when different supersonic airfoils are added to the rocket. The institutions that will participant in these efforts include:

- University of Washington
- Bellevue College (an AANAPISI)
- Pierce College Fort Steilacoom (an AANAPISI)
- North Seattle College
- Seattle Central College (an AANAPISI).

By having a diverse group of rocket builders, we will be able to test a variety of different configurations on an annual basis and build a large data set for parameters controlling performance.

C. SMART Goal: To set up supersonic rocket research programs at five WSGC institutions: (BC, PCFS, NSC, SCC, and UW) to provide studies in performance associated with different materials and airfoils.

C. SMART Objective: Provide initial workforce development that would aid students in gaining more immersive experiences, particularly undergraduates, in the focus area of supersonic flight performance within ARMD.

C. SMART Metric: Take data from at least 5 supersonic systems each year, with different flight characteristics in terms of peak altitude reached, peak speed, and size of payload.

***C. SMART Target Number*:** Have 60 students participate in launches.

C. SMART Deadline: Provide workshops for students across WSGC in Fall with launches performed in Spring/Summer in the following year; each year we anticipate incorporating increasingly advanced rocket design and diagnostics.

These efforts fulfill Space Grant Objective 2: solving Mission Directorate challenges, SG Objective 3: state-wide network of organizations, SG Objective 4: cooperative programs amongst universities, aerospace industry, and NASA, SG Objective 5: encouraging interdisciplinary programs that support research and development for NASA STEM, and SG Objective 7: innovative program advancing aerospace knowledge.

D. Activities Relevant to Science Mission Directorate Research: High Altitude Balloon Research Program (HABRP)

Wildfires are expected to increase through the twenty-first century due to climate change effects[12]. The problem is predicted to be very severe in the Pacific Northwest, which has seen an increase in fires in the past associated with warming periods of the Holocene and medieval periods[13], and which is predicted to see a large increase in burn area (up to 300%) and burn severities up to 50% higher[14] within the next 10-20 years. These changes are evidenced by the 400 square mile Carlton fire in 2014 and the Okanogan Complex Fire (2015), which was the largest in recorded Washington history at over 256,500 acres[15].

Figure 2. Proposed dust collecting payload along with student-built payloads, launch from the Spokane Indian Reservation, Aug 2019.

Impacts from such effects are a focus area for SMD in terms of water and carbon cycles and climate science as part of studies underway. WSGC is in a unique position to study the dust impact from such fires, as it is able to launch several high-altitude balloons each year from different locations and at different times of the year. For the proposed effort, UW, the lead institution for WSGC, will develop a standardized dust collecting system that will capture dust particles at different altitudes, from ground level to 90,000 feet. UW will then provide the system to affiliates for additional payloads to their existing HAB systems. The dust collecting system will involve an Arduino CPU with a pressure sensor measuring the ambient conditions. As the balloon ascends, one of four collectors will be opened to provide sampling between 5,000-20,000 feet, 20,000-40,000 feet, 40,000-60,000 feet, and 60,000-80,000 feet. The collected samples would then be evaluated using digital microscopes to measure size distributions and number of collected samples. Creating a data set will provide important insight into air quality changes associated with wildfires.

This dust collecting system is not only important because of the data collected, but also provides a means to introduce higher level experiments and electronics to affiliates and thereby increase the participating students' experience and expertise. The long history of WSGC means that a very long-term data set can be collected from multiple launch points and used to identify long-term impacts. Figure 2 shows the launch of the dust collecting system along with the student built payloads developed by Native Americans on the Spokane Indian Reservation.

D. SMART Goal: To set up high altitude balloon programs at four WSGC institutions: (EvCC, CWU, HU, and UW) to provide studies in dust altitude profiles at several locations in Washington over a long period of time to investigate potential influences from climate change.

D. SMART Objective: Provide initial workforce development that would aid students in gaining more immersive experiences for secondary school students and undergraduates in the focus area of climate change in SMD.

D. SMART Metric: Take data from at least four launches per year in Washington, with 20% URM and 50% women participation.

***D. SMART Target Number*:** Have 60 secondary school students participating in launches, and 30 undergraduates.

D. SMART Deadline: Develop initial prototype for dust collection in Year 1 and distribute to affiliates in subsequent years with launches primarily in Spring and Summer.

These efforts fulfilll SG Objective 1: inclusion of elementary and secondary students, SG Objective 2: solving Mission Directorate challenges, SG Objective 3: state-wide network of organizations, SG Objective 4: cooperative programs amongst universities, aerospace industry, and NASA, SG Objective 5: encouraging interdisciplinary programs that support research and development for NASA STEM, and SG Objective 6: a diverse workforce.

E. Activities Relevant to Space Technology Mission Direction and Glenn Research Center and Marshall Space Flight Center: CubeSat Technology Development Program

Small satellites have become an increasingly important tool for space science and technology developments. One type of small satellite, the CubeSat, has seen a proliferation in growth with more than 200 CubeSat flights since 2003 and over 100 CubeSats being launched this past year[16]. These CubeSats have also increased in capability, initially starting as 1U systems (10×10×10 cm), to a point where 3U (30×10×10 cm) and larger systems are now being routinely developed and flown. CubeSats can also provide diagnostics in regions that might be considered too dangerous for the main spacecraft. One example was the CubeSat deployed by Hayabusa II during its impactor experiment to excavate some of the subsurface material from an asteroid.

Solicitations such as the NASA Centennial CubeQuest Challenge and the Europa CubeSat further exemplify this trend towards greater utilization of small satellites. Because of their importance, CubeSat development including in-space propulsion technologies are part of ongoing research efforts at GSFC, MSFC, and JPL. More recently, micro-satellites are being proposed for the Great Lunar Expedition for Everyone (GLEE)[17] to provide distributed mapping of the temperature, magnetic field, and gravity of the Moon.

Students at the University of Washington (UW), with support from the WSGC under USIP, have developed a 3U CubeSat boasting two innovative systems: an electric propulsion system capable of high specific thrust needed for quick trajectory changing, and a communication system capable of significantly higher data throughput. The thruster uses a pulse plasma thruster (PPT) that utilizes sulfur as its propellant, which yields a specific thrust of about 80 mN/kW with the potential of producing a ΔV of a few hundred m/s which would be a major advance for CubeSats. To fully take advantage of the increased orbit facilitated by this ΔV, the UW system also incorporated a k-band software radio and a reflect array that would fit within the geometric factors of a CubeSat while providing directed transmissions that could be received tens of thousands of km downrange[18,19].

Figure 3. The 3U Cubesat built at UW for delivery to NASA, Sept 2019.

The UW CubeSat (Figure 3)will be delivered to NASA September 2019. A spinoff from this effort was also the development of an

air-breathing plasma thruster that could enable a high altitude flier in the Earth's upper (> 60,000 ft) atmosphere or a Mars flier that could provide aerial remote sensing over large distances and long durations. The development of such an air-breathing system is an active research focus at Glenn Research Center.

The above CubeSat development involved approximately 40 undergraduates and 2 graduates annually during the development of the system. This effort not only supports NASA objectives but provides benefits to Washington's aerospace industry including: development work on new space technologies, including spacecraft propulsion via plasma thrusters, high data throughput communications, hands-on training with space hardware for future engineers and scientists, validation of new commercial technologies, and the opening up of additional CubeSat opportunities. The importance of this program is illustrated by the fact that students on the project have been recruited upon graduation to many of the major aerospace companies in the Seattle area.

The proposed effort seeks the development of the next version of this CubeSat, which would be based off this initial CubeSat but have increased power through deployable solar arrays, which would then enable the system to operate beyond low Earth orbit. The students will focus their efforts on a preliminary design of a CubeSat mission to the asteroids assuming a drop-off from one of the tests of Space Launch System to the moon. These efforts will include orbital analysis to set the ΔV requirements, a proof-of concept for the deployable solar arrays, and continued optimization of the plasma thruster, including additional lifetime testing.

Testing of subsystems and experience in system development may also be provided through rides available on Blue Origins' *New Shepard.* These students have well-developed system requirements but offer fast and cheaper access to extend zero-g environments, albeit not be exposed to the vacuum of space.

E. SMART Goal: To sustain a CubeSat Technology Development Program at the lead institution with the goal of developing a preliminary design for a 3U to 6U CubeSat able to study a near-Earth asteroid starting from an SLS launch.

E. SMART Objective: Provide initial workforce development that would aid students in gaining immersive experiences for undergraduates in space technology and space sciences.

E. SMART Metric: Develop a preliminary design for space launch system and develop and test subsystems as needed.

***E. SMART Target Number*:** 40 undergraduates per year.

E. SMART Deadline: Preliminary design would be developed at the end of Year 1, with subsystems developed in subsequent years. Additional preliminary designs would be developed as opportunities for space flight become available.

These efforts fulfill SG Objective 2: solving Mission Directorate challenges, SG Objective 4: cooperative programs amongst universities, aerospace industry, and NASA, SG Objective 5: encouraging interdisciplinary programs that support research and development for NASA STEM, and SG Objective 6: a diverse workforce.

A summary of all the SMART goals and Timetable are given at the end of this proposal.

F. Professional Development Associated with Science Mission Directorate Student Challenges

With support from the Science Mission Directorate and the Office of STEM Engagement, the staff of WSGC and the Northwest Earth and Space Sciences Pipeline (NESSP) collaborated to develop and host the Apollo Next Giant Leap (ANGLeS) Student Challenge to celebrate the 50th Anniversary of the Apollo 11 moon landing. Through the program's professional development component, ANGLeS provided extended training in NASA STEM to over 325 educators across the country including some 70 educators in Washington. By supporting these educators we had nearly 3,000 students (including over 300 in Washington) in immersive NASA STEM efforts including lunar geology, programming, drone flight, and remote sensing. Of the 300 students in Washington, about half attended the Challenge event on July 19th, 2019, with nearly 200 parents and friends also attending. The activities were reported on local news channels including Fox, ABC, and NBC. Through such media coverage we are able demonstrate to the communities across Washington that NASA STEM has impact on their communities.

While we are still awaiting the final data from the external evaluators of the ANGLeS project, initial data from the surveys prior to the event showed that the program was able to instill in the teachers and students a deeper under understanding of NASA STEM and, for the students, an improved desire to be more successful at their studies.

Our proposed effort seeks to continue the collaboration between the Office of STEM Engagement and SMD to continue to support K-12 teachers/students in their participation of extended NASA STEM challenges tied to missions associated with SMD. WSGC will include an emphasis on the Yakima Valley, an underserved community with an above average population of underrepresented minorities which is served by ESD105. The proposed effort would be the first formal effort we have had in this district.

The next effort will most likely be associated with the launch and arrival of Mars 2020 followed by Double Asteroid Redirection Test (DART) and *Lucy,* which will be the first space mission to Jupiter's Trojan asteroids in 2021, Psyche a mission to study the main belt asteroid 16 Psyche in 2022, and the lunar ring eclipse and sample return by OSIRIS-Rex in 2023. With this series of important upcoming events for NASA missions, there will be plenty of new material to engage students and educators in NASA STEM. As an example, the Mars 2020 student challenge will incorporate a search-for-life component that will bring in an astrobiology component, which was not included in the ANGLeS Challenge.

F. SMART Goal: To support educators and teams across Washington who wish to participate in student challenges that are being run as part of sponsored programs within SMD with an emphasis for educators in the Yakima Valley, an underserved community with an above average population of underrepresented minorities which is served by ESD105.

F. SMART Objective: To provide professional development for K-12 educators with the STEM components associated with student challenges.

F. SMART Metric: Provide at least 4 professional development workshops in rural Washington.

***F. SMART Target Number*:** Support 20 educators as well as support 8 teams with a total of 40 students participating in challenge events.

F. SMART Deadline: Host professional development workshops in Fall and Winter to support educators.

These efforts fulfill SG Objective 1: inclusion of elementary and secondary students, SG Objective 2: solving Mission Directorate challenges, SG Objective 3: state-wide network of organizations, and SG Objective 6: a diverse student pool in STEM.

2. Project Evaluations.

WSGC will participate in all components required by NASA for its external evaluations. In addition, to ensure the quality of the program, WSGC will continue its assessment plan to not only monitor the success of the program in turns of retention of students in STEM during their higher education efforts and in their next steps beyond higher education, but will continue formative and summative evaluations of the students as they enter and move through activities supported by WSGC.

Studentship Formative Evaluation: The questions guiding the formative evaluation will be: (1) What are participants' perceptions of their higher education institution (e.g., class performance, networking, financial and education support, research skills)? (2) To what extent are NASA resources enabling progress in carrying out the students' intended educational and research interest? (3) Does assignment of a science matter expert with experience in NASA STEM aid the student in attaining their goals? (4) How well does the project's collaboration (such as the creation of a smaller community within the larger university community) take advantage of the unique expertise of the WSGC?

Internship Formative Evaluation: (1) What is the quality of the experience between the different types of internships offered (private, NASA, or higher ed experiences), (2) Does the quality of experience change with progression through the years at the higher education program? (3) What types of barriers does the student encounter and/or overcome in having access to research opportunities? (4) Does the experience increase the student's capacity to more effectively compete in their next steps towards working in STEM/aerospace workforce and/or class performance?

Team Formative Evaluation: (1) How is classroom knowledge translated into real life experiences through the team activity? (2) Conversely, does team experience translate into increased performance in class efforts? (3) Does the team experience open new avenues of STEM inquiry? (4) Is the experience interdisciplinary versus disciplinary, and does that impact the student interests and outcomes?

All students will participate in the summative evaluation.

Summative Evaluation. The summative component of the evaluation will focus on the project's impacts on student outcomes. The questions guiding the summative evaluation will be: (1) To what extent are the project-based efforts influencing student outcomes? (2) Does the program provide a seamless pipeline through higher education for all students, including women and underrepresented minorities? (3) Does the program increase the students' interest to persist in their STEM degrees? (4) Is the program able to increase the students' aspirations in STEM careers?

	Mission Directorate Contributions			
WSGC Programmatic Elements (with Budget Identifiers)	**ARMD**	**HEOMD**	**SMD**	**STMD**
NASA Internships and Fellowships				
NASA Internships (Consortium Wide)		*	*	*
Internships (UW)		*	*	*
Internships (WWU)			*	
Internships (WU)			*	*
Graduate Research Fellowships (WSU)		*	*	
Graduate Research Fellowships (UW)			*	*
Studentships (Competitively Awarded)				
Studentships (UW)		*	*	*
Studentships (BC)			*	
Studentships (PC)			*	
Studentships (SCC)			*	
Studentships (WWU)			*	
Group Projects				
Supersonic Rocket Student Research Program	*	*		
High Altitude Balloon Research Program			*	
CubeSat Development and Plasma Thrusters				*
Professional Development Student Challenges			*	

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4. Consortium Management

Established in 1989, Washington NASA Space Grant Consortium (WSGC) is presently composed of 15 institutions within the state of Washington, comprising universities (including 1 HSI), community colleges (3 of which are AANAPISI), museums, and four private industry collaborators. The consortium operates under the guidance of a director and an associate director, and an executive committee made up of representatives from each of the affiliate institutions. The leadership is diverse with five women and six persons of color, including one African American, two Native Americans, and one Hispanic. The director is responsible for all aspects of the program. Decision-making is through shared governance with input from an executive committee.

WSGC members are broken into two groups: affiliates and partners. Affiliates have sustained programs, work with a significant number of students or teachers, and/or participate on the executive committee. Because of the size of their programs, most members have individual subcontracts and provide detailed reporting statements each year. Partners participate in the support of a small number of students or teachers. Because the scope of their participation is limited, partners do not serve on the executive committee and their funding is provided directly by the lead institution (no subcontract). Partners are typically drawn from private industry, the state community college system, or educational nonprofits. The lead institution provides tracking of students participating in partner programs. All educational partners (and their students) receive NASA mailings and are invited to participate in WSGC events. Partners who show a strong level of participation and commitment to NASA goals and objectives may be invited to become WSGC members.

Consortium members must be in good standing to propose projects for the coming year. Members achieve good standing by timely billing for their subcontracts, submission of their data for the annual report, production of adequate documentation for their portion of the required cost share, and participation in consortium activities (recruiting students for summer programs, helping to evaluate student applications when required, attending consortium meetings).

Consortium Structure/Network

The University of Washington, WSGC's lead institution, is located in Seattle with a current enrollment of 46,166 students, of whom 31,331 are undergraduates (2018). In FY2013, UW received > $1 billion in research grants and contracts. Washington State University, also a research institution and a land grant university, is located on the opposite side of the state, with an enrollment of 30,614, of whom 25,277 are undergraduates (2018). Western Washington University, with 15,915 undergraduates enrolled in education, serves as home to the Science, Mathematics, and Technology Education (SMATE) program for pre-service teachers and education research. A new component is the support of a recent planetary science course at WWU in addition to supporting SMATE. Central Washington University is the smallest of WSGC's public school members with an undergraduate enrollment of 12,572 (2018).

Two private institutions are the University of Puget Sound in Tacoma and Whitworth University in eastern Washington. Both provide their students with WSGC-supported hands-on research opportunities. The third private institution is a minority-serving institution: Heritage University, a private, four-year HSI located within the Yakama Nation reservation in central Washington.

Over the last 5 years we have more than doubled the number of community college members. Our initial members included Seattle Central College (an AANAPISI) and North Seattle College. New additions include Bellevue College (an AANAPISI), Everett College, Pierce College, and Peninsula College (which is a rural community college). These new institutions are designated as partners as opposed to affiliates until the point where the funding to WSGC can enable larger sustainable programs.

In addition, WSGC membership includes the Pacific Science Center and Museum of Flight (both participants in the NASA Museum Alliance). Pacific Science Center efforts supported by the program include their internship program. Museum of Flight programs are concentrated on the Washington Aerospace Scholars Program, which did not rise as a high priority with respect to the requirements in the present AO and therefore, due to the budget restrictions, will not be participating in funding in the present AO.

Two of our previous partners, North Central Educational Service District and the Olympic Educational Service District, have been graduated out of the program since they have received support for over a decade from WSGC. We have elected to bring in a new partner — ESD105 which serves the rural areas in Eastern Washington around the Yakima Valley where there are large populations of underserved and underrepresented communities.

WSGC industry partners within the field of aeronautics and astronautics are Eagle Harbor Technologies and Tethers Unlimited, Inc.; partner Woodruff Scientific, Inc. is focused on new energy technologies. WSGC also collaborates with the larger aerospace companies in the area including Boeing, Blue Origin, Aerojet Rocketdyne, and Space X. However, these efforts do not involve any transfer of funds to these companies as they are already well funded. Activities include outreach events, public talks by professionals, and career panels.

Consortium Operations

The number of WSGC members is dictated in part by our ability to fund their subcontract proposals. Prospective members meet with the executive committee during the annual meeting and are approved by the membership.

The executive committee, as described earlier, sets the mission, vision, and long-term goals for our consortium. The committee also votes on changes in mission, policy, and director. One face-to-face meeting is scheduled annually. Attendees may participate via technologies such as Zoom, if necessary. Telecons are held as needed to complete specific projects (joint proposals, application review, etc).

Representatives at member institutions must coordinate WSGC projects at their locations and serve as conduits for disseminating information about NASA opportunities such as internships, fellowships, requests for proposals, curriculum materials, and professional development workshops. Representatives at partner institutions are responsible for reporting their student information to the lead institution and disseminating information about NASA opportunities on their campuses.

All members of WSGC and their students also participate in the annual WSGC poster session and reception. Email lists and social media are used to distribute NASA and WSGC news such as internships, fellowships, requests for proposals, and professional development workshops.

All members received a copy of the AO for the proposed efforts. They submitted their proposals to the lead institution. The PI notified the institutions about areas in their proposals that may not have been in compliance with the AO requirements. Revisions were made and submitted to the lead institution. As many elements as possible that were competitive, met the AO requirements, and fit within the budget requirements were selected to be part of this proposal. Within each of the proposals, the scholars, interns, and fellows are all selected on a competitive process.

Lead Institution Staff

The PI is housed at the lead institution and is responsible for all aspects of the proposed work, including NIF, and the development and implementation of current and new NASA related student projects. He is assisted by an Associated Director in these areas but with a focus on underserved and underrepresented communities, particularly in rural WA. An Academic Adviser it provides mentoring, academic counseling and professional development workshops including poster presentations, oral talks, and vita development for the students in the program. The Academic Adviser also coordinates the NIF programs and liaison with underrepresented communities and nonprofit organizations to maximize STEM opportunities for underrepresented minority students, and assist in supporting the students in the higher education efforts.

Administrative Support.

The Program Manager is responsible for managing the fiscal and reporting requirements for WSGC. A fiscal specialist provides support for dispersal of NIF and studentship funds, travel (both staff and students) and the purchase of supplies for WSGC and student projects. Two months of support is requested for this effort. The Public Information Specialist/Webmaster is responsible for collection of reporting data, entry of data into OEPM, event agendas, the WSGC electronic newsletter, and social media.

The proposed funding support for this staff is detailed in the budget justification.

Vita: Robert M. Winglee
Professor, Earth and Space Sciences
Director, Washington NASA Space Grant
Director, Northwest Earth and Space Sciences Pipeline
Department of Earth and Space Sciences, Box 351310
University of Washington, Seattle, WA 98195-1310; Ph: 1-206-685-8160

Professional Preparation.

Ph. D., University of Sydney, 1984; B. Sc. (Hons.), University of Sydney, 1980

Appointments. (Last 15 yrs)

7/07 – present: Director, Washington NASA Space Grant Consortium, University of Washington
1/16 – present: Director, Northwest Earth and Space Science Pipeline, Washington, Montana and Oregon
7/05—6/15: Chair, Department Earth and Space Sciences
9/00—present: Professor, Dept. of Earth and Space Sciences (formerly Geophysics Program), UW
7/00—present: Adjunct Professor, Department of Aeronautics and Astronautics, UW. University of Washington
5/93—present: Adjunct Professor, Department of Physics, UW

Awards.

College of the Environment, Outstanding Diversity Commitment by a Faculty Member, 2016.
Univ. of Washington Undergraduate Research Mentor Awardee, 2014.
DISCOVER Magazine Awards for Technological Innovation, sponsored by the Christopher Columbus Fellowship Foundation, Aerospace category, 2001.

Students Supervised

PhD's: M. McKean, Z. Zhu, R. Elsen, A. Goodson, M. Wilber, S. Matt, E. Harnett*, T. Ziemba, L Giersch, C. Paty*, J. Prager, D. Snowden*, Kidder*, M. Cash*, B. R. Roberson, I. Johnson, K. Vereen** A.
Masters: Q. Li, D. Collin, M. Bartone, D. Peters, Moon-Young Choi*, I. Slobodov, I. Johnson, J. Waldock*, T. Robinson*, N. Murakami*, C. Truitt, J. Koch, M. Wennerstrom

Current Graduate Students

P. Northway (Earth and Space Sciences) *
P. Strummer (Physics)
M. Danner (Earth and Space Sciences) *
M. Rosales (Aeronautics and Astronautics)**

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Current Graduate Students

P. Northway (Earth and Space Sciences) *
P. Strummer (Physics)
M. Danner (Earth and Space Sciences) *
M. Rosales (Aeronautics and Astronautics)**

Undergraduate Students Mentored in Research

J. Hughes, K. Princehouse. L. Winstrom, B. Warrick, M. Bentz*, E. Suthers, H. Cummings*, J. Cascarden, L. Rachmeler*, M. Nivala, T. Schnackenberg, S. Isley, A. Stickle*, E. Bell*, G. Quetin, J. Trescott, J. DeBoever*, J. Porter*, J. Duncan, S. Campbell, A. Bourdages, Keith Cowan, Julian Picard, Deven Bryant, Sr., Theodore Newell, Reece Beigh, Tia Lerud*, Jamie Wadlock*, Nadia Ifland*, Chad Tuitt, Craig Fould, Brandt Monson, Austin Arechiga, Huang Vo*, Caleb Moore, Austin Arechiga, Brittney Dobson*, Carlos Herrera, Brian Petrich, Tyler Valentine**, Chayse Aubuchon, Hunter Mellema, Rick Shibata, Nicholas Gutierrez****, Angela Kimer*,Tyler Valentine**, John Corry, Alex, Lee, Marcquis Deshawn**, Steve Papagayo

* Women

** Underrepresented Minority

Published Over 140 papers.

Recent Publications IN SPACE SCIENCES:

Winglee, R. M., A. Kidder, E. Harnett, N. Ifland, C. Paty, and D. Snowden, Generation of Periodicities within the Kronian Magnetosphere by Titan's Interaction with the Centrifugal Instability, *J. Geophys. Res*., 118, 4253–4269, DOI: 10.1002/jgra.50397, 2013.

Winglee, R. M. and E. Harnett, The Influence of Temperature Anisotropies in Controlling the Development of Magnetospheric Substorms, arXiv: 1605.01399, astro-ph.EP, 2016.

Winglee, R. M. and E. Harnett, Magnetosphere Magnetic Field Wobble Effects on the Dynamics of the Jovian Magnetosphere, arXiv: 1607.02167, astro-ph.EP, 2016.

Winglee, R. M., and C. Truitt, High-Velocity Penetrators as a means of extracting core samples from rocky solar system objects, *Acta Astronautica,* 137, 274, http://dx.doi.org/10.1016/j.actaastro.2017.04.022, 2017.

Recent Publications IN SPACE PROPULSION:

Rosales, M. A., P. E. Northway, and R. M. Winglee, Air-breathing pulsed plasma thruster with a variable spacing cathode for atmospheric satellite applications, 53rd AIAA/SAE/ASEE Joint Propulsion Conference, AIAA 2017-5039, 2017.

Northway, P. E., C. Aubuchon, H. Mellema, and R. M. Winglee, Pulsed plasma thruster gains in specific thrust for Cubesat propulsion, 53rd AIAA/SAE/ASEE Joint Propulsion Conference, AIAA 2017-5040, 2017.

Winglee, R. M., T. Robinson, M. Danner, and J. Koch, Cryo-braking using penetrators for enhanced capabilities for the potential landing of payloads on icy solar system objects, *Acta Astronautica,* **144**, 136, https://doi.org/10.1016/j.actaastro.2017.12.019, 2018.

Washington NASA Space Grant College and Fellowship Program Extension
Budget Explanation, 05/01/2019 -05/31/2020

Salaries

Key Personnel. Washington NASA Space Grant Consortium (WSGC) Director, Professor R. M. Winglee, will continue to be responsible for all aspects of the proposed work, including NIF, and the NASA related student projects. He is a tenured faculty member so that the time to do administrative work comes at no cost to the program. The requested support is for his efforts in supporting the development of the CubeSat program at the UW, and the consortium wide effort for the building of supersonic rocket systems.

An Associate Director will be the lead for providing professional development for educators participating in participating in the SMD related student challenges. This effort will focus on working with underserved and underrepresented communities, particularly in rural WA.

The total funding requested for this effort is:

	Yr 1	Yr 2	Yr 3	Yr 4
Senior personnel				
R. Winglee (PI)* 0.5 mos @ $16,604/month	8,302	8,551	8,808	9,072
Associate Director** 1 mos @ $8,800/month	8,800	9,064	9,336	9,616

Other Personnel.
Academic Adviser. WSGC is able to sustain a high retention rate (>90%) because through the efforts of the Academic Adviser it provides mentoring, academic counseling and professional development workshops including poster presentations, oral talks, and vita development for the students in the program. The Academic Adviser also coordinates the NIF programs and liaison with underrepresented communities and nonprofit organizations to maximize STEM opportunities for underrepresented minority students, and assist in supporting the students in the higher education efforts. A total of 9 months at 100% is requested for this effort.

Administrative Support. The Program Manager is responsible for managing the fiscal and reporting requirements for WSGC. Ten percent (40%) of 12 months of funding is requested to continue her total support for efforts on WSGC. A fiscal specialist provides support for dispersal of NIF and studentship funds, travel (both staff and students) and the purchase of supplies for WSGC and student projects. Two months of support is requested for this effort. The Public Information Specialist/Webmaster is responsible for collection of reporting data, entry of data into OEPM, event agendas, the WSGC electronic newsletter, and social media. A 33% support for 12 months is requested for this effort. A fiscal specialist at 33% is requested to support processing of student applications, scholars, order supplies, and assist with budget analysis.

The total funding requested for Other Personnel is as follows:

Staff	Yr 1	Yr 2	Yr 3	Yr 4
Program adminstrator (12 mos @ 40%)** 4 mos @ $6,267/month	25,068	26,071	27,114	28,198
Fiscal Specialist (12 mos @ 33%)*** 2 mos @ $4,238/month	8,476	8,815	9,168	9,534
Public Information Specialist** 12 mos@ 33% $6,013/month	24,052	25,014	26,015	27,055
Academic Adviser** 9 mos @ $4,767/month	42,903	44,619	46,404	48,260

Fringe Benefits

The current fringe rates used are actual rates in effect at 23.9% for faculty (*), 32.1% for professional staff (**), and 41.2% for classified staff (***).

Summary of requested salary support and matching provided by unrecovered RCR proportioned out relative to requested costs:

Senior personnel		Yr 1		Yr 2	
		NASA Funding (Mths)	Cost Share (unrecovered RCR)	NASA Funding (Mths)	Cost Share (unrecovered RCR)
R. Winglee (PI)	*Dollars*	10,286	2,983	10,595	3,072
	Time	0.5	0.1	0.5	0.1
Associate Director	*Dollars*	11,625	3,371	11,974	3,472
	Time	1	0.3	1	0.3
Program Admin.	*Dollars*	33,115	9,603	34,439	9,987
	Time	4	1.2	4	1.2
Fiscal Specialist	*Dollars*	16,197	4,697	16,845	4,885
	Time	2	0.6	2	0.6
Public Info Specialist	*Dollars*	37,824	10,969	39,337	11,408
	Time	4		4	
Academic Adviser	*Dollars*	46,395	13,455	48,251	13,993
	Time	9	2.6	9	2.6

Senior personnel		Yr 3		Yr 4	
		NASA Funding (Mths)	Cost Share (unrecovered RCR)	NASA Funding (Mths)	Cost Share (unrecovered RCR)
R. Winglee (PI)	*Dollars*	10,913	3,165	11,240	3,260
	Time	0.5	0.1	0.5	0.1
Associate Director	*Dollars*	12,333	3,576	12,703	3,684
	Time	1	0.3	1	0.3
Program Admin.	*Dollars*	35,817	10,387	37,250	10,802
	Time	4	1.2	4	1.2
Fiscal Specialist	*Dollars*	17,518	5,080	18,219	5,284
	Time	2	0.6	2	0.6
Public Info Specialist	*Dollars*	40,910	11,864	42,547	12,339
	Time	4		4	1.2
Academic Adviser	*Dollars*	50,181	14,552	52,188	15,135
	Time	9	2.6	9	2.6

Services

Campus services includes freight, postage, and printing of reception programs and student information materials, and postage. Costs are close to actual amounts encountered in Year 3. These costs include:

Freight	300
Printing : Reception	1,300
Recruiting and Outreach	1,700
Postage	600
Catering	1,400
Total Campus Services	**$ 5,300**

An approved computer cost-center provides enhanced IT services and computer security. Participation in this cost center by WSGC is at $1,000 per person for two persons.

Event fees include room rentals ($1,200), audio/visual services ($400) and parking ($200) for scholarship recruitment events, statewide consortium meetings, and an annual reception and poster session. Longitudinal tracking, which is required to meet NASA reporting standards, is provided by EPSS ($4,400). The totals for these services are as follows:

SERVICES	
Campus Services	5,300
Computer Services	2,000
Event fees (room rental, parking)	1,800
Longitudinal Tracking	4,400
TOTAL SERVICES	**13,500**

Travel
Funding is requested to attend each of the

Travel to Space Grant Directors Meetings (per person)

NSG Spring Meeting		
Airfare (Washington, DC)		$600
Registration		$475
Per Diem, 3 days @$200/day		$600
Ground Transportation		$20
	Total Item Cost	$1,695
NSG Fall Meeting		
Airfare (Montana)		$400
Registration		$425
Per Diem, 3 days @$150/day		$450
Ground Transportation		$295
	Total Item Cost	$1,570

Two person will travel to each of these meeting.

NASA Site Visit @ Consortium Meeting		
Per Diem, 25 people @ $40/day 1 day.		$1,000
(PI and lead students)	Total Cost	$1,000

Supplies

The items under supplies are for the support of courses and hands-on experimental opportunities being supported by WSGC.

Supersonic Rocket program involves carbon fiber (@ $120/yd, 9 yds) and rocket motors at $80-200/motor, for 10 motors, misc. rocket parts (nose cone, parachutes) for $100/system, for a total

of $4000, in Yr 1 starting as a consortium wide effort. In the following year, the requested funds are only for the UW effort only, with the affiliates contributing their funds in subsequent years. Hence the reduced request for funds in Years 2-4, from $1,200 in Yr 2, $1200 in yr 3 and $924 in Yr 4.

Supplies for the Student Challenges include Lego Mindstorm robot systems at $500 per item. We plan for 10 in Yr 1, 4 in Yr 2, 2 in Yr 3 and 2 in Yr 4. Each system would be given to a different school on a competitive basis and as we build up their infrastructure less systems will be needed as hence the reduced request in the latter years.

Supplies for the balloon projects require helium at $200/per K bottle, balloons at $100/balloon; and GPS tracking system at $200 for GPS tracking and flight computer @$100 each. It is expected that at least 50% of the equipment will be recovered each year. The proposed expenditures are therefore expected to provide support for six balloon flights each year.

The CubeSat supplies include:

PCB fabrication and assembly (3-6)	@ $700 each
Micro-controllers (3-6)	@ $100 each
Radio (1)	@$1000
Batteries (3)	@ $200 each

Year 1 will have the most costs associated with building up initial subsystems (4 total) at a total cost of $7813. Subsequent years will see primarily refinement and improvement of these initial subsystems so that the required amount for CubeSat supplies decreases in subsequent years to $7253 in Yr 2, $5291 in Yr 3 and $4000 in Yr 4.

Participant Support.

Participants at the University of Washington include:

UW Undergrad Scholars (12 students)
Consortium-wide Community College Trainees (4 total)
K-12 Educator Additional Support (20 educators)

UW Graduate Fellowship (3 qtrs) (NIF)

NASA Internships, 4 awards at $8000 includes travel supplement (NIF)

Industry Internships (4 interns; NIF)

Cubesat Internships (2 interns; NIF)

University of Washington Summer Undergrad Research Program SURP
(24 interns, NIF)

For these 73 participants, approximately $245k is requested each year.

Other Direct Funded Programs through Subcontracts include for each year

Washington State University (20 grad fellows)	50,000
Seattle Central College (4 interns, 8 studentships, rocketry)	45,000
Whitworth University (3 interns, 10 studentships)	12,500
Peninsula College (3 studentships)	10,000
University of Puget Sound (6 studentships)	10,000
Bellevue College (2 students, rocketry)	10,000
Everett College (rocketry, HAB; 40 Middle School students)	5,000
Central Washington University (4 studentships, rocketry, HAB)	12,000
Western Washington University (6 interns, 3 studentships)	38,820
Pierce College (rocketry; 40 grade 6-12)	7,600
Pacific Science Center (3 studentships; 40 outreach and PD)	9,250
Heritage University (20 grade 6-12)	16,000

Indirect Costs and Cost Share

The University of Washington's Facilities and Administrative (F&A) rate for training and educational activities is 37%, as per the current DHHS agreement, dated 7/21/17. However, the UW has agreed to waive a portion of the F&A costs because of its strong support of the Space Grant program. The amount requested is 8% of modified total direct costs (MTDC). The remaining 29% has been waived by the UW and is included as cost share. In addition, UW will provide tuition waivers for UW scholarship winners as part of its match. All members of WSGC receiving funds from the program will also provide cost share as well.

The breakdown of costs and cost sharing in terms of the NASA subtopics is provided after the subcontract information. These components need the NASA requirements.

Required Additional Information

The following budget for the lead institution is given in the next few pages. This is followed by the subcontract information.

Summary of cost share information follows these subcontracts.

Table 1: Funds Requested FOR NASA Only

Space Grant College and Fellowship Program 8
6/1/20 to 05/31/24

	Year 1 NASA	Year 2 NASA	Year 3 NASA	Year 4 NASA	Cummaltive Total
Senior personnel					
R. Winglee (PI)* 0.5 mos @ $16,604/month	8,302	8,551	8,808	9,072	
Associate Director** 1 mos @ $8,800/month	8,800	9,064	9,336	9,616	
Staff					
Program adminstrator (12 mos @ 33%)** 4 mos @ $6,267/month	25,068	26,071	27,114	28,198	
Fiscal Specialist (6 mos @ 33%)*** 2 mos @ $4,238/month	8,476	8,815	9,168	9,534	
Public Information Specialist** 12 mos@ 33% 4mos $6,013/month	24,052	25,014	26,015	27,055	
Academic Adviser** 9 mos @100% $4,767/month	42,903	44,619	46,404	48,260	
TOTAL Salary	**117,601**	**122,134**	**126,843**	**131,736**	**498,314**
BENEFITS					
*Faculty Benefits @23.9% (PI)	1,984	2,044	2,105	2,168	
**Professional staff benefits @ 32.1% (co-I)	2,825	2,910	2,997	3,087	
**Professional staff benefits @ 32.1% (Program Admin)	8,047	8,369	8,703	9,052	
**Professional staff benefits @ 32.1% (Public Info Spec)	7,721	8,030	8,351	8,685	
**Professional staff benefits @ 32.1% (Academic Adviser)	13,772	14,323	14,896	15,491	
***Classified staff Benefits @ 41.2%	3,492	3,632	3,777	3,928	
TOTAL BENEFITS	**37,840**	**39,306**	**40,829**	**42,411**	**160,386**
TOTAL SALARIES & BENEFITS	**155,441**	**161,440**	**167,672**	**174,146**	**658,700**
SERVICES					
Campus Services	5,300	5,300	5,300	5,300	
Computer Services	2,000	2,000	2,000	2,000	
Event fees (room rental, parking)	1,800	1,800	1,800	1,800	
Longitudinal Tracking	4,400	4,400	4,400	4,400	
TOTAL SERVICES	**13,500**	**13,500**	**13,500**	**13,500**	**54,000**
TRAVEL					
Travel to Directors Spring Meeting (2 persons)	3,390	3,390	3,390	3,390	
Travel to Directors Fall Meeting (2 persons)	3,140	3,140	3,140	3,140	
NASA Site visit + Consortium Meeting	1,000	1,000	1,000	1,000	
TOTAL TRAVEL	**7,530**	**7,530**	**7,530**	**7,530**	**30,120**
Supplies and Materials					
Hardware/supplies for rocket programs	4,000	1,200	1,200	924	
Supplies for Student Challenges	5,000	2,000	1,000	1,000	
Balloon Supplies	3,600	1,800	1,800	700	
Hardware for CubeSat Program	7,813	7,253	5,291	4,000	
TOTAL Supplies	**20,413**	**12,253**	**9,291**	**6,624**	**48,581**

PARTICPANT COSTS					
Participants					
UW Undergrad Scholars (12 students)	60,000	60,000	60,000	60,000	
Consortium-wide Community College Undergrads (4 total)	20,000	20,000	20,000	20,000	
K-12 Educator Additional Support (20 educators)	10,320	8,000	7,785	5,669	
UW Graduate Fellowship (3 qtrs) (NIF)	33,487	33,862	34,245	34,642	
NASA Internships, 4 awards (NIF)	32,000	32,000	32,000	32,000	
Industry Internships (4 interns; NIF)	16,000	16,000	16,000	16,000	
Cubesat Internships (2interns; NIF)	10,000	10,000	10,000	10,000	
University of Washington Summer Undergrad Research Program SURP (24 interns, NIF)	66,000	66,000	66,000	66,000	
Total Participant Costs	**247,807**	**245,862**	**246,030**	**244,310**	**984,008**
					-
Subcontracts					
Washington State University (20 grad fellows)	50,000	50,000	50,000	50,000	**200,000**
Seattle Central College (4 interns, 8 studentships, rocketry)	45,000	45,000	45,000	45,000	**180,000**
Whitworth University (3 interns, 10 studentships, 25 grade 6-12)	12,500	12,500	12,500	12,500	**50,000**
Peninsula College (3 studentships)	10,000	10,000	10,000	10,000	**40,000**
University of Puget Sound (6 studentships)	10,000	10,000	10,000	10,000	**40,000**
Bellevue College (2 students, rocketry)	10,000	8,000	8,000	8,000	**34,000**
Everett College (rocketry, HAB; 40 Middle school students)	5,000	5,000	5,000	5,000	**20,000**
Central Washington University (4 studentships, rocketry, HAB)	12,000	12,000	12,000	12,000	**48,000**
Western Washington University (6 interns, 3 studentships)	38,820	38,820	38,820	38,820	**155,280**
Pierce College (rocketry; 40 grade 6-12)	7,600	7,600	7,600	7,600	**30,400**
Pacific Science Center (3 studentships; 40 outreach and PD)	9,250	9,250	9,250	9,250	**37,000**
Heritage University (20 grade 6-12)	16,000	14,000	14,000	14,000	**58,000**
Total Subcontracts	**226,170**	**222,170**	**222,170**	**222,170**	**892,680**
					-
TOTAL DIRECT COSTS	**670,861**	**662,755**	**666,192**	**668,280**	**2,668,088**
Match Excluding RCR Waiver					-
Base Subject to RCR	**364,234**	**278,073**	**235,093**	**209,000**	**1,086,401**
Indirect costs at 8% MTDC (8% NASA, 29% UW cost share)	**29,139**	**22,246**	**18,807**	**16,720**	**86,912**
Waiver RCR at 29% as UW cost share					-
TOTAL NASA Funds	**700,000**	**685,000**	**685,000**	**685,000**	**2,755,000**

Table 2: NASA Funds + Cost Share

Space Grant College and Fellowship Program 8
6/1/20 to 05/31/24

	Year 1		Year 2		Year 3		Year 4		Cummaltive Total
	NASA	Cost Share	NASA	Cost Share	NASA	Cost Share	NASA	Cost Share	
Senior personnel									
R. Winglee (PI)* 0.5 mos @ $16,604/month	8,302		8,551		8,808		9,072		
Associate Director** 1 mos @ $8,800/month	8,800		9,064		9,336		9,616		
Staff									
Program adminstrator (12 mos @ 33%)** 4 mos @ $6,267/month	25,068		26,071		27,114		28,198		
Fiscal Specialist (6 mos @ 33%)*** 2 mos @ $4,238/month	8,476		8,815		9,168		9,534		
Public Information Specialist** 12 mos@ 33% 4mos $6,013/month	24,052		25,014		26,015		27,055		
Academic Adviser** 9 mos @100% $4,767/month	42,903		44,619		46,404		48,260		
TOTAL Salary	**117,601**		**122,134**		**126,843**		**131,736**		**498,314**
BENEFITS									
*Faculty Benefits @23.9% (PI)	1,984		2,044		2,105		2,168		
**Professional staff benefits @ 32.1% (Assoc Dir)	2,825		2,910		2,997		3,087		
**Professional staff benefits @ 32.1% (Program Admin)	8,047		8,369		8,703		9,052		
**Professional staff benefits @ 32.1% (Public Info Spec)	7,721		8,030		8,351		8,685		
**Professional staff benefits @ 32.1% (Academic Adviser)	13,772		14,323		14,896		15,491		
***Classified staff Benefits @ 41.2%	3,492		3,632		3,777		3,928		
TOTAL BENEFITS	**37,840**		**39,306**		**40,829**		**42,411**		**160,386**
TOTAL SALARIES & BENEFITS	**155,441**		**161,440**		**167,672**		**174,146**		**658,700**
SERVICES									
Campus Services	5,300		5,300		5,300		5,300		
Computer Services	2,000		2,000		2,000		2,000		
Event fees (room rental, parking)	1,800		1,800		1,800		1,800		
Longitudinal Tracking	4,400		4,400		4,400		4,400		
TOTAL SERVICES	**13,500**		**13,500**		**13,500**		**13,500**		**54,000**
TRAVEL									
Travel to Directors Spring Meeting (2 persons)	3,390		3,390		3,390		3,390		
Travel to Directors Fall Meeting (2 persons)	3,140		3,140		3,140		3,140		
NASA Site visit + Consortium Meeting	1,000		1,000		1,000		1,000		
TOTAL TRAVEL	**7,530**		**7,530**		**7,530**		**7,530**		**30,120**
Supplies and Materials									
Hardware/supplies for rocket programs	4,000		1,200		1,200		924		
Supplies for Student Challenges	5,000		2,000		1,000		1,000		
Balloon Supplies	3,600		1,800		1,800		700		
Hardware for CubeSat Program	7,813		7,253		5,291		4,000		
TOTAL Supplies	**20,413**		**12,253**		**9,291**		**6,624**		**48,581**
PARTICPANT COSTS									
Participants									
UW Undergrad Scholars (12 students)	60,000	170,000	60,000	170,000	60,000	185,000	60,000	190,000	
Consortium-wide Community College Undergrads (4 total)	20,000	35,000	20,000	35,000	20,000	35,000	20,000	35,000	
K-12 Educator Additional Support (20 educators)	10,320		8,000		7,785		5,669		
UW Graduate Fellowship (3 qtrs) (NIF)	33,487		33,862		34,245		34,642		
NASA Internships, 4 awards (NIF)	32,000		32,000		32,000		32,000		
Industry Internships (4 interns; NIF)	16,000		16,000		16,000		16,000		
Cubesat Internships (2interns; NIF)	10,000		10,000		10,000		10,000		
University of Washington Summer Undergrad Research Program SURP (24 interns, NIF)	66,000		66,000		66,000		66,000		
Total Participant Costs	**247,807**		**245,862**		**246,030**		**244,310**		**984,008**
		205,000		**205,000**		**220,000**		**225,000**	**855,000**
Subcontracts									
Washington State University (20 grad fellows)	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	**200,000**
Seattle Central College (4 interns, 8 studentships, rocketry)	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	**180,000**
Whitworth University (3 interns, 10 studentships, 25 grade 6-12)	12,500	12,500	12,500	12,500	12,500	12,500	12,500	12,500	**50,000**
Peninsula College (3 studentships)	10,000	10,096	10,000	10,096	10,000	10,096	10,000	10,096	**40,000**
University of Puget Sound (6 studentships)	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	**40,000**
Bellevue College (2 students, rocketry)	10,000	10,000	8,000	8,000	8,000	8,000	8,000	8,000	**34,000**
Everett College (rocketry, HAB; 40 Middle school students)	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	**20,000**
Central Washington University (4 studentships, rocketry, HAB)	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	**48,000**
Western Washington University (6 interns, 3 studentships)	38,820	38,820	38,820	38,820	38,820	38,820	38,820	38,820	**155,280**
Pierce College (rocketry; 40 grade 6-12)	7,600	7,800	7,600	7,800	7,600	7,800	7,600	7,800	**30,400**
Pacific Science Center (3 studentships; 40 outreach and PD)	9,250	9,250	9,250	9,250	9,250	9,250	9,250	9,250	**37,000**
Heritage University (20 grade 6-12)	16,000	16,000	14,000	14,000	14,000	14,000	14,000	14,000	**58,000**

Total Subcontracts	**226,170**		**222,170**		**222,170**		**222,170**		**892,680**	
		226,466		**222,466**		**222,466**		**222,466**	**893,864**	
									0	
TOTAL DIRECT COSTS	**670,861**		**662,755**		**666,192**		**668,280**		2,668,088	
Match Excluding RCR Waiver		**431,466**		**427,466**		**442,466**		**447,466**	1,748,864	
									0	
Base Subject to RCR	**364,234**		**278,073**		**235,093**		**209,000**		1,086,401	
									0	1,581,688
Indirect costs at 8% MTDC (8% NASA, 29% UW cost share)	**29,139**		**22,246**		**18,807**		**16,720**		86,912	
Waiver RCR at 29% as UW cost share		**105,628**		**80,641**		**68,177**		**60,610**	315,056	
TOTAL NASA Funds	**700,000**		**685,000**		**685,000**		**685,000**		**2,755,000**	2,063,920
Total Match		**537,094**		**508,107**		**510,643**		**508,076**	**2,063,920**	
TOTAL COSTS		**1,237,094**		**1,193,108**		**1,195,643**		**1,193,077**	**4,818,921**	

Central Washington University
400 E. University Way, Department of Physics, Ellensburg, WA 98926-7422

TO:	Washington NASA Space Grant Consortium Earth and Space Sciences, Box 351310 University of Washington Seattle, WA 98195-1310 Tel: 206.543.1943; email: nasa@u.washington.edu
TYPE OF SUPPORT REQUESTED:	Subcontract
TITLE OF PROJECT:	Enhancing NASA related research and activities at Central Washington University
PRINCIPAL INVESTIGATOR:	Dr. Darci Snowden Assistant Professor Department of Physics Central Washington University 400 E. University Way* Ellensburg, WA 98926-7422 Tel: 509-963-2914; email: snowdend@cwu.edu
PERIOD OF PERFORMANCE:	June 1, 2020 – May 31, 2024
AMOUNT REQUESTED:	
OFFICE TO BE CONTACTED REGARDING NEGOTIATION OF AWARD:	
DATE: August 20th, 2019	
OFFICE AUTHORIZED TO GIVE INSTITUTIONAL APPROVAL:	

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February 6, 2015

To whom it may concern,

I confirm that I am named as Collaborator to the proposal, entitled Washington State Space Grant College and Fellowship Program, to be submitted by Professor Robert Winglee to the NASA Training Grant Announcement Number NNH15ZHA003N. I am willing and able to carry out the responsibilities associated with Central Washington University (CWU). I also understand that my participation in the proposed work will be judged during the peer review. The objectives, management plan, and budget described by the proposal are an accurate description of the proposed work to be carried out at CWU. Broadly, the proposed funds allocated to CWU will be used to provide undergraduates with faculty mentored research and outreach opportunities in NASA-related fields. Specifically, the funds will be spent on providing necessary equipment for rocket and astronomy related research projects and for summer research fellowships for under-represented students.

Sincerely,

Dr. Darci Snowden
Assistant Professor

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PROPOSED PROGRAMS AT CENTRAL WASHIGNTON UNIVERSITY

Institutional PI: Dr. Darci Snowden

Central Washington University (CWU) is a regional university with approximately 10,000 students. Most students are from Washington state and 35% are students of color including 15% Hispanic/Latino. These demographics make CWU campus more diverse than Washington state. The presence of Washington Space Grant at a diverse regional institution like CWU addresses a main objective of the national program to recruit and train women and underrepresented minorities. We plan to request funds for supplies, salary, and travel costs to support programs that fall under the *Aeronautics Research, Human Space Flight, and Science* areas of emphasis in the mission directorate.

1. Research Related Equipment for High Altitude Balloon and Supersonic Rocket Program
High Altitude Balloon and Rocket Research Program

General Description: CWU has a ~4-year track record in supporting student balloon and rocket research projects. NASA's *Aeronautics Research* program includes a focus on, "Innovation in Commercial Supersonic Aircraft." We will introduce students to the concept of supersonic flight through the building and flying of supersonic rockets. We also propose funds to support a research program that falls under NASA's *Human Space Flight* program's area of *Space Biology*. Specifically, we will study the effects of cold temperatures and high UV and particle radiation environments on E. coli bacteria using student built high altitude balloon payloads and laboratory facilities at CWU. These projects will take place during the academic year; therefore, we are proposing for funding for supplies and associated travel only.
Estimated Yearly Participation: 4-6 students

2. High Altitude Balloon Round-Up

General Description: Ellensburg is an ideal location to launch high-altitude balloons and CWU already sporadically hosts launches of high school and college groups from around the state. We propose to host a two-day ballooning event during the third year of the subcontract for groups of students and educators to gather, launch, and learn from one another. CWU would provide basic launch materials along a forum for educators and students to share experiences, experimental results, and best practices. Funds would be requested to pay for room fees, catering, ballooning supplies, helium, a student assistant, and (potentially) housing.
Estimated Participation: ~30 students

3. Astronomy Research Fellowship

General Description: CWU has a 0.6-m observatory on campus that is well suited for short-term observation projects. We propose to host a week- or two-week-long research experience for CWU students, as well as students from other 4-year and 2-year colleges. Participants would be selected through a competitive process. Funds are requested to pay for an undergraduate telescope supervisor, supplies, and room/board for non-resident participants.
Estimated Yearly Participation: 2-3 students

Total Budget: Our budget will not exceed **$12,000 per year**. Matching funds would be provided primarily through faculty workload units.

Statement on diversity: CWU will focus on including students from traditionally underrepresented groups (women and minorities) in these programs. We plan to target these groups through direct selection, advertisement, and student advising. We will also provide a supportive environment with a reasonable barrier for entry. Research opportunities related to balloons, rockets, and astronomy will be advertised broadly and diversity will be a selection criterion. The high altitude balloon round-up would be designed to attract students and educators from the surrounding areas that have significant Hispanic/Latino and Native American populations.

Year 1 Proposed Budget **Central Washington University**
Darci Snowden, Department of Physics
Budget Period: June 1, 2020 – May 31, 2021

	WA Space Grant	CWU
Supplies and Materials		
1. Supersonic rocket supplies Description: Rocket kits, engines, sensors	$3,880	$0
2. High Altitude Balloon (HAB) Supplies Description: helium for launch, Iridium tracking, sensors	$600	$0
Travel		
3. Travel to supersonic rocket launch Description: 4-6 students to Brothers, OR	$1,200	$0
4. Travel to retrieve HAB Description: Gas/mileage for one retrieval	$100	$0
Salary/Wages		
5. Astronomy Research Fellowship	$4,000	$0
Benefits		
6. Astronomy Fellowship Benefits 3% of Wages	$120	$0
7. Faculty Workload Units (WLU) 6 WLU at $2K/WLU	$0	$12,000
Total	**$9,900**	**$0**
TOTAL DIRECT COSTS	**$9,900**	**$12,000**
TOTAL INDIRECT COSTS	**$2,100***	**$0**
**Indirect cost are calculated as 52.5% of the student wages.*		
TOTAL BUDGET	**$12,000**	**$12,000**

Distribution of costs
Request from WA Space Grant **$12,000**
CWU Contribution **$12,000**

TOTAL PROPOSED BUDGET **$24,000**

Note: While supplies and material costs may vary depending on the specific projects performed with undergraduates, the total amount requested from the Washington Space Grant Consortium shall not exceed $12,000.

Year 2 Proposed Budget **Central Washington University**
Darci Snowden, Department of Physics
Budget Period: June 1, 2021 – May 31, 2022

	WA Space Grant	CWU
Supplies and Materials		
1. Supersonic rocket supplies Description: Rocket kits, engines, sensors	$2,000	$0
2. High Altitude Balloon (HAB) Supplies Description: helium for launch, Iridium tracking, sensors	$1,347	$0
Travel		
3. Travel to supersonic rocket launch Description: 4-6 students to Brothers, OR	$1,200	$0
4. Travel to retrieve HAB Description: Gas/mileage for multiple retrievals	$300	$0
Salary/Wages		
5. Astronomy Research Fellowship	$4,600	$0
Benefits		
6. Astronomy Fellowship Benefits 3% of Wages	$138	$0
7. Faculty Workload Units (WLU) 6 WLU at $2K/WLU	$0	$12,000
Total	**$9,585**	**$0**
TOTAL DIRECT COSTS	**$9,585**	**$12,000**
TOTAL INDIRECT COSTS	**$2,415***	**$0**
TOTAL BUDGET	**$12,000**	**$12,000**

**Indirect cost are calculated as 52.5% of the student wages.*

Distribution of costs
Request from WA Space Grant **$12,000**
CWU Contribution **$12,000**

TOTAL PROPOSED BUDGET **$24,000**

Note: While supplies and material costs may vary depending on the specific projects performed with undergraduates, the total amount requested from the Washington Space Grant Consortium shall not exceed $12,000.

Year 3 Proposed Budget **Central Washington University**
Darci Snowden, Department of Physics
Budget Period: June 1, 2022 – May 31, 2023

	WA Space Grant	CWU
Supplies and Materials		
1. Supersonic rocket supplies Description: Rocket kits, engines, sensors	$1,500	$0
2. High Altitude Balloon (HAB) Supplies Description: helium for launch, Iridium tracking, sensors	$1,335	$0
3. High Altitude Balloon Round-Up Description: equipment, room fees, Catering, housing	$3,000	
Travel		
3. Travel to supersonic rocket launch Description: 4-6 students to Brothers, OR	$1,200	$0
4. Travel to retrieve HAB Description: Gas/mileage for multiple retrievals	$300	$0
Salary/Wages		
5. Astronomy Research Fellowship	$3,000	$0
Benefits		
6. Astronomy Fellowship Benefits 3% of Wages	$90	$0
7. Faculty Workload Units (WLU) 6 WLU at $2K/WLU	$0	$12,000
Total	**$10,425**	**$0**
TOTAL DIRECT COSTS	**$10,425**	**$12,000**
TOTAL INDIRECT COSTS	**$1,575***	**$0**
**Indirect cost are calculated as 52.5% of the student wages.*		
TOTAL BUDGET	**$12,000**	**$12,000**

Distribution of costs	
Request from WA Space Grant	**$12,000**
CWU Contribution	**$12,000**
TOTAL PROPOSED BUDGET	**$24,000**

Note: While supplies and material costs may vary depending on the specific projects performed with undergraduates, the total amount requested from the Washington Space Grant Consortium shall not exceed $12,000.

Year 4 Proposed Budget **Central Washington University**
Darci Snowden, Department of Physics
Budget Period: June 1, 2023 – May 31, 2024

	WA Space Grant	CWU
Supplies and Materials		
1. Supersonic rocket supplies Description: Rocket kits, engines, sensors	$1,000	$0
2. High Altitude Balloon (HAB) Supplies Description: helium for launch, Iridium tracking, sensors	$947	$0
Travel		
3. Travel to supersonic rocket launch Description: 4-6 students and to Brothers, OR	$1,200	$0
4. Travel to retrieve HAB Description: Gas/mileage for multiple retrievals	$300	$0
Salary/Wages		
5. Astronomy Research Fellowship	$5,500	$0
Benefits		
6. Astronomy Fellowship Benefits 3% of Wages	$165	$0
7. Faculty Workload Units (WLU) 6 WLU at $2K/WLU	$0	$12,000
Total	**$9,112**	**$0**
TOTAL DIRECT COSTS	**$9,112**	**$12,000**
TOTAL INDIRECT COSTS	**$2,888***	**$0**
**Indirect cost are calculated as 52.5% of the student wages.*		
TOTAL BUDGET	**$12,000**	**$12,000**

Distribution of costs	
Request from WA Space Grant	**$12,000**
CWU Contribution	**$12,000**
TOTAL PROPOSED BUDGET	**$24,000**

Note: While supplies and material costs may vary depending on the specific projects performed with undergraduates, the total amount requested from the Washington Space Grant Consortium shall not exceed $12,000.

Heritage University

August 16, 2019

Dr. Robert Winglee
Director, Washington Space Grant Consortium
University of Washington
Seattle, WA 98195-1310

Re: Heritage University 2020-2024 WSGC NASA Space Grant funding renewal

Dear Dr. Winglee,

It is our pleasure to submit the following information in support of Heritage University's (HU) participation in the 2020-2024 WSGC NASA Space Grant renewal:

(I) Overview and Work Plan

We intend to accomplish the following during the proposed grant period (2020-2024):

(i) *Support White Swan High School's* (WSHS) *rocketry club*: This activity will commence as soon as funding is available. Support for the club will consist of providing funding for rocket kits and associated equipment.

Emphasis will be placed on rockets with supersonic capability, conforming to an emphasis area of NASA's Aeronautics Mission Directorate. In addition to purchasing supersonic rocket kits, the funding will purchase the equipment necessary to quantitatively evaluate the kinematics of launches.

In the 2018-19 academic year, the club had four active members; three of them are Native American and female.

(ii) *Rocketry camp for Mt. Adams School District middle school students*: This activity is planned for each July of the grant period. We will contract Dr. Greg Van Doren (WSHS) as the lead instructor. Planning for the camp will commence each April. The Mt. Adams School District will provide funding for rockets/engines and food/transportation for the participants through their annual Gear Up summer program. Supersonic rockets will be emphasized; the experience gained by the WSHS rocketry club in launching supersonic rockets will be essential to this activity.

In 2018 and 2019 we had 25 middle school participants in this program. Most of the participants are Native American, a few are Hispanic, and about two thirds are female. In 2019 six of these students indicated interest in joining the WSHS when they enter high school.

(iii) *Host local high school students in Dr. David Laman's laser spectroscopy/materials science laboratory*: This activity falls under the *Materials Science* and the *Fundamental Physics* subcategories of the *Physical Science Research* category on page 51 of the NASA solicitation document. We maintain a laser spectroscopy and material science laboratory that studies luminescent organic semiconductors, e.g., the types of luminescent materials used in OLED

displays; current research focuses on determining the sample fabrication conditions required for high phosphorescence efficiency at room temperature. This effort falls under the *materials science* subcategory. Under the *Fundamental Physics* subcategory, we are attempting to detect long-time deviations from exponential decay of long-lived excited triplet states of organic compounds by monitoring the time dependence of phosphorescence emission. This addresses fundamental questions on the nature of excited state decay.

This activity is planned for mid-June through early August of each year. In 2018 and 2019, three Native American females and one Hispanic male participated in this program.

(II) Budget

Year 1

(i) *Support White Swan High School's* (WSHS) *rocketry club*

- rocket kits, motors, associated equipment: $1000

(ii) *Rocketry camp for Mt. Adams School District middle school students*

- contracted instructor stipend: $3000

(iii) *Host local high school students in Dr. David Laman's laser spectroscopy/materials science laboratory*

- student stipends: 2 x $1000 = $2000
- peer mentor (HU STEM undergraduates) stipends: 2 x $2500 = $5000
- project supplies (chemicals, optics): $5000

Budget year 1: $16,000

Each of years 2-4

(i) *Support White Swan High School's* (WSHS) *rocketry club*

- rocket kits and motors for L-1 certification of club members; club activities: $1000

(ii) *Rocketry camp for Mt. Adams School District middle school students*

- contracted instructor stipend: $3000

(iii) *Host local high school students in Dr. David Laman's laser spectroscopy/materials science laboratory*

- student stipends: 2 x $1000 = $2000
- peer mentor (HU STEM undergraduates) stipends: 2 x $2500 = $5000
- project supplies (chemicals, optics): $3000

Budget years 2-4: $42,000

Total funds requested: $58,000

(III) Statement of Commitment

We acknowledge that the Science, Mathematics and Technology Education (SMATE) program at Heritage University is identified by name as a Collaborator in the proposal, entitled *Washington State Space Grant College and Fellowship Program.* We understand that Professor Robert Winglee will submit this proposal to the NASA Training Grant announcement number NNH19ZHA001C, and we intend to carry out all responsibilities identified for us in this proposal. We also understand that the extent and justification of our participation as stated in this proposal will be considered during peer review in determining the merits of this proposal. We have read the entire proposal, including the management plan and budget, and we agree that the proposal correctly describes our commitment to the proposed research and scholarly activity.

(IV) HU Cost Sharing

Year 1

- 25% of overhead cost: $4,000 (25% of $16,000 direct cost of grant)
- Use of laboratory space and related equipment: HU will cover costs related to use of the dedicated laser spectroscopy/materials science laboratory and any other in-house equipment needed for the proposed project: $450/week x 8 weeks = $3600
- Estimated faculty salary for Dr. David Laman, 8.65% FTE: $6548/$1852

Cost sharing year 1: $16,000

Each of years 2-4

- 25% of overhead cost: $10,500 (25% of $42,000 direct cost of grant)
- Use of laboratory space and related equipment: HU will cover costs related to use of the dedicated laser spectroscopy/materials science laboratory and any other in-house equipment needed for the proposed project: $300/week x 21 weeks = $6300
- Estimated faculty salary for Dr. David Laman, 8.65% FTE: $19,644/$5556

Cost sharing years 2-4: $42,000

Total cost sharing: $58,000

(V) Estimated Number of Student Participants

(i) *Support White Swan High School's* (WSHS) *rocketry club* - The club faculty advisor reports four current active members and six middle school students that have expressed interest in joining the club when they enter high school. A conservative estimate is 6 high school student participants in club activities each year through 2024, and we expect from the ethnic makeup of WSHS that most of them will be Native American.

(ii) *Rocketry camp for Mt. Adams School District middle school students* - 14 middle school students participated in this program in 2018 and 11 in 2019. We expect at least 35 middle school participants in this program through 2024, and we expect from the ethnic makeup of the Mt. Adams School District that most of them will be Native American.

(iii) *Host local high school students in Dr. David Laman's laser spectroscopy/materials science laboratory* - Four local high school students participated in this program in 2018 and 2019; one additional student was unable to participate due to limited funds. We expect eight participants in this program through 2024, and we expect from the ethnic makeup of local high schools that most of them will be Native American or Hispanic.

Estimated number of impacted students through 2024: 60-65

(VI) Impacted NASA Areas of Emphasis

The following areas of emphasis (as outlined in the NASA Space Grant Areas of Emphasis document) are addressed in this proposal:

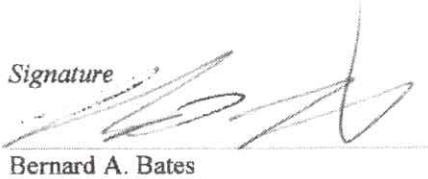
- *Authentic hands-on experience in science and engineering disciplines* (supersonic rocketry, materials science, fundamental physics)
- *Summer opportunities for secondary students on college campuses*
- *Diversity of institutions, faculty, and students*
- *Science research* (materials science, fundamental physics)
- *Hands-on research and engineering experience on authentic flight platforms* (supersonic rocketry)

Thank you for including Heritage University in your proposal. If you wish to discuss the contents of this contribution, please contact Dr. David Laman (laman_d@heritage.edu; 509 865 0422.

Sincerely,

David Laman, PhD
Associate Professor of Physics and Chemistry

Kazuhiro Sonoda. PhD
Provost/Vice President for Academic Affairs

TO:	Washington NASA Space Grant Consortium Earth and Space Sciences, Box 351310 University of Washington Seattle, WA 98195-1310 Tel: 206.543.1943; email: nasa@u.washington.edu
TYPE OF SUPPORT REQUESTED:	Subcontract
TITLE OF PROJECT:	University of Puget Sound NASA Space Grant Summer Student Research Grants
PRINCIPAL INVESTIGATOR:	Bernard A. Bates, Ph.D. Physics Department University of Puget Sound 1500 North Warner, CMB 1031 Tacoma, WA 98416-1031 Tel: 253.879.3762; email: bates@pugetsound.edu Fax: 253.879.3352
AMOUNT REQUESTED:	$ 40,000
AMOUNT OF INSTITUTIONAL COST SHARE:	$ 40,000
DESIRED PERIOD:	June 1, 2020 – May 31, 2024
OFFICE TO BE CONTACTED REGARDING NEGOTIATIONS OF AWARD:	Office of Finance University of Puget Sound Stefanie Lund 1500 North Warner Street, CMB 1075 Tacoma, WA 98416-1075 Tel: 253.879.8619; email: slund@pugetsound.edu Fax: 253.879.8507
DATE: August 26, 2019	*Signature*  Bernard A. Bates
OFFICIAL AUTHORIZED TO GIVE UNIVERSITY APPROVAL	*Signature*  Laura L. Behling Provost

September 5, 2019

Dear Professor Robert Winglee,

Below please find the University of Puget Sound's 4-year sub-contract proposal for 2020-2024.

Sincerely,

Dr. Bernard Bates
Physics Department
University of Puget Sound

Project Description: University of Puget Sound NASA Space Grant Student Summer Research Grants

The University of Puget Sound proposes to request funds for our Student Summer Research program. We request funds to support six (6) students per year for the summers of 2021, 2022, 2023 and 2024. Each award stipend will total $3250, with a modest supply budget ($84).

Summer Research Grants in Science and Mathematics

The Summer Research Program in the Sciences and Mathematics at the University of Puget Sound is designed to encourage and support research projects conducted by Puget Sound students and their faculty mentors in the natural sciences, physical sciences, mathematics, computer science, or exercise science. The grant program seeks to foster imagination, creativity, and accomplishment.

The program supports roughly 50 students per year.

Eligibility

Students currently enrolled at Puget Sound who are returning the following fall semester and planning to conduct research in the fields of exercise science, physics, chemistry,

biology, geology, mathematics, or computer science are eligible to apply for a Summer Science Research Grant.

Interdisciplinary projects are eligible only if the home department of the proposed research advisor is one of the departments listed above.

The proposed project may be laboratory-based, field-based, theoretical, or any combination thereof.

Although off-campus research projects are eligible, preference will be given to students working with Puget Sound advisors. Field-based projects under the direction of Puget Sound professors are considered on-campus.

In most cases, the completion of at least two years of college coursework is necessary to achieve the level of sophistication needed for the development of a competitive proposal; however, first-year students are eligible to apply.

Awards are made only for work scheduled to be completed before graduation. Students who have previously received a Summer Research Grant are eligible to re-apply; all applications will be evaluated solely on merit.

Recipient Responsibilities

Students who receive summer funding agree to:

- Treat their research as a full-time job for at least 10 weeks of the summer, according to the stipulations outlined above;
- Not enroll in summer classes, and not hold any other employment while engaged in research;
- submit a copy of the research poster or report to the faculty research advisor and an electronic copy of the poster or report to Collins Memorial Library for publication in Sound Ideas, an online repository of Puget Sound academic materials, by September 21;
- Give a poster presentation at the Fall Student Research Poster Symposium held in early September.

While not required, students are encouraged to present the results of their work at regional, national or international research conferences.

Types of Awards

There are several types of general awards, including the Mellam Scholar, Summer Science Scholar, Adam S. Goodman Scholar, Simpson Tacoma Kraft Scholar, **Washington NASA Space Grant Scholar**, and John Gilbertson Scholar. Recipients of a general award receive a $3,250 summer stipend. Mellam recipients also receive up to an

additional $2,000 toward materials and other expenses directly related to the project. The top ranked proposals will be considered for Agricola Scholar or McCormick Scholar awards.

Summer Research Grant stipends are intended to pay for living expenses during the summer. The summer stipend is not intended to supplement external research programs such as NSF-REU programs or field camps.

Award Administration

Award recipients will receive stipends in two payments. The first payment is issued on or about May 15, and the remaining $500 payment is issued after the research report is submitted to the Associate Dean, following the Fall Student Research Poster Symposium presentation in early September. If the public presentation and research reports are not completed by September 21, the final $500 payment will be forfeited and returned to the pool of funds to be awarded to other students the following summer.

Measurable Goals for Proposed Work and a Timeline to Meet Those Goals

Student researchers must work with a faculty supervisor during the summer. The supervisor's responsibility is to keep the students work "on track" and to monitor the student's progress. Also, as stated in the student application instructions, those who receive funding through the Summer Research Program must agree to:

- Treat their research as a full-time job for at least 10 weeks of the summer, according to the stipulations outlined above;
- Not enroll in summer classes, and not hold any other employment while engaged in research;
- submit a copy of the research poster or report to the faculty research advisor and an electronic copy of the poster or report to Collins Memorial Library for publication in Sound Ideas, an online repository of Puget Sound academic materials, by September 21;
- Give a poster presentation at the Fall Student Research Poster Symposium held in early September.

Narrative Budget

The University of Puget Sound requests funds for our Student Summer Research Program. Student researchers are required to spend 10 weeks at 40 hours per week on research for a total of 400 hours.

Per year, we request funds to support six (6) student stipends at $3,250, with an additional $84 (per student) for supplies and materials, for a total of **$20,000**.

Therefore, for the four years of this subcontract, we are requesting support for twenty-four (24) students with a total of $78,000 in stipends and $2,000 for supplies and materials for a 4-year total budget of $80,000.

The University agrees to match a $10,000 WSGC contribution per year with a matching contribution of $10,000 per year for the total program budget of $20,000 per year.

We therefore propose a 4-year budget request for 2020-2024 of $40,000 from Space Grant with a total matching commitment of $40,000 from the University of Puget Sound. This gives a total proposed 4-year budget of $80,000.

Budget

University of Puget Sound
Budget Period: June 1, 2020 – May 31, 2024

	Wash Space Grant	Cost Share
Salaries	--	--
Total Direct Salaries	--	--
Employee Benefits	--	--
Total Benefits	--	--
Supplies and Materials	$1000.	$1000.
Total Supplies	--	--
Travel	--	--
Total Travel	--	--
Student Stipends Summer Research	$39000.	$39000.
Twenty four (24) awards at $3250 each		
Other Direct Costs	--	--
INDIRECT COSTS UPS's Rate N/A	--	--
TOTAL BUDGET	$40000.	$40000.

Distribution of Costs	
Requested from UW	= $40000.
Contributed by University of Puget Sound	= $40000.
TOTAL PROPOSED BUDGET	= $80000.

September 5, 2019 In Reply Please Refer To: 10646-029

University of Washington
Attn: Office of Sponsored Programs
4333 Brooklyn Ave NE
Seattle, WA 98195-9472

Dear Robert Winglee:

Washington State University is transmitting the attached proposal as prepared by Dr. Valipuram Manoranjan, College of Arts & Sciences on the project entitled "***Encouraging Excellence in Space-Related Science Proposal***".

For a proposed approved budget of:	**$200,000**
Cost Share approved budget of:	**$200,000**
Anticipated period of performance is:	06/01/2020-05/31/2024
TIN:	91-6001108
Congressional District:	WA-005
F&A rate agreement:	https://sps.wsu.edu/fa-documents/

The university reserves the right to negotiate all terms and conditions associated from an award under this proposal. Negotiations concerning fiscal aspects of this project or any other official correspondence, including award documents, should be addressed to the Office of Research Support & Operations, Washington State University, 280 Lighty, Pullman, WA 99164-1060.

The signatory below is acknowledging review and approval of these materials; and is the institutionally authorized individual to bind the university in this matter.

Sincerely,

Dan Nordquist
AVP, Research Support & Operations

Washington State University, Pullman WA

Proposer: V.S. Mano Manoranjan, Professor of Mathematics

Proposed Work

Graduate Student Fellowships - Request: $50,000 per year

We request funding in the amount of $50,000 for twenty graduate student fellowships for students whose theses are in research areas that are strongly related to NASA's mission, interests and projects.

Project Description:

Twenty graduate fellowships of $2,500 per student will support graduate students from the College of Arts and Sciences (CAS) and the Voiland College of Engineering and Architecture (VCEA) during the academic year to work on independent research projects pertinent to their graduate research programs that are NASA-focused.

At Washington State University, we have expertise in research related to **Human Exploration and Operation Mission Directorate's priorities (Space Biology)**:

- Muscle atrophy and serum factors involved in reducing muscle atrophy – could help to understand why astronauts lose muscle mass during space missions.
- Regulation of hydrogen sulfide and nitric oxide in physiological and pathophysiological processes – could lead to a possible remedy for the oxidative stress associated with astronauts' exposure to space radiation.
- Plant physiology and photosynthesis under varying environmental conditions – could provide a better understanding of growing food in the space station.

Also, we have expertise in areas of priorities in NASA's **Engineering Research and Science Mission Directorate Research (Astrophysics & Earth Science)**:

- Rocket and space stage vehicle design
- Cryogenics
- Gravitational waves
- Black hole-neutron star binary mergers
- Computational models associated with aerospace vehicle's re-entry into earth's atmosphere
- Structural geology and volcanology

The graduate students that seek NASA fellowships will carry out independent, and at times interdisciplinary, work in the abovementioned research areas.

For example, in the past, students have worked on projects on understanding the magmatic processes in Mars, simulating the aftermath of binary neutron star mergers and modeling the formation and growth of icy layers on outer solar system satellites. Each student will spend a minimum of six hours per week during the academic year actively working on their research.

Insofar as allowed under the current Washington law, women and minorities will be encouraged to apply for these fellowships. The requirement for one to one matching will be provided by Washington State University, CAS and VCEA. The matching will be in the form of other scholarships/fellowships and may include various forms of RA/TA support, as well as the waiver of indirect costs.

PI Name(s): Mano Agency Name: UW (Nasa)					YR1 06/01/20 05/31/21	YR2 06/01/21 05/31/22	YR3 06/01/22 05/31/23	YR4 06/01/23 05/31/24	TOTAL
00 - SALARIES	**Pay Rate**	**# Mos.**	**% FTE**						
PI:	0.00	0.00	0.00%	Salary	-	-	-	-	-
				Benefits 29.9%	-	-	-	-	-
PI:	0.00	0.00	0.00%	Salary	-	-	-	-	-
				Benefits 29.9%	-	-	-	-	-
Co-PI:	0.00	0.00	0.00%	Salary	-	-	-	-	-
				Benefits 29.9%	-	-	-	-	-
Co-PI:	0.00	0.00	0.00%	Salary	-	-	-	-	-
				Benefits 29.9%	-	-	-	-	-
Co-PI:	0.00	0.00	0.00%	Salary	-	-	-	-	-
				Benefits 29.9%	-	-	-	-	-
Post-Doc/Research Assoc:	0.00	0.00	0.00%	Salary	-	-	-	-	-
				Benefits 35.0%	-	-	-	-	-
Classified Staff:	0.00	0.00	0.00%	Salary	-	-	-	-	-
				Benefits 46.0%	-	-	-	-	-
PhD Student ~ Step #				Salary	-	-	-	-	-
QTR inflation - 4%/year				*QTR*	-	-	-	-	-
					-	-	-	-	-
				Benefits 11.3%	-	-	-	-	-
Master Student ~ Step #				Salary	-	-	-	-	-
QTR inflation - 4%/year				*QTR*	-	-	-	-	-
					-	-	-	-	-
				Benefits 11.3%	-	-	-	-	-
01 - WAGES	**$ Per Hr.**	**Hrs/Wks**	**# Wks.**						
Student:	$0.00	0	0	Wages	-	-	-	-	-
				Benefits 1.6%	-	-	-	-	-
Student (enrolled part-time) :	$0.00	0	0	Wages	-	-	-	-	-
				Benefits 10.0%	-	-	-	-	-
*Non-Student Temporary	$0.00	0	0	Wages	-	-	-	-	-
				Benefits 9.4%	-	-	-	-	-
**Non-Student Temporary	$0.00	0	0	Wages	-	-	-	-	-
				Benefits 22.2%	-	-	-	-	-
***Non Student Temporary	$0.00	0	0	Wages	-	-	-	-	-
				Benefits 68.3%	-	-	-	-	-
				Total Salary	-	-	-	-	-
				Total Wages	-	-	-	-	-
				Total Salary & Wages	-	-	-	-	-
07 - BENEFITS									
				Total Benefits	-	-	-	-	-
				Total Salaries/Wages/Benefits	-	-	-	-	-
02 - PERSONAL SERVICES CONTRACTS (Consultants)									
									-
									-
									-
				Total Personal Services Contracts	-	-	-	-	-
03 - GOODS/SERVICES									
									-
									-
									-
									-
									-
									-
									-
				Total Goods/Services	-	-	-	-	-
04 - TRAVEL									
Domestic									-
Foreign									-
									-
				Total Travel	-	-	-	-	-
06 - CAPITAL EQUIPMENT (>$5,000)									
									-
									-
									-
				Total Capital Equipment	-	-	-	-	-
08 - STIPENDS/SUBSIDIES/PARTICIPANT SUPPORT COSTS									
Fellowships					50,000	50,000	50,000	50,000	200,000
									-
									-
				Total Stipends/Subsidies/Participant Support Costs	50,000	50,000	50,000	50,000	200,000
14 - RESTRICTED: Incl. SUBAWARDS/SUBCONTRACTS									
University One	***YR-1***	***YR-2***	***YR-3***	***YR-4***	***YR-5***				
SBCT DC					-	-	-	-	-
SBCT IC (?%)					-	-	-	-	-
University Two	***YR-1***	***YR-2***	***YR-3***	***YR-4***	***YR-5***				
SBCT DC					-	-	-	-	-
SBCT IC (?%)					-	-	-	-	-
				Total Subcontractor DC	-	-	-	-	-
				Total Subcontractor IC	-	-	-	-	-
				Total Subcontracts/Restricted	-	-	-	-	-
16 - NON-CAPITALIZED EQUIPMENT *(e.g. Laptops w/agcy approval)*					https://policies.wsu.edu/prf/index/manuals/70-00-purchasing/70-09-expenditure-objects-subobjects/#state				
					-	-	-	-	-
					-	-	-	-	-
					-	-	-	-	-
				Total Non-Capitalized Equipment ("Small & Attractive" Items)	-	-	-	-	-
TOTAL DIRECT COSTS					**50,000**	**50,000**	**50,000**	**50,000**	**200,000**
EXCLUSIONS									
QTR					-	-	-	-	-
Equipment (Over 5k)					-	-	-	-	-
Subcontracts, amt excluding first 25K (per subcontract), HAND ENTER:									
Other (Off-Site Rental & Stipends, Etc)					50,000	50,000	50,000	50,000	200,000
				Total Exclusions	50,000	50,000	50,000	50,000	200,000
MTDC BASE				**Base**	-	-	-	-	-
13 - FACILITIES & ADMINISTRATIVE COSTS (F&A, IDCs, OVERHEAD)				**F&A Rate: 53.000%**	-	-	-	-	-
TOTAL COSTS					50,000	50,000	50,000	50,000	200,000

F&A Base Type:	MTDC	TD	TC	SWB	Other
0.53000	X				

Cognizant Agency DHHS - Helen Fung, 415-437-7820

Approved By: Amanda Yager
Date: 8/5/19

Category/Object	Year 1	Year 2	Year 3	Year 4	Total
Salaries - 00	-	-	-	-	-
Wages - 01	-	-	-	-	-
Personal Svc Contract - 02	-	-	-	-	-
Goods/Services - 03	-	-	-	-	-
Travel - 04	-	-	-	-	-
Computer Services - 05	-	-	-	-	-
Equipment - 06	-	-	-	-	-
Benefits - 07	-	-	-	-	-
Stipends/Subsides - 08	50,000	50,000	50,000	50,000	200,000
SBCTs/Restricted - 14	-	-	-	-	-
Small/Attractive Items - 16	-	-	-	-	-
Total Direct Costs	50,000	50,000	50,000	50,000	200,000
F&A - 13	-	-	-	-	-
Total Costs	50,000	50,000	50,000	50,000	200,000

	Year 1 - 2020-2021		Year 2 - 2021-2022		Year 3 - 2022-2023		Year 4 - 2023-2024		Cumulative	
	NASA/WA Space Grant Funds	WWU Cost Share	NASA/WA Space Grant Funds	WWU Cost Share	NASA/WA Space Grant Funds	WWU Cost Share	NASA/WA Space Grant Funds	WWU Cost Share	NASA/WA Space Grant Funds	WWU Cost Share
A. Personnel/Direct Labor										
1. Principal Investigator/Director (Emily Borda-5% 11-month Effort)		$7,500		$7,500		$7,500		$7,500		$30,000
2. Research Associates (6 faculty-2 summer months 13.66%)		$11,977		$11,977		$11,977		$11,977		$47,908
3. Staff Support (Lori Torres 4% Summer Effort)		$2,437		$2,437		$2,437		$2,437		$9,748
4. Undergrad Researchers (6 Students $13/hr - 400 hrs)										
Total Salaries	**$0**	**$21,914**	$0	$21,914	$0	$21,914	$0	$21,914	$0	$87,656
B. Fringe Benefits										
1. Principal Investigator/Director (15%)		$1,125		$1,125		$1,125		$1,125		$4,500
2. Co-PI										
3. Research Associates (6 faculty - 2 summer months 26% Fringe Rate)		$3,114.02		$3,114.02		$3,114.02		$3,114.02		$12,456.08
4. Staff Support (Lori Torres 27% Fringe Rate)		$657.98		$657.98		$657.98		$657.98		$2,631.92
5. Undergrad Researchers (6 Students 10% Fringe Rate)	$0		$0		$0		$0		$0	
Total Fringe	**$0**	**$4,897**	$0	$4,897	$0	$4,897	$0	$4,897	$0	$19,588
C. Equipment										
D. Materials and Supplies										
E. Services (Stipends $750.00*6)	$4,500		$4,500		$4,500		$4,500		$18,000	
F. Domestic Travel										
G. NASA Internships and Fellowships										
1. Internships	$34,320		$34,320		$34,320		$34,320		$34,320	
2. Fellowships										
3. Scholarships										
H. Aeronautics Mission Directorate Projects										
1. Project 1										
2. Project 2										
I. Human Exploration Mission Directorate Projects										
1. Project 1										
2. Project 2										
J. Science Mission Directorate Project										
1. Project 1										
2. Project 2										
K. Space Technology Mission Directorate Projects										
1. Project 1										
2. Project 2										
L. NASA Community College Aerospace Scholars (NCAS)										
Total Direct Project Costs	**$38,820**	**$0**	$38,820	$0	$38,820	$0	$38,820	$0	$155,280	$0
M. Subcontracts										
N. Total Direct Costs	$38,820	$26,811	$38,820	$26,811	$38,820	$26,811	$38,820	$26,811	$155,280	$107,244
O. Indirect Cost (54.8% Grant Funds+Cost Share Salaries and Wages)		$12,009		$12,009		$12,009		$12,009		$48,035
Total Cost	**$38,820**	**$38,820**	$38,820	$38,820	$38,820	$38,820	$38,820	$38,820	$155,280	$155,279

PI Name(s):

COST-SHARE BUDGET

Agency Name:

	Pay Rate	# Mos.	% FTE		YR1 06/01/20 05/31/21	YR2 06/01/21 05/31/22	YR3 06/01/22 05/31/23	YR4 06/01/23 05/31/24	TOTAL
00 - SALARIES									
PI:	0.00	0.00	0.00%	Salary	-	-	-	-	-
				Benefits 29.9%	-	-	-	-	-
PI:	0.00	0.00	0.00%	Salary	-	-	-	-	-
				Benefits 29.9%	-	-	-	-	-
Co-PI:	0.00	0.00	0.00%	Salary	-	-	-	-	-
				Benefits 29.9%	-	-	-	-	-
Co-PI:	0.00	0.00	0.00%	Salary	-	-	-	-	-
				Benefits 29.9%	-	-	-	-	-
Co-PI:	0.00	0.00	0.00%	Salary	-	-	-	-	-
				Benefits 29.9%	-	-	-	-	-
Post-Doc/Research Assoc:	0.00	0.00	0.00%	Salary	-	-	-	-	-
				Benefits 35.0%	-	-	-	-	-
Classified Staff:	0.00	0.00	0.00%	Salary	-	-	-	-	-
				Benefits 46.0%	-	-	-	-	-
PhD Student ~ Step #				Salary	-	-	-	-	-
QTR inflation - 4%/year				*QTR*	-	-	-	-	-
					-	-	-	-	-
				Benefits 11.3%	-	-	-	-	-
Master Student ~ Step #				Salary	-	-	-	-	-
QTR inflation - 4%/year				*QTR*	-	-	-	-	-
					-	-	-	-	-
				Benefits 11.3%	-	-	-	-	-
01 - WAGES	**$ Per Hr.**	**Hrs/Wks**	**# Wks.**						
Student:	$0.00	0	0	Wages	-	-	-	-	-
				Benefits 1.6%	-	-	-	-	-
Student (enrolled part-time) :	$0.00	0	0	Wages	-	-	-	-	-
				Benefits 10.0%	-	-	-	-	-
*Non-Student Temporary	$0.00	0	0	Wages	-	-	-	-	-
				Benefits 9.4%	-	-	-	-	-
**Non-Student Temporary	$0.00	0	0	Wages	-	-	-	-	-
				Benefits 22.2%	-	-	-	-	-
***Non Student Temporary	$0.00	0	0	Wages	-	-	-	-	-
				Benefits 68.3%	-	-	-	-	-
				Total Salary	-	-	-	-	-
				Total Wages	-	-	-	-	-
				Total Salary & Wages	-	-	-	-	-
07 - BENEFITS									
				Total Benefits	-	-	-	-	-
				Total Salaries/Wages/Benefits	-	-	-	-	-
02 - PERSONAL SERVICES CONTRACTS (Consultants)									
									-
									-
									-
				Total Personal Services Contracts	-	-	-	-	-
03 - GOODS/SERVICES									
									-
									-
									-
									-
									-
									-
									-
				Total Goods/Services	-	-	-	-	-
04 - TRAVEL									
Domestic									-
Foreign									-
									-
									-
				Total Travel	-	-	-	-	-
06 - CAPITAL EQUIPMENT (>$5,000)									
									-
									-
									-
				Total Capital Equipment	-	-	-	-	-
08 - STIPENDS/SUBSIDIES/PARTICIPANT SUPPORT COSTS									
Fellowships					50,000	50,000	50,000	50,000	200,000
									-
									-
				Total Stipends/Subsidies/Participant Support Costs	50,000	50,000	50,000	50,000	200,000
14 - RESTRICTED: incl. SUBAWARDS/SUBCONTRACTS									
University One	***YR-1***	***YR-2***	***YR-3***	***YR-4*** ***YR-5***					
SBCT DC					-	-	-	-	-
SBCT IC (?%)					-	-	-	-	-
University Two	***YR-1***	***YR-2***	***YR-3***	***YR-4*** ***YR-5***					
SBCT DC					-	-	-	-	-
SBCT IC (?%)					-	-	-	-	-
				Total Subcontractor DC	-	-	-	-	-
				Total Subcontractor IC	-	-	-	-	-
				Total Subcontracts/Restricted	-	-	-	-	-
16 - NON-CAPITALIZED EQUIPMENT *(e.g. Laptops w/agcy approval)*				https://policies.wsu.edu/prf/index/manuals/70-00-purchasing/70-09-expenditure-objects-subobjects/#slate					
					-	-	-	-	-
					-	-	-	-	-
					-	-	-	-	-
					-	-	-	-	-
				Total Non-Capitalized Equipment ("Small & Attractive" Items)	-	-	-	-	-
TOTAL DIRECT COSTS					50,000	50,000	50,000	50,000	200,000
EXCLUSIONS									
QTR					-	-	-	-	-
Equipment (Over 5k)					-	-	-	-	-
Subcontracts, amt excluding first 25K (per subcontract), HAND ENTER.									-
Other (Off-Site Rental & Stipends, Etc)					50,000	50,000	50,000	50,000	200,000
				Total Exclusions	50,000	50,000	50,000	50,000	200,000
MTDC BASE				**Base**	-	-	-	-	-
13 - FACILITIES & ADMINISTRATIVE COSTS (F&A, IDCs, OVERHEAD)				**F&A Rate:** 53.000%	-	-	-	-	-
TOTAL COSTS					50,000	50,000	50,000	50,000	200,000

F&A Base Type:	MTDC	TD	TC	SWB	Other
0.53000	X				

Cognizant Agency DHHS - Helen Fung, 415-437-7820

Approved By: Amanda Yager
Date: 8/5/19

Category/Object	Year 1	Year 2	Year 3	Year 4	Total
Salaries - 00	-	-	-	-	-
Wages - 01	-	-	-	-	-
Personal Svc Contract - 02	-	-	-	-	-
Goods/Services - 03	-	-	-	-	-
Travel - 04	-	-	-	-	-
Computer Services - 05	-	-	-	-	-
Equipment - 06	-	-	-	-	-
Benefits - 07	-	-	-	-	-
Stipends/Subsides - 08	50,000	50,000	50,000	50,000	200,000
SBCTs/Restricted - 14	-	-	-	-	-
Small/Attractive Items - 16	-	-	-	-	-
Total Direct Costs	50,000	50,000	50,000	50,000	200,000
F&A - 13	-	-	-	-	-
Total Costs	50,000	50,000	50,000	50,000	200,000

WESTERN
WASHINGTON UNIVERSITY

Emily J. Borda, Ph.D.
Director of Science, Mathematics and Technology Education
Professor of Chemistry and Science Education

SI. 220 • MS 9155
516 High Street, Bellingham, Washington 98225
(360) 650-3637 • Fax (360) 650-7588
Emily.Borda@wwu.edu

September 5, 2019

Dr. Robert Winglee, Director
Washington NASA Space Consortium
Box 351310
University of Washington
Seattle, WA 98195-1310

Dear Professor Winglee:

We propose to enhance the mission of NASA by supporting undergraduates with summer internships to engage in NASA-related research and outreach activities, thereby addressing the need for a diverse and skilled STEM workforce. We will work simultaneously at two levels: First, by supporting basic, applied, and education-related space science research for Pre-Service Teachers (PSTs), we aim to enhance the quality of space science education and the attractiveness of aerospace careers for K-12 students. Second, by supporting space science research for undergraduates interested in aerospace careers, we aim to provide authentic, high-quality student experiences that directly support the objectives of NASA's Science Mission Directorate. Through these efforts, we will directly address two of NASA's Goals for STEM Engagement: 1) ***Building a Diverse, Skilled STEM Workforce***, and 2) ***Enabling contributions to NASA's work***.

We will leverage the unique position of WWU as a major producer of teachers in the State combined with its high level of STEM research activity. This research includes growing engineering, planetary, and space science research programs, all Strategic Priorities of WWU's College of Science and Engineering. We will leverage existing programs focused on increasing diversity, such as S-STEM and HHMI-Inclusive Excellence programs, to recruit diverse cohorts of interns. To be selected, undergraduates will be required to show their proposed work directly supports one or more research priority for NASA's Science Mission Directorate (SMD) and/or Human Exploration and Operations Mission Directorate (HEOMD), either through basic or applied research, or through education research aimed at improving student understanding of those priorities. We expect most projects to address the following NASA priorities: ***physical science or engineering (HEOMD); Earth science, planetary science, or astrophysics (SMD)***. Undergraduates will be supervised by faculty members who are experts in these areas.

Together, the PSTs and future aerospace professionals will participate in a ***multilayered approach toward engaging with NASA's strategic interests*** as an interdisciplinary cohort. In addition to conducting their research, each cohort will be required to plan and administer one outreach activity to introduce K-12

students to NASA science, specifically the HEOMD and SMD areas listed above, and aerospace careers. One example would be to design and deliver a show about NASA's planetary exploration missions for visiting school groups at WWU's planetarium. Such outreach activities will also enhance the local K-8 curriculum, which is lacking in aerospace STEM content, and will directly address the third NASA Goal for STEM Engagement: ***strengthen understanding of STEM through powerful connections to NASA***. Interns will also be required to present their work at WWU's annual Scholar's Week in the form of a poster or oral presentation. Collaborations between students with a teaching emphasis and those interested in aerospace careers will generate a more diverse and skilled future STEM workforce, contributing directly to the needs of Washington State, identified in Washington State's Aerospace Strategy, for ***cultivating a deep and talented aerospace workforce***.

We are requesting funding for the following activities for each year: 1) 400-hour summer research internships (6 x $5,200 + $520 fringe), three each for PSTs and STEM majors, and 2) Stipends for faculty (6 x $750), totaling $38,820 annually with matching time and effort.

Sincerely,

Emily J. Borda

Dr. Emily J. Borda, Director
Science, Mathematics and Technology Education
Professor of Chemistry

WHITWORTH
UNIVERSITY

16th July 2019

To

Professor Robert Winglee
University of Washington
Director, Washington NASA Space Grant Consortium

Dear Professor Winglee:

This letter is to certify that Whitworth University intends to participate in the Washington Space Grant Consortium for FY 2020 – 2024. The Space Grant funding of $12,500/year will be used, as specified in the detailed budget, to execute the work detailed in our proposal. We also commit to a 1:1 cost-sharing.

The $5000/year requested for the '*Undergraduate Research*' portion of the proposal involves two undergraduate students per year working with Dr. Kamesh Sankaran at Whitworth; one will work on a project with Dr. Kurt Polzin (Team Lead in the Advanced Concepts Office at the NASA Marshall Space Flight Center) on a new ion propulsion system for spacecraft; the other will work on evaluating a solar electric propulsion system (under the NASA Space Technology Mission Directorate) for the Dual Asteroid Redirect Test (DART) Mission. Over the 11-year history of our participation in the Space Grant, we have demonstrated cost-effectiveness in training 22 students at this cost-effective rate, with 12 students becoming co-authors in 5 publications and 9 pursuing graduate studies in physical sciences and engineering. With the support of Space Grant, we also recruit under-represented minority (UREP) students to participate in this research at more than twice the rate as enrollment in our department.

The $2000-$3000/year requested for the '*Undergraduate Curriculum and Outreach Opportunities*' portion of the proposal provides hands-on opportunities in rocketry for 12 students in alternating years and in near-space research for another 12 students per year. It also supports up to 10 undergraduate students to mentor about 25 middle school students to develop and launch their own near-space research projects. This prepares a pipeline of students to support the NASA Earth Science Division in the future. UREP student participation rate in this program is more than twice that of enrollment in our department.

The $3000-$4000/year requested '*Scholarships for UREP Undergraduates in STEM*' will be awarded to 3-4 students to encourage them to pursue further opportunities in physics and engineering. This directly supports NASA's ongoing efforts to build a diverse and skilled STEM workforce because 100% of these awards are given to UREP students, and 100% of them did a summer internship in their major, and 100% have either graduated (or are on track to graduate) with a degree in engineering or physics.

Thank you for supporting educational and research opportunities for undergraduate students in spaceflight and near-space physics at Whitworth.

Sincerely,

Dr. Kamesh Sankaran
Principal Investigator
Whitworth University

WHITWORTH UNIVERSITY
300 W. Hawthorne Rd., Spokane, WA 99251

TO:	Washington NASA Space Grant Consortium Earth and Space Sciences, Box 351310 University of Washington Seattle, WA 98195-1310 Tel: 206.543.1943; email: nasa@u.washington.edu
TYPE OF SUPPORT REQUESTED:	Subcontract
TITLE OF PROJECT:	*Research and Outreach Opportunities for Students in Spaceflight and Near-Space Physics*
PRINCIPAL INVESTIGATOR:	Dr. Kamesh Sankaran Engineering & Physics Department Whitworth University, Spokane, WA 99251 Phone: 509-777-4243 Fax: 509-777-4633 ksankaran@whitworth.edu
AMOUNT REQUESTED:	$12,500/Year
AMOUNT OF INSTITUTIONAL COST SHARE:	$12,500/Year
DESIRED PERIOD:	June 1st, 2020 - May 31st, 2024
OFFICE TO BE CONTACTED REGARDING NEGOTIATION OF AWARD:	*Melinda Stoops, Director of Sponsored Programs* *Whitworth University* 509-777-3701; mstoops@whitworth.edu

DATE: 8/7/19

Dr. Kamesh Sankaran, Principal Investigator

OFFICIAL AUTHORIZED TO GIVE INSTITUTIONAL APPROVAL: Caroline J. Simon 8/13/2019

Dr. Caroline J. Simon, Provost

ABSTRACT

Whitworth has consistently participated in the Washington Space Grant Consortium since 2008. The support of WSGC has been used efficiently by Whitworth to produce significant results: our faculty-student research teams support the research at NASA centers, we train undergraduate researchers on spaceflight and near-space research and provide incentives for women and under-represented minority students in STEM to continue further research at NASA or U.S. federal government facilities, and train our students to mentor middle-students in near-space projects. Therefore, Whitworth requests $12500/year from the WSGC to continue these activities that encourage and equip our students to pursue careers of interest to NASA.

1. Introduction

Three major areas of this subcontract map directly on to three focus areas defined by the NASA Office of STEM Engagement (Figure 1, Section 1 of the Announcement of Opportunity Number NNH19ZHA001C). Specifically, we propose to address each focus area in the following manner:

- "*Create unique opportunities for students to contribute to NASA's work*" – We will build on our proven history of involving undergraduate students in the work of NASA Marshall Space Flight Center on its ongoing projects that have led to publications.
- "*Build a diverse future STEM workforce by engaging students in authentic learning experiences.*" – We will continue our approach of providing incentives for under-represented minority students in STEM, which has proven to be effective in allowing them to pursue hands-on experiential learning opportunities inside and outside of Whitworth.
- "*Strengthen public understanding by enabling powerful connections to NASA's mission and work.*" – We will continue our successful efforts to train undergraduate students to mentor local middle-school students in near-space research and generate interest in spaceflight from an early age.

Data published by the American Institute of Physics shows that over 40 percent of bachelor's degrees in physics in the U.S. are produced by primarily undergraduate institutions (PUIs). Yet, the impact of NASA on PUIs is often minimal. Consequently, NASA is missing an opportunity to influence a significant portion of the future science and technology workforce. Since the primary job of the faculty at PUIs is to prioritize undergraduate student development, supporting research opportunities and curriculum development at PUIs is an effective way to attract students to pursue topics of interest to NASA. If students do not obtain exposure to such topics at the undergraduate level, they are less likely to pursue it at the graduate level compared to the areas of research to which they have already been exposed.

Due to its track record in preparing students in areas of interest to NASA, Whitworth is a good partner to advance the goals of WSGC and to meet the stated objective of the Space Grant Program to "*establish and maintain a national network of universities with interests and capabilities in aeronautics, space, and related fields*" (Section 2.1.1 of the AO). Therefore, this proposal requests a grant to support Research and Outreach Opportunities for Students in Spaceflight and Near-Space Physics. Furthermore, our track record of accomplishing all of this in a cost-effective manner (at $12.5K/year) is yet another way in which Whitworth strongly supports the goals of NASA.

2. Proposed Activities

2.1. Research Experience for Undergraduates

NASA's STEM Engagement to meet Objective 3.3 of the NASA 2018 Strategic Plan calls for activities that "*create unique opportunities for students to contribute to NASA's work in exploration and discovery*" and to "*strengthen understanding by enabling powerful connections to NASA's mission and work.*" (Section 1.3 of the Announcement of Opportunity).

Whitworth remains the only primarily-undergraduate institution in the U.S. where spaceflight research is conducted in collaboration with a NASA. Ever since Whitworth started participating in the Space Grant, multiple undergraduate students have worked on various projects in plasma propulsion and its applications to ongoing projects and missions at NASA. The following is a list of publications that have resulted from this endeavor (WSGC supported students in bold):

- K. Sankaran, **T. Widmer, T. Dale**, and K.A. Polzin, "Computational Investigation of the Near-Field Plasma Plume in Ion-Ion Propulsion", AIAA Proceedings 2018-4912.
- K. Sankaran, **A. French, S. Gady, T. Wisniewski,** and **M. Woodkey**, "Evaluation of *Electric Propulsion Systems for Asteroid and Comet Sample-Return Missions*", AIAA Proceedings 2014-3720.
- K. Sankaran, **J. Hoff,** and **C. Grochowski**, "*Electric Propulsion Options for the OSIRIS-REx Mission*", Advances in the Astronautical Sciences, vol. 148, paper #412, 2013.
- K.A. Polzin, K. Sankaran, **A.G. Ritchie**, and J.P. Reneau, "*Inductive pulsed plasma thruster model with time-evolution of energy and state properties*", Journal of Physics D: Applied Physics, Vol. 46, #47, paper #475201, 2013.
- K. Sankaran, **B. Hamming, C. Grochowski, J. Hoff, M. Spaun,** and **M. Rollins**, "*Evaluation of Existing Electric Propulsion Systems for the OSIRIS-REx Mission*", Journal of Spacecraft and Rockets, Vol. 50, No. 6 (2013), pp. 1292-1295.
- K. Sankaran, **K. Oetgen, M. Rollins,** and **E. Staley**, "*Parametric Investigation of the Effects of Plasma Thruster Performance on Mars Cargo Missions*", Journal of Spacecraft and Rockets, v. 47, #2, 2010.

Continuing on that work, we intend for two students to participate in full-time research (400 hours per student over the summer) with the PI on one of two research projects:

- Simulation of plasma flows in a new ion-ion propulsion device that is under investigation at the NASA Marshall Space Flight Center,
- Evaluation of mission alternatives to the Dual-Asteroid Redirection Test (DART) and related near-Earth object (NEO) flights by treating the onboard NEXT-C ion thruster as the primary in-space propulsion system.

This proposed research experience meets the call of NASA for "*educational hands-on traineeships that provide unique NASA-related research and operational experiences for ... undergraduate students*" (Appendix C of the AO) and allows WSGC to meet **Goal 1.0** ("*Enabling contributions to NASA's work*") and its **Objective 1.1** ("*Students contribute to NASA's endeavors in exploration and discovery*") and **Objective 1.2** ("*Research and development capacity of educational institutions is enhanced, enabling broad and diverse contributions that directly address NASA priorities.*") as listed in Section 1.3 of the Announcement of Opportunity.

2.2. Student Outreach Opportunities

It is a stated objective of the Space Grant Program to "*promote a strong STEM education base from elementary through secondary levels while providing support to teachers in these grade levels toward more effectively improving student academic outcomes.*" (Section 2.1.1 of the AO)

Whitworth began an initiative in AY '11-'12 to train its undergraduate students to mentor students at Northwood Middle School in Spokane to the study the near-space environment using high-altitude. Since then, almost 75 Whitworth students have been trained in this project. Many of them have, in turn, trained about 300 seventh-grade students and their teacher at Northwood Middle School to do various scientific experiments in the near-space environment (~100,000 ft.). Our undergraduate students worked with their middle-school science teacher to help these 7th graders to design experiments, formulate hypotheses on specific scientific problems to be tested during the flight, then designed and constructed sensors to investigate those hypotheses, carried out the flight, and then analyzed the acquired data. This has led to valuable outreach opportunities with local K-12 schools. Continuing this collaborative outreach will inspire and equip middle school students in Spokane to pursue degrees in physics and engineering. Building on that ongoing relationship, this PI regularly speaks at the Summer STEM Academy hosted by the Mead School District to introduce NASA to students who are entering grades 3-9 in the following academic year.

We request support to continue and build on this initiative to help the Space Grant Program meet its **Goal 3.0** to "strengthen Understanding of STEM through Powerful Connections to NASA") and **Objective 3.1** so that "youth are introduced to STEM concepts and content through readily available NASA STEM engagement resources and content." (Section 1.3 of the AO)

3. Summary

This proposal requests support from the WSGC for two students to work with a faculty member in the summer, to provide incentives for under-represented students to obtain hands-on training and research opportunities, and to train undergraduate students to mentor middle-school students in near-space science. Put together, this subcontract allows the Washington Space Grant Consortium to align with these focus areas of NASA's Office of STEM Architecture to:

- *Create unique opportunities for students to contribute to NASA's work,*
- *Build a diverse future STEM workforce by engaging students in authentic learning experiences,*
- *Strengthen public understanding by enabling powerful connections to NASA's mission and work, and*
- *Plasma propulsion support space technology mission directorial research.*

Since the Whitworth Engineering & Physics Department has more 100 students and only two will receive the research internships and only up to four students will receive the co-op incentives, there will be a high level of competition for these awards. Furthermore, because of the interdisciplinary nature of this work, the applicants for the research internships will include

students majoring in Engineering, Physics, Mathematics, and Computer Science. Our high-altitude balloon project also incorporates the study of atmospheric chemistry and intentionally invites the Chemistry majors on campus to participate in it. Thus, our plans fit well with the stated desire of the NASA Space Grant to promote interdisciplinary collaboration. As stated earlier, we strongly encourage the recipients of these awards to pursue graduate education in physical sciences and engineering and have a good track record of succeeding in that. For these reasons, our proposal aligns well with the stated NASA Education Outcomes.

To this end, Whitworth is requesting $12,500 per year for four years ($50,000 total) in support from the WSGC. With Whitworth's cost share of $12,500 per year for four years ($50,000 total), these funds will go toward recruiting and equipping students in the areas of interest to NASA.

ANNUAL BUDGET (YEARS 2020-2024)

	WA Space Grant	Whitworth Cost Share
Salaries		
Summer research faculty mentor		
1 faculty mentor, 10-wk appointment	$5,000	$1,000
Summer research students		
2 students, 400-hr appointments		
Stipend @ $5,400 each	$0	$10,800
Total Direct Salaries	**$5,000**	**$11,800**
Employee Benefits		
Faculty mentor – 10%	$500	$100
Total Benefits	**$500**	**$100**
Total Travel	**$1,000**	**$0**
Supplies and Materials		
High-altitude balloon project	$2,000	$0
Total Supplies	**$2,000**	**$0**
Other Direct Costs		
Physics/Engineering Scholarships	$4,000	$600
Total Other Direct Costs	**$4,000**	**$600**
TOTAL DIRECT COSTS	**$12,500**	**$12,500**
TOTAL INDIRECT COSTS		
TOTAL BUDGET	**$12,500**	**$12,500**

Distribution of Costs	
Requested from WSGC	$12,500
Cost Share by Whitworth	$12,500
TOTAL PROPOSED BUDGET	**$25,000**

BELLEVUE COLLEGE

3000 Landerholm Circle SE • Bellevue, WA 98007-6484 • www.bellevuecollege.edu

August 26, 2019

Dear Dr. Robert Winglee,

To support the 2020-2024 National Space Grant College and Fellowship Program, Bellevue College (BC) will build on its existing activities since joining the Washington Space Grant Consortium in 2017. As the largest community college in Washington State, BC is well positioned to help NASA's Office of STEM Engagement build a diverse and skilled STEM workforce. In Fall 2018, 24% of BC students were from minority groups underrepresented in STEM, and 55% of entering students defined themselves as first-generation college students. BC will support NASA's goals and objectives via three activities.

Activity 1: Support Diverse STEM Students' Success with Space Grant Co-ops

Supports *Objective 2.1: A broad and diverse set of students are attracted to STEM via NASA opportunities.*

BC will award Space Grant Co-ops to 2-3 students annually, with a priority to award recipients from backgrounds underrepresented in STEM. BC will connect Co-op students to experiential learning opportunities: they will spend 150+ hours per year on Space Grant-related activities, and BC staff will help them apply for NASA internships, REUs, and other STEM opportunities.

Activity 2: Integrate Research Opportunities in Rocketry and Space Sciences into BC's Curriculum

Supports *Objective 1.2: Research and development capacities of educational institutions is enhanced, enabling broad and diverse contributions that directly address NASA priorities.*

Our previous activities have focused on developing an elective course on rocketry and on bringing rocketry activities into first-year Physics courses, and we will sustain these activities. Over the grant period, BC faculty will also focus on bringing projects related to rocketry and space sciences into research-driven capstone courses so our students can directly engage with NASA research priorities. We will develop a capstone research option in the Engineering Physics III course that aligns with the goals of the Aeronautics Research Mission Division. In addition, we will competitively award a development grant in one of BC's bachelor's programs such as Computer Science, Molecular Biosciences, or Data Analytics to develop a research partnership and 400-level capstone project that engages upper-division BC students with NASA-funded research projects. At least 50 BC students will engage in these capstone projects over four years.

Activity 3: Support BC's Rocketry & Aerospace Club

Supports *Objective 1.1: Students contribute to NASA's endeavors in exploration and discovery.*

BC staff and faculty will continue to support an active membership of at least 30 students per year. We will partner with UW and other institutions to participate in a supersonic rocket challenge that aligns with the research interests of the Aeronautics Research Mission Division.

To perform this work, BC requests **$34,000** over four years. BC will provide a cost-share of **$34,000**. Trevor Gamble, Assistant Professor of Physics and Michael Reese, Director of Program Development for the RISE Learning Institute will each devote at least an hour per week to this work. The BC Foundation will match Space Grant Co-op funds on a dollar-for-dollar basis. Please see the budget on the next page for further details.

2020–2024 Budget and Cost Share

Expense Items	Year 1	Year 2	Year 3	Year 4	Total
Research project development by BC Physics faculty ($41.36/hr for 50 hrs in Y1, 35 in Y2, 30 in Y3 & 4 w/ 3% COLA /yr)	$2,068	$1,491	$1,316	$1,356	$6,231
Research coordination award to department that will connect BC capstone students to NASA research	-	$1,000	$1,000	$1,000	$3,000
Faculty benefits (21%)	$434	$523	$486	$495	$1,939
Rocket Club supplies	$2,522	$1,605	$1,816	$1,768	$7,711
Space Grant Co-ops for 2-3 students annually	$4,500	$3,000	$3,000	$3,000	$13,500
Total direct costs	$9,524	$7,619	$7,619	$7,619	$32,381
Indirect (5% of total direct costs)	$476	$381	$381	$381	$1,619
Total Space Grant Request	**$10,000**	**$8,000**	**$8,000**	**$8,000**	**$34,000**
BC Cost Share	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Total**
2.25% of Michael Reese's salary and benefits (with 3% COLA/yr)	$2,393	$2,465	$2,539	$2,614	$10,010
2.5% of Trevor Gamble's salary and benefits (with 3% COLA/yr)	$2,514	$2,590	$2,667	$2,719	$10,490
Matched Co-op funds	$4,500	$3,000	$3,000	$3,000	$13,500
Total BC Cost Share	**$9,407**	**$8,054**	**$8,206**	**$8,333**	**$34,000**

BC is committed to the success of this project and committed to the consortium to help NASA meet its STEM engagement priorities. We thank you for including our institution and students in this proposal.

Sincerely,

Dr. Kristen Jones

Rebecca Chawgo

EVERETT
COMMUNITY COLLEGE
2000 Tower Street · Everett, WA · 98201-1390 · 425.388.9100

Wednesday, August 7, 2019

To: Robert Winglee, Washington NASA Space Grant Director

This letter is to express Everett Community College's interest in being included on the 2020-2024 Space Grant Renewal Grant. Kristine Washburn will serve as the local coordinator of these funds at EvCC. We would like to continue at the level we had been working previously -- $5,000 from Space Grant and $5,000 matching funds from EvCC -- in order to continue building our programs in high altitude ballooning and rocketry with students. This work supports the missions of the Aerospace, Science, and Human Exploration Operations directorates and helps to prepare a diverse and skilled STEM workforce.

Students participating in rocketry work will go to regional launches and compete in the regional collegiate competition in Brothers, OR organized by University of Washington and Washington NASA Space Grant. Students working on high altitude ballooning will design and launch experiments as part of a class, either Engineering 298 or Physics 233. These will include work pertaining to astrobiology, specifically survivability in the near-space environment.

Though it is difficult to determine the exact demographic makeup of future students doing these projects, below is an estimate based on the last year of work in rocketry and high altitude ballooning. The groups doing this work last year were targeted to do these projects as a way to further improve their persistence in STEM, thus they over-represent the diversity in our STEM classes and programs at EvCC. While the intention is for this to remain our strategy in future years, we will have more students from outside our target groups participating as these programs grow, diluting these numbers.

Student participant demographics, 2018-19 academic year				
	Number Involved	Male/Female percents	% students of color	% low income (Pell eligible)
Rocketry	14	43% / 57%	64%	75%
High Altitude Ballooning	20	40% / 60%	75%	90%

A tentative budget is as follows.

NASA funds:		Matching funds:	
Rocketry Rocket kits Rocket motors DAQ Hardware Misc hardware (3D printer filament, etc)	 $2000 $1300 $200 $500	Rocketry Travel expenses Faculty mentoring (80 hrs @ $48/hr)	 $1000 $3800
High Altitude Ballooning Balloons Hardware GPS use Satellite service	 $200 $200 $100 $500	High Altitude Ballooning Travel expenses Faculty mentoring (covered by course)	 $200 --
TOTAL:	$5000	TOTAL:	$5000

EvCC faculty in Engineering, Physics, and Biology will support this work by mentoring students for these projects in student clubs and courses and by reporting participant demographics annually.

Sincerely,

Heather Bennett

Heather Bennett
Executive Director of Institutional Effectiveness and Resource Development
Everett Community College

PENINSULA COLLEGE

August 5, 2019

Dr. Robert M. Winglee
Washington NASA Space Grant Consortium
University of Washington
Box 351310, Seattle, WA

Dear Dr. Winglee:

Below is a proposed statement of work and related cost share for Peninsula College toward participation in the Washington NASA Space Grant Consortium.

Statement of Work May 2020 – April 2024

Each project year Peninsula College will select three underrepresented students seeking STEM degrees or STEM transfer to receive a $4,000 scholarship and participate in the WNSG consortium. The PI will gather input from STEM faculty at PC to establish reasonable yet competitive scholarship selection criteria and will work with Student Development to establish an annual award notice, selection, and distribution cycle.

Underrepresented students may be low-income and/or first-generation, women in STEM, students of color, and/or students with disabilities. All students will meet rural underserved criteria, as Peninsula College is located in a geographically isolated region. Peninsula College serves six tribal nations on the North Olympic Peninsula and will actively recruit Native American students who meet the eligibility criteria and encourage them to apply.

The students selected for the scholarships will receive 1:1 faculty mentorship from the PI and/or other faculty specific to the student's field of study. Faculty mentors will document a minimum of 8 contact hours with the student per quarter and will connect students with an array of academic support services as well as career and/or field experiences. The students will be required to participate in at least one authentic research experience in alignment with NASA mission directorates (e.g., rocket launch, balloon launch, etc.) each academic year s/he receives an award. When possible, Peninsula College students may participate in UW-sponsored authentic research experiences hosted on the North Olympic Peninsula via NESSP. Finally, the PI will be responsible for submitting timely progress reports and other documentation as required by the grant.

Annual Budget and Cost Share FY May 2020 – April 2024

ANNUAL ITEMS – GRANT FUNDED	**Amount**
3 Scholarships for STEM students @ $3,000 each (Space-Grant funded)	$9,000
Transportation and Materials Costs for annual Authentic Research Experience	$1,000
TOTAL ANNUAL GRANT FUNDED PER YEAR	**$10,000**
TOTAL PROJECT GRANT FUNDED	**$40,000**
ANNUAL ITEMS – PENINSULA COLLEGE MATCHING FUNDS	
.065 FTE PI Salary ($56,000 base salary) – Peninsula College funded	$3,640
PI Benefits @ 40% - Peninsula College Funded	$1,456
Student Scholarships	$5,000
TOTAL ANNUAL COST SHARE	**$10,096**
TOTAL PROJECT COST SHARE	**$40,384**

Sincerely,

Carie Edmiston
Interim Vice President of Finance and Administration

PIERCE COLLEGE

FORT STEILACOOM

August 23, 2019

Pierce College is the largest community college in Pierce County serving over 20,000 full and part time students and has two main campuses Pierce College Fort Steilacoom (in Lakewood) and Pierce College Puyallup, as well as a satellite campus at Joint Base Lewis-McCord (JBLM). Pierce College has been recognized by the Aspen Institute as one of the top 5 community colleges in the nation. It has also been selected as an *Achieving the Dream* Leader College and won the prestigious 2017 Leah Meyer Austin Award for implementing college-wide solutions that resulted in increased graduation rates and narrowing of the achievement gap. The College supports culturally impactful co-curricular activities that seek to encourage a diverse student population through empowerment activities, mentoring, tutoring, leadership, and service learning. We are an institution that values diversity and continue to acquire resources that will help us reflect our surrounding communities.

The activities described in this proposal will take place at Pierce College Fort Steilacoom. Pierce College Fort Steilacoom has 3,100 students, 40% are students of color, 63% are women and 48% are first generation college students. Pierce College Fort Steilacoom houses the Pierce College Science Dome, the only digital planetarium in the South Puget Sound region. The Pierce College Science Dome hosts regular public shows, offers over 220 field trips per year for pk-12 grade schools and youth organizations, free special events with hands-on science activities for the public and Space Camp for elementary students. The annual attendance of the Pierce College Science Dome is over 13,000.

Pierce College will participate in the WA NASA Space Grant program in two ways. First, by building a rocketry program at the college. Second, by creating a week long summer camp for middle and high school students. We are requesting an annual amount of $7600 from Space Grant with $7800 matching funds provided by Pierce College

College students participating in the rocketry program will attend a workshop at the University of Washington on the making of supersonic rockets in the fall and compete in a supersonic rocket challenge in the spring organized by the University of Washington in Brothers, Oregon. This will support the goals of the Aeronautics Mission Directorate.

The summer camp program will focus on reaching out to underrepresented middle and high school students in STEM. The camp will utilize the Pierce College Science Dome (a digital planetarium) and will focus on the Moon to Mars program. College students will be trained and act as leaders for the camp. This program will support the Science and Human Exploration Mission Directorates.

Hillary Stephens will serve as the local PI. Dr. Stephens holds a PhD in physics from the University of Wisconsin – Madison. She has over a decade of experience in teaching and advising at the college level and over 20 years of experience in creating and implementing informal science education experiences for diverse audiences. She is a Lakota Native, Professor of Physics and Astronomy, Director of the Pierce College Science Dome (Planetarium), and Physics department coordinator at Pierce College Fort Steilacoom. Dr. Stephens also plays an active role in the STEM bound program at Pierce College Fort Steilacoom which serves to increase the number of underrepresented students in STEM.

Estimated Student Demographics

Program	**Type of student**	**Number involved**	**Male/Female %**	**% students of color**
Rocketry	College	10	50%/50%	50%
Summer Camp	College	6	50%/50%	50%
	Grade 6-12	40	50%/50%	65%

Budget

	NASA funds		**Matching funds**	
Rocketry	Rocket kits	$1500	Travel Expenses	$1000
	Rocket motors	$1000	Faculty mentoring (50 hours @ $45/hr)	$2200

	Misc hardware	$500		
Summer Camp	Stipends for College student leaders	$4100	Faculty development & coordination (80 hrs @ $45/hr)	$3600
	Camp materials (bottle rockets, 3D printing material, etc)	$500	Planetarium technician development (40 hrs @ $25/hr)	$1000

Signed,

Hillary Stephens
Professor of Physics and Astronomy

Thomas Broxson
Dean of Natural Sciences

SEATTLE CENTRAL COLLEGE
One of the Seattle Colleges

Seattle Central College (SCC) and its students have benefited from participation in the Washington NASA Space Grant Consortium. As such, we submit this proposal for continued participation in the 4-year renewal. The remainder of this one-pager describes the activities SCC will engage in, their connection to NASA's strategic objectives, and an estimated cost for the proposal.

Rocketry

Befitting the Aeronautics Research Directorate, SCC will host a rocketry club invested in building and launching a supersonic rocket. This rocketry experience addresses NASA's "Goal 1.0: Enabling contributions to NASA's work", and "Objective 1.1 in which students contribute to NASA's endeavors in exploration and discovery." Activities will include: 1) University of Washington training for SCC faculty and students; 2) Rocketry Club meetings; Rocket launches; and 4) Undergraduate research projects related to science and engineering of the supersonic rocket.

Undergraduate Research and Internships

SCC is currently in partnership with the University of Washington's Pre-Major in Astronomy program and will leverage this collaboration to introduce students to undergraduate science research in astronomy, in alignment with the Science Directorate. SCC is also part of the NW Hub for an NSF INCLUDES STEM Core initiative. The STEM Core creates a path to employment for students by helping them achieve calculus readiness through contextualized and accelerated mathematics; providing a dedicated student support specialist to provide psychosocial support and services to reduce academic and non-academic barriers; and connecting them with paid internships in STEM industries. We are collaborating with Growth Sector, a non-profit workforce intermediary, to place STEM students in paid internships with National Laboratories and corporate partners in the Pacific Northwest region. Internships are project-based, 400-hour positions. Not all industry partners are able to fund paid internships. These activities meet Objective 2.4 to develop "strategic partnerships with industry, academia, non-profit organizations and educational institutions enhance and extend the impact of NASA's efforts in STEM engagement."

Budget

Category	Description	Annual	Subtotals	4 year totals
Rocketry	faculty advisor stipend at $35/hour	6,865.00	8,032.00	32,128.00
Rocketry	faculty advisor benefits at 17%	1,167.00		
Rocketry	Materials	5,000.00	5,000.00	20,000.00
Rocketry	launch travel	3,000.00	3,000.00	12,000.00
Undergraduate Research	faculty mentors stipends at $35/hour	1,025.00	1,200.00	4,800.00
Undergraduate Research	faculty mentors benefits at 17%	175.00		

Undergraduate Research	Materials	1,400.00	1,400.00	5,600.00
Internships	400-hour internship at $16/hour	25,600.00	26,368.00	105,472.00
Internships	benefits at 3%	768.00		
	SUBTOTAL	45,000.00	45,000.00	180,000.00

Benefits are broken out in column 3 in case there are NASA requirements for benefits.

No matching funds are included; we can easily do this with a little guidance. In general, we would cover matching as some of the work of the faculty advisors, rocketry work Seattle Central supports, and administration/staff costs.

Sincerely,

Wendy Rockhill, Ph.D.
(she/her pronouns)

Dean: Science, Technology, Engineering and Mathematics (STEM) + Business

Seattle Central College | 1701 Broadway, SAM 110 or BE 3176 | Seattle, WA 98122

p: 206-934-6921 | e: wendy.rockhill@seattlecolleges.edu www.seattlecentral.edu

Dr. Ricco Bonicalzi (ricco.bonicalzi@seattlecolleges.edu)

Dr. Chelsia Berry (chelsia.berry@seattlecolleges.edu)

Dr. Krystle Balhan (krystle.balhan@seattlecolleges.edu)

PACIFIC SCIENCE CENTER

TO:	Washington NASA Space Grant Consortium Earth and Space Sciences, Box 351310 University of Washington Seattle, WA 98195-1310 Tel: 206.543.1943; Email: nasa@uw.edu
TYPE OF SUPPORT REQUESTED:	Subcontract
TITLE OF PROJECT:	Washington Space Grant
PRINCIPAL INVESTIGATOR:	Maureen A. Devery Director of Informal Education and Engagement Pacific Science Center 200 Second Ave N. Seattle, WA 98109 206.443.3354, mdevery@pacsci.org
PERIOD OF PERFORMANCE:	June 1, 2020 – May 31, 2024
AWARD AMOUNT REQUESTED:	$37,000
AMOUNT OF INSTITUTIONAL COST SHARE:	$37,000
OFFICE TO BE CONTACTED REGARDING NEGOTIATION OF AWARD:	Will Daugherty President and CEO Pacific Science Center 200 Second Ave N. Seattle, WA 98109 206.443.2889, wdaugherty@pacsci.org

DATE: 9/19/19

[signature]
Maureen A. Devery
Director of Informal Education and Engagement

OFFICIAL AUTHORIZED TO GIVE INSTITUTIONAL APPROVAL:

[signature]
Will Daugherty
President and CEO

Pacific Science Center
Space Grant 4-Yr Renewal Proposal

In 2020 through 2024, Pacific Science Center (PSC) proposes to continue our Space Grant work in supporting high school age youth exploration of Aeronautics and Science careers:

1) Funding summer research internships and school year internships for our Discovery Corps Teens;
2) Support for space and earth science-based Teen Science Cafés.
3) Training researchers and industry professionals whose careers focus on aerospace or other areas of focus under the Science Mission Directorate through the Portal to the Public Science Communication Fellowship program in order to effectively present at the Teen Science Cafes.

Discovery Corps Youth Development Program: Pacific Science Center is dedicated to providing programs that reach populations historically underrepresented in STEM fields. Discovery Corps currently serves 72 teens – a number that will increase to 120 by 2021. Current demographics of program participants are: 63% female, 36% male, 1% identifies differently; Students of color comprise 93% of current participants, including: 19% African American, 31% Asian, 24% Hispanic, and 17% multiracial; and 49% of youth are from low-income families. We plan to use some of the WA Space Grant funds to offer summer research internships for Discovery Corps' youth in fields specifically related to the Aeronautics Research or Science Mission Directorate as well as a school year internship that will allow youth to research and create NASA related content for the planetarium, Science On a Sphere or other educational programs. Research internships have placed Discovery Corps youth in 8-to-10 week summer internships with local research organizations guided by qualified 1-to-1 scientist mentors in work groups that study astronomy, astrobiology, space biomedical equipment, geochemistry and other disciplines. While the content that interns will learn depends on the research and project focus, all youth will gain an increased understanding of what research entails and a greater awareness of careers in this field. **Cost: $4,750 per year for 2 research interns and 1 school year intern.**

Space and Earth Science Focused Teen Science Night: Pacific Science Center's Teen Science Night will be organized by and designed for local teens and feature hands-on activities and informal talks bringing scientists and science professionals face-to-face with our area's youth ages 13-19, at PSC and in neighborhood community centers. Teen Science Night will build on PacSci's skills in training researchers and industry professionals to better communicate their work through the Portal to the Public program and involves our Discovery Corps youth, as a teen leadership council with direction and focus as well as a sense of teen ownership of the program. We know from feedback from current interactions between local scientists and researchers, DC interns, and former Teen Science Café participants that teens want and enjoy the face-to-face interactions with scientists. Additionally, we regularly see parents brining teens to events with scientists as ways to expose them to possible science-based careers. Funding from WA Space Program for space or science-focused Teen Science Night will helps us to be better able to meet this need and desire of our audience. **Cost: $2,500 per year for teen advisory committee and coordination of event.**

Aeronautics Research and Science Mission Directorate Focused Communications Workshop: The ability to communicate effectively with policymakers and the public is now widely recognized as an important skill for scientists to possess. Two researchers or industry professionals will participate in Pacific Science Center's *Science Communication Fellowship Program*, which will serve as a means to train scientists and industry professionals whose work is aligned with the Aeronautics Research or Science Mission Directorates in science communication and to facilitate development of research and career specific content for the Teen Science Cafes and other public outreach. Participants learn how to communicate science to general audiences, including young adults, and they brainstorm ideas for creating hands-on outreach activities to construct and present. Each participant comes up with an activity to illustrate his/her particular research project that will be able to engage teen audiences and introduce them to his/her career. **Cost: $2,000 tuition for 2 participants/year**

*Costs are grant funded costs and do not include cost match of equal amount.

Pacific Science Center
Washington NASA Space Grant Proposal
2020-2024

GRANT FUNDED BUDGET	Year 1 (June 2020 - May 2021)	Year 2 (June 2021 - May 2022)	Year 3 (June 2022 - May 2023)	Year 4 (June 2023 - May 2024)
Teen Science Night				
Refreshments for Café (soda, water, chips, pizza)	$400	$400	$400	$400
Materials and supplies	$94	$94	$94	$94
4 DC Event Committee Members (8 hrs x 4 @ $15.75 p/hr + 9.49% benefits)	$552	$552	$552	$552
Portal to the Public Program Supervisor (10 hrs @ $19 p/hr + 28.73% benefits)	$245	$245	$245	$245
Subtotal	$1,290	$1,290	$1,290	$1,290
Science Communication Fellowship Program				
Tuition for 1 Science Communication Fellows ($2000/fellow)	$2,000	$2,000	$2,000	$2,000
Subtotal	$2,000	$2,000	$2,000	$2,000
Discovery Corps Co-ops				
2 DC Summer Co-ops (115 hrs x 2 @ $15.75 p/hr + 9.49% benefits)	$3,966	$3,966	$3,966	$3,966
2 Stipends to the hosting research labs @ $350 p/lab	$700	$700	$700	$700
1 DC school year Co-op (75 hrs @ $15.75 p/hr + 9.49% benefits)	$1,293	$1,293	$1,293	$1,293
Subtotal	$5,960	$5,960	$5,960	$5,960
Total	**$9,250**	**$9,250**	**$9,250**	**$9,250**

MATCHING BUDGET	Year 1 (June 2020 - May 2021)	Year 2 (June 2021 - May 2022)	Year 3 (June 2022 - May 2023)	Year 4 (June 2023 - May 2024)
Teen Science Night				
Materials and supplies	$48	$48	$48	$48
Design time for flyers and website (6 hrs @ $35 p/hr + 28.73% benefits)	$270	$270	$270	$270
Discovery Corps Coordinator (22 hrs @ $17.75 p/hr + 28.73% benefits)	$503	$503	$503	$503
Subtotal	$821	$821	$821	$821
Science Communication Fellowship Program				
Tuition for 1 Science Communication Fellows ($2000/fellow)	$2,000	$2,000	$2,000	$2,000
Subtotal	$2,000	$2,000	$2,000	$2,000
Discovery Corps Co-ops				
Science Interpretation Supervisor (20 hrs @ $19.5 p/hr + 28.73% benefits)	$502	$502	$502	$502
Discovery Corps Supervisor (8 hrs @ $19.5 p/hr + 28.73% benefits)	$201	$201	$201	$201
Discovery Corps Manager (6 hrs @ $23.25 p/hr + 28.73% benefits)	$180	$180	$180	$180
Subtotal	$882	$882	$882	$882
Grant Administration				
Dir. of Informal Ed. & Engagement (8 hrs @ $35.58 p/hr + 28.73% benefits)	$366	$366	$366	$366
Subtotal	$366	$366	$366	$366
Matching Funds Subtotal	$4,070	$4,070	$4,070	$4,070
Matching Indirect				
Indirect on Funding ($8,550 @ 41.05%)	$3,510	$3,510	$3,510	$3,510
Indirect on Matching Funds ($4,070 @ 41.05%)	$1,671	$1,671	$1,671	$1,671
Subtotal	$5,180	$5,180	$5,180	$5,180

				Total	**$9,250**	**$9,250**	**$9,250**	**$9,250**

ESD 105
Educational Service District

July 29, 2019

Robert Winglee
Director, Washington Space Grant Consortium
Northwest Earth and Space Sciences Pipeline
Johnson Hall, Rm 265
Univ. of Washington
Seattle WA 98195-1310

Mr. Winglee:

It is with great anticipation and excitement that I share with you the interest Educational Service District 105 has in participating in the next round of the NASA Space Grant consortium that will be facilitated by you and the Northwest Earth and Space Sciences Pipeline (NESSP). We are intrigued by past involvement of other educational service districts in past consortiums, and we are confident that we will fully support the efforts of NASA and NESSP to provide high quality professional development for educators in our region.

ESD 105 has a strong network of committed program coordinators who will be tasked with disseminating information to our region's science teachers concerning NASA Space Grant activities:

- Mark Cheney- Director of the South Central Washington STEM Network
- Luke Matlack- Migrant Academic Services Coordinator; Math & Science
- Mike Brown- Science Education Coordinator
- Larry Davison- Teaching & Learning Support Coordinator

We are excited to collaborate with NASA, NESSP and other partners and to learn more about how the NASA Space Grant will impact STEM education for students across our region.

Sincerely,

Larry Davison
Teaching & Learning Support Coordinator

Mark Cheney
Director South Central Washington
STEM Network

33 South Second Avenue
Yakima, WA 98902
509.575.2885
Fax 509.575.2918
www.esd105.org

WSGC: Cost-Match Yr 1 - 2020-2021

Lead Institution

$105,628	Unrecovered RCR
$170,000	Tuition Waivers
$35,000	Mary Gates Scholarships
$310,628	**Total Lead Institution Matching Funds**

Affiliates

$50,000	Washington State University (20 grad fellows)
$45,000	Seattle Central College (4 interns, 8 studentships, rocketry)
$12,500	Whitworth University (3 interns, 10 studentships, 25 grade 6-12)
$10,096	Peninsula College (3 studentships)
$10,000	University of Puget Sound (6 studentships)
$10,000	Bellevue College (2 students, rocketry)
$5,000	Everett College (rocketry, HAB; 40 MS students)
$12,000	Central Washington University (4 studentships, rocketry, HAB)
$38,820	Western Washington University (6 interns, 3 studentships)
$7,800	Pierce College (rocketry; 40 grade 6-12)
$9,250	Pacific Science Center (3 studentships; 40 outreach and PD)
$16,000	Heritage University (20 grade 6-12)
$226,466	**Total Affiliates Matching Funds**

$537,094 **Total Match**

WSGC: Cost-Match Yr 2 - 2021-2022

Lead Institution

$80,641	Unrecovered RCR
$170,000	Tuition Waivers
$35,000	Mary Gates Scholarships
$285,641	**Total Lead Institution Matching Funds**

Affiliates

$50,000	Washington State University (20 grad fellows)
$45,000	Seattle Central College (4 interns, 8 studentships, rocketry)
$12,500	Whitworth University (3 interns, 10 studentships, 25 grade 6-12)
$10,096	Peninsula College (3 studentships)
$10,000	University of Puget Sound (6 studentships)
$8,000	Bellevue College (2 students, rocketry)
$5,000	Everett College (rocketry, HAB; 40 MS students)
$12,000	Central Washington University (4 studentships, rocketry, HAB)
$38,820	Western Washington University (6 interns, 3 studentships)
$7,800	Pierce College (rocketry; 40 grade 6-12)
$9,250	Pacific Science Center (3 studentships; 40 outreach and PD)
$14,000	Heritage University (20 grade 6-12)
$222,466	**Total Affiliates Matching Funds**

$508,107	**Total Match**

WSGC: Cost-Match Yr 3 - 2022-2023

	Lead Institution
$68,177	Unrecovered RCR
$185,000	Tuition Waivers
$35,000	Mary Gates Scholarships
$288,177	**Total Lead Institution Matching Funds**
	Affiliates
$50,000	Washington State University (20 grad fellows)
$45,000	Seattle Central College (4 interns, 8 studentships, rocketry)
$12,500	Whitworth University (3 interns, 10 studentships, 25 grade 6-12)
$10,096	Peninsula College (3 studentships)
$10,000	University of Puget Sound (6 studentships)
$8,000	Bellevue College (2 students, rocketry)
$5,000	Everett College (rocketry, HAB; 40 MS students)
$12,000	Central Washington University (4 studentships, rocketry, HAB)
$38,820	Western Washington University (6 interns, 3 studentships)
$7,800	Pierce College (rocketry; 40 grade 6-12)
$9,250	Pacific Science Center (3 studentships; 40 outreach and PD)
$14,000	Heritage University (20 grade 6-12)
$222,466	**Total Affiliates Matching Funds**
$510,643	**Total Match**

WSGC: Cost-Match Yr 4 - 2023-2024

Lead Institution

$60,610	Unrecovered RCR
$190,000	Tuition Waivers
$35,000	Mary Gates Scholarships
$285,610	**Total Lead Institution Matching Funds**

Affiliates

$50,000	Washington State University (20 grad fellows)
$45,000	Seattle Central College (4 interns, 8 studentships, rocketry)
$12,500	Whitworth University (3 interns, 10 studentships, 25 grade 6-12)
$10,096	Peninsula College (3 studentships)
$10,000	University of Puget Sound (6 studentships)
$8,000	Bellevue College (2 students, rocketry)
$5,000	Everett College (rocketry, HAB; 40 MS students)
$12,000	Central Washington University (4 studentships, rocketry, HAB)
$38,820	Western Washington University (6 interns, 3 studentships)
$7,800	Pierce College (rocketry; 40 grade 6-12)
$9,250	Pacific Science Center (3 studentships; 40 outreach and PD)
$14,000	Heritage University (20 grade 6-12)
$222,466	**Total Affiliates Matching Funds**

$508,076	**Total Match**

WSGC: Cost-Match Cummulative - 2020-2024

	Lead Institution
$315,056	Unrecovered RCR
$715,000	Tuition Waivers
$140,000	Mary Gates Scholarships
$1,170,056	**Total Lead Institution Matching Funds**
	Affiliates
$200,000	Washington State University (20 grad fellows)
$180,000	Seattle Central College (4 interns, 8 studentships, rocketry)
$50,000	Whitworth University (3 interns, 10 studentships, 25 grade 6-12)
$40,384	Peninsula College (3 studentships)
$40,000	University of Puget Sound (6 studentships)
$34,000	Bellevue College (2 students, rocketry)
$20,000	Everett College (rocketry, HAB; 40 MS students)
$48,000	Central Washington University (4 studentships, rocketry, HAB)
$155,280	Western Washington University (6 interns, 3 studentships)
$31,200	Pierce College (rocketry; 40 grade 6-12)
$37,000	Pacific Science Center (3 studentships; 40 outreach and PD)
$58,000	Heritage University (20 grade 6-12)
$893,864	**Total Affiliates Matching Funds**
$2,063,920	**Total Match**

Table 2a: Budget NASA Topic BreakOut YR 1

Space Grant College and Fellowship Program 8
6/1/21 to 05/31/22

		Year 1: NASA Funds	2020-2021 Cost Share	Total Cost
Adminstrative Staff				
Program adminstrator (12 mos @ 33%)** 4 MM @ $6,267/month		25,068		25,068
Fiscal Specialist (6 mos @ 33%)*** 2 MM @ $4,238/month		8,476		8,476
Public Information Specialist** 4 months@ $6,013/month		24,052		24,052
TOTAL Salary		**57,596**		**57,596**
BENEFITS				
*Faculty Benefits @23.9% (PI)				
**Professional staff benefits @ 32.1% (co-I)				
**Professional staff benefits @ 32.1% (Program Admin)		8,047		8,047
**Professional staff benefits @ 32.1% (Public Info Spec)		7,721		7,721
**Professional staff benefits @ 32.1% (Academic Adviser)				-
***Classified staff Benefits @ 41.2% (fiscal Specialist)		3,492		3,492
	Total	**19,260**		**19,260**
TOTAL SALARIES & BENEFITS		**76,856**		**76,856**
SERVICES				
Campus Services		5,300		5,300
Computer Services		2,000		2,000
Event fees (room rental, parking)		1,800		1,800
Longitudinal Tracking		4,400		4,400
TOTAL SERVICES		**13,500**		**4,400**
TRAVEL				
Travel to Directors Spring Meeting (2 persons)		3,390		3,390
Travel to Directors Fall Meeting (2 persons)		3,140		3,140
NASA Site visit + Consortium Meeting		1,000		1,000
TOTAL TRAVEL		**7,530**		**6,300**
NIF				
Lead Institution				
NASA Internships, 4 awards l (NIF)		32,000		32,000
University of Washington SURP (24 interns, NIF)		66,000		66,000
Cubesat Internships		10,000		10,000
Industry Internships		16,000		16,000

Seattle Central College Internship	26,368	26,368	52,736
Whitworth University Internship	5,000	5,000	10,000
Western Washington University	34,320	34,320	68,640
Total Interns	**189,688**	**65,688**	**255,376**
Washington State University Fellowships (20)	50,000	50,000	100,000
UW Graduate Fellowship (3 qtrs)	33,487		33,487
Total Fellows	**83,487**	**50,000**	**133,487**
Total NIF	**273,175**	**115,688**	**388,863**

Mutli-disciplinary; 70% SMD, HEOM 10%, STMD 10%: Studentships; faculty support			
1. Peninsula College	10,000	10,000	20,000
2. Seattle Central College	0	-	-
4. University of Puget Sound	10,000	10,000	20,000
5. Western Washington Univ	4,500	4,500	9,000
6. UW Undergrad Scholars	60,000	170,000	230,000
7. UW Consortium-wide Community College Undergrads	20,000	35,000	55,000
6. Training of students provided by UW (including student adviser time)	56,675		56,675
Total Mutli-Disciplinary Studentship Support	**161,175**	**229,500**	**390,675**

AMD 80%; HEOMD 20%: Supersonic Rocket Development			
1. Bellevue College	10,000	10,000	20,000
2. Everett College	4,000	4,000	8,000
3. Central Washington University	11,400	12,000	23,400
4. Piece College	7,600	7,800	15,400
5. Seattle Central College	18,632	18,632	37,264
6. UW (including Director time for workshops and onsite launch events)	8,229		8,229
7. Rocket Supplies	4,000		4,000
Total Supersonic Rocket Development	**63,861**	**52,432**	**116,293**

SMD: High Altitude Balloons			
1. Everett College	1,000	1,000	2,000
2. Central Washington Univ.	600		
3. Univ. of Washington	1,000		
2. Constorium Wide Balloon Supplies	2,600		2,600
Total High Altitude Balloons	**5,200**	**1,000**	**6,200**

SMD: In-Service Teacher Support for ROADS on Mars			
2. Pacific Science Center	9,250	9,250	18,500
3. Whitworth University	7,500	7,500	15,000
4. K-12 Educator Addition Support (competitive)	10,320	-	10,320
5. Heritage University	16,000	16,000	32,000
6. Challenge Supplies	5,000		5,000
7. UW (including Associate director time running PD)	11,625		11,625
Total K-12 Student Challenge	**59,695**	**32,750**	**92,445**
STMD: Cubesat Development			
1. CubeSat internships (through NIF)	-		
2. Grad Student support (included through NIF)	-		
3. UW (including Director time)	2,057		2,057
4. Cubesat Supplies	7,813		7,813
Total Cubesat Development	**9,870**		**9,870**
TOTAL DIRECT COSTS	**670,861**	**431,370**	**1,102,231**
Base Subject to RCR	**364,234**		
Indirect costs at 37% MTDC (8% UW, 29% Unrecovered RCR for cost sh	**29,139**	**105,628**	**134,767**
TOTAL Funds Reqested	**700,000**	**536,998**	**1,236,998**
Total Cost		**1,236,998**	

Table 2b: Budget NASA Topic BreakOut YR 2

Space Grant College and Fellowship Program 8
6/1/21 to 05/31/22

		Year 2: NASA Funds	2021-2022 Cost Share	Total Cost
Adminstrative Staff				
Program adminstrator (12 mos @ 33%)** 4 MM @ $6,267/month		26,071		26,071
Fiscal Specialist (6 mos @ 33%)*** 2 MM @ $4,238/month		8,815		8,815
Public Information Specialist** 4 months@ $6,013/month		25,014		25,014
TOTAL Salary		**59,900**		**59,900**
BENEFITS				
*Faculty Benefits @23.9% (PI)				
**Professional staff benefits @ 32.1% (co-I)				
**Professional staff benefits @ 32.1% (Program Admin)		8,369		8,369
**Professional staff benefits @ 32.1% (Public Info Spec)		8,030		8,030
**Professional staff benefits @ 32.1% (Academic Adviser)				-
***Classified staff Benefits @ 41.2% (fiscal Specialist)		3,632		3,632
	Total	**20,030**		**20,030**
TOTAL SALARIES & BENEFITS		**79,930**		**79,930**
SERVICES				
Campus Services		5,300		5,300
Computer Services		2,000		2,000
Event fees (room rental, parking)		1,800		1,800
Longitudinal Tracking		4,400		4,400
TOTAL SERVICES		**13,500**		**4,400**
TRAVEL				
Travel to Directors Spring Meeting (2 persons)		3,390		3,390
Travel to Directors Fall Meeting (2 persons)		3,140		3,140
NASA Site visit + Consortium Meeting		1,000		1,000
TOTAL TRAVEL		**7,530**		**6,300**
NIF				
Lead Institution				
NASA Internships, 4 awards (NIF)		32,000		32,000
University of Washington SURP (24 interns, NIF)		66,000		66,000
Cubesat Internships		10,000		10,000

Industry Internships	16,000		16,000
Seattle Central College Internship	26,368	26,368	52,736
Whitworth University Internship	5,000	5,000	10,000
Western Washington University	34,320	34,320	68,640
Total Interns	**189,688**	**65,688**	**255,376**
Washington State University Fellowships (20)	50,000	50,000	100,000
UW Graduate Fellowship (3 qtrs)	33,862		33,862
Total Fellows	**83,862**	**50,000**	**133,862**
Total NIF	**273,550**	**115,688**	**389,238**

Mutli-disciplinary; 70% SMD, HEOM 10%, STMD 10%: Studentships; faculty support			
1. Peninsula College	10,000	10,000	20,000
2. Seattle Central College	0	-	-
4. University of Puget Sound	10,000	10,000	20,000
5. Western Washington Univ	4,500	4,500	9,000
6. UW Undergrad Scholars	60,000	170,000	230,000
7. UW Consortium-wide Community College Undergrads	20,000	35,000	55,000
6. Training of students provided by UW (including student adviser time)	58,942		58,942
Total Mutli-Disciplinary Studentship Support	**163,442**	**229,500**	**392,942**

AMD 80%; HEOMD 20%: Supersonic Rocket Development			
1. Bellevue College	8,000	8,000	16,000
2. Everett College	4,000	4,000	8,000
3. Central Washington University	11,400	12,000	23,400
4. Piece College	7,600	7,800	15,400
5. Seattle Central College	18,632	18,632	37,264
6. UW (including Director time for workshops and onsite launch events)	8,476		8,476
7. Rocket Supplies	1,200		1,200
Total Supersonic Rocket Development	**59,308**	**50,432**	**109,740**

SMD: High Altitude Balloons			

1. Everett College	1,000	1,000	2,000
2. Central Washington Univ.	600		
3. Univ. of Washington	1,000		
2. Constorium Wide Balloon Supplies	800		800
Total High Altitude Balloons	**3,400**	**1,000**	**4,400**
SMD: In-Service Teacher Support for ROADS on Mars			
2. Pacific Science Center	9,250	9,250	18,500
3. Whitworth University	7,500	7,500	15,000
4. K-12 Educator Addition Support (competitive)	8,000	-	8,000
5. Heritage University	14,000	14,000	28,000
6. Challenge Supplies	2,000		2,000
7. UW (including Associate director time running PD)	11,974		11,974
Total K-12 Student Challenge	**52,724**	**30,750**	**83,474**
STMD: Cubesat Development			
1. CubeSat internships (through NIF)	-		
2. Grad Student support (included through NIF)	-		
3. UW (including Director time)	2,119		2,119
4. Cubesat Supplies	7,253		7,253
Total Cubesat Development	**9,372**		**9,372**
TOTAL DIRECT COSTS	**662,755**	**427,370**	**1,090,125**
Base Subject to RCR	**278,073**		
Indirect costs at 37% MTDC (8% UW, 29% Unrecovered RCR for cos	**22,246**	**80,641**	**102,887**
TOTAL Funds Reqested	**685,000**	**508,011**	**1,193,012**
Total Cost		**1,193,012**	

Table 2c: Budget NASA Topic BreakOut YR 3

Space Grant College and Fellowship Program 8
6/1/22 to 05/31/23

		Year 3: NASA Funds	2022-2023 Cost Share	Total Cost
Adminstrative Staff				
Program adminstrator (12 mos @ 33%)** 4 MM @ $6,267/month		27,114		27,114
Fiscal Specialist (6 mos @ 33%)*** 2 MM @ $4,238/month		9,168		9,168
Public Information Specialist** 4 months@ $6,013/month		26,015		26,015
TOTAL Salary		**62,296**		**62,296**
BENEFITS				
*Faculty Benefits @23.9% (PI)				
**Professional staff benefits @ 32.1% (co-I)				
**Professional staff benefits @ 32.1% (Program Admin)		8,703		8,703
**Professional staff benefits @ 32.1% (Public Info Spec)		8,351		8,351
**Professional staff benefits @ 32.1% (Academic Adviser)				-
***Classified staff Benefits @ 41.2% (fiscal Specialist)		3,777		3,777
	Total	**20,831**		**20,831**
TOTAL SALARIES & BENEFITS		**83,127**		**83,127**
SERVICES				
Campus Services		5,300		5,300
Computer Services		2,000		2,000
Event fees (room rental, parking)		1,800		1,800
Longitudinal Tracking		4,400		4,400
TOTAL SERVICES		**13,500**		**4,400**
TRAVEL				
Travel to Directors Spring Meeting (2 persons)		3,390		3,390
Travel to Directors Fall Meeting (2 persons)		3,140		3,140
NASA Site visit + Consortium Meeting		1,000		1,000
TOTAL TRAVEL		**7,530**		**6,300**
NIF				
Lead Institution				
NASA Internships, 4 awards (NIF)		32,000		32,000
University of Washington SURP (24 interns, NIF)		66,000		66,000
Cubesat Internships		10,000		10,000
Industry Internships		16,000		16,000
Seattle Central College Internship		26,368	26,368	52,736
Whitworth University Internship		5,000	5,000	10,000

Western Washington University	34,320	34,320	68,640
Total Interns	**189,688**	**65,688**	**255,376**
Washington State University Fellowships (20)	50,000	50,000	100,000
UW Graduate Fellowship (3 qtrs)	34,245		34,245
Total Fellows	**84,245**	**50,000**	**134,245**
Total NIF	**273,933**	**115,688**	**389,621**

Mutli-disciplinary; 70% SMD, HEOM 10%, STMD 10%: Studentships; faculty support			
1. Peninsula College	10,000	10,000	20,000
2. Seattle Central College	0	-	-
4. University of Puget Sound	10,000	10,000	20,000
5. Western Washington Univ	4,500	4,500	9,000
6. UW Undergrad Scholars	60,000	185,000	245,000
7. UW Consortium-wide Community College Undergrads	20,000	35,000	55,000
6. Training of students provided by UW (including student adviser time)	61,300		61,300
Total Mutli-Disciplinary Studentship Support	**165,800**	**244,500**	**410,300**

AMD 80%; HEOMD 20%: Supersonic Rocket Development			
1. Bellevue College	8,000	8,000	16,000
2. Everett College	4,000	4,000	8,000
3. Central Washington University	11,400	12,000	23,400
4. Piece College	7,600	7,800	15,400
5. Seattle Central College	18,632	18,632	37,264
6. UW (including Director time for workshops and onsite launch events)	8,730		8,730
7. Rocket Supplies	1,200		1,200
Total Supersonic Rocket Development	**59,562**	**50,432**	**109,994**

SMD: High Altitude Balloons			
1. Everett College	1,000	1,000	2,000
2. Central Washington Univ.	600		
3. Univ. of Washington	1,000		
2. Constorium Wide Balloon Supplies	800		800
Total High Altitude Balloons	**3,400**	**1,000**	**4,400**

SMD: In-Service Teacher Support for ROADS on Mars			
2. Pacific Science Center	9,250	9,250	18,500
3. Whitworth University	7,500	7,500	15,000
4. K-12 Educator Addition Support (competitive)	7,785	-	7,785
5. Heritage University	14,000	14,000	28,000
6. Challenge Supplies	1,000		1,000
7. UW (including Associate director time running PD)	12,333		12,333

Total K-12 Student Challenge	**51,868**	**30,750**	**82,618**
STMD: Cubesat Development			
1. CubeSat internships (through NIF)	-		
2. Grad Student support (included through NIF)	-		
3. UW (including Director time)	2,183		2,183
4. Cubesat Supplies	5,291		5,291
Total Cubesat Development	**7,474**		**7,474**
TOTAL DIRECT COSTS	**666,192**	**442,370**	**1,108,562**
Base Subject to RCR	**235,093**		
Indirect costs at 37% MTDC (8% UW, 29% Unrecovered RCR for cost share)	**18,807**	**68,177**	**86,984**
TOTAL Funds Reqested	**685,000**	**510,547**	**1,195,547**
Total Cost		**1,195,547**	

Table 2d: Budget NASA Topic BreakOut YR 4

Space Grant College and Fellowship Program 8
6/1/23 to 05/31/24

		Year 4: NASA Funds	2023-2024 Cost Share	Total Cost
Adminstrative Staff				
Program adminstrator (12 mos @ 33%)** 4 MM @ $6,267/month		28,198		28,198
Fiscal Specialist (6 mos @ 33%)*** 2 MM @ $4,238/month		9,534		9,534
Public Information Specialist** 4 months@ $6,013/month		27,055		27,055
TOTAL Salary		**64,788**		**64,788**
BENEFITS				
*Faculty Benefits @23.9% (PI)				
**Professional staff benefits @ 32.1% (co-I)				
**Professional staff benefits @ 32.1% (Program Admin)		9,052		9,052
**Professional staff benefits @ 32.1% (Public Info Spec)		8,685		8,685
**Professional staff benefits @ 32.1% (Academic Adviser)				-
***Classified staff Benefits @ 41.2% (fiscal Specialist)		3,928		3,928
	Total	**21,664**		**21,664**
TOTAL SALARIES & BENEFITS		**86,452**		**86,452**
SERVICES				
Campus Services		5,300		5,300
Computer Services		2,000		2,000
Event fees (room rental, parking)		1,800		1,800
Longitudinal Tracking		4,400		4,400
TOTAL SERVICES		**13,500**		**4,400**
TRAVEL				
Travel to Directors Spring Meeting (2 persons)		3,390		3,390
Travel to Directors Fall Meeting (2 persons)		3,140		3,140
NASA Site visit + Consortium Meeting		1,000		1,000
TOTAL TRAVEL		**7,530**		**6,300**
NIF				
Lead Institution				
NASA Internships, 4 awards (NIF)		32,000		32,000
University of Washington SURP (24 interns, NIF)		66,000		66,000
Cubesat Internships		10,000		10,000

Industry Internships	16,000		16,000
Seattle Central College Internship	26,368	26,368	52,736
Whitworth University Internship	5,000	5,000	10,000
Western Washington University	34,320	34,320	68,640
Total Interns	**189,688**	**65,688**	**255,376**
Washington State University Fellowships (20)	50,000	50,000	100,000
UW Graduate Fellowship (3 qtrs)	34,642		34,642
Total Fellows	**84,642**	**50,000**	**134,642**
Total NIF	**274,330**	**115,688**	**390,018**

Mutli-disciplinary; 70% SMD, HEOM 10%, STMD 10%: Studentships; faculty support			
1. Peninsula College	10,000	10,000	20,000
2. Seattle Central College	0	-	-
4. University of Puget Sound	10,000	10,000	20,000
5. Western Washington Univ	4,500	4,500	9,000
6. UW Undergrad Scholars	60,000	190,000	250,000
7. UW Consortium-wide Community College Undergrads	20,000	35,000	55,000
6. Training of students provided by UW (including student adviser time)	63,752		63,752
Total Mutli-Disciplinary Studentship Support	**168,252**	**249,500**	**417,752**

AMD 80%; HEOMD 20%: Supersonic Rocket Development			
1. Bellevue College	8,000	8,000	16,000
2. Everett College	4,000	4,000	8,000
3. Central Washington University	11,400	12,000	23,400
4. Piece College	7,600	7,800	15,400
5. Seattle Central College	18,632	18,632	37,264
6. UW (including Director time for workshops and onsite launch events)	8,992		8,992
7. Rocket Supplies	924		924
Total Supersonic Rocket Development	**59,548**	**50,432**	**109,980**

SMD: High Altitude Balloons			
1. Everett College	1,000	1,000	2,000
2. Central Washington Univ.	600		

3. Univ. of Washington	1,000		
2. Constorium Wide Balloon Supplies	-300		(300)
Total High Altitude Balloons	**2,300**	**1,000**	**3,300**
SMD: In-Service Teacher Support for ROADS on Mars			
2. Pacific Science Center	9,250	9,250	18,500
3. Whitworth University	7,500	7,500	15,000
4. K-12 Educator Addition Support (competitive)	5,669	-	5,669
5. Heritage University	14,000	14,000	28,000
6. Challenge Supplies	1,000		1,000
7. UW (including Associate director time running PD)	12,703		12,703
Total K-12 Student Challenge	**50,121**	**30,750**	**80,871**
STMD: Cubesat Development			
1. CubeSat internships (through NIF)	-		
2. Grad Student support (included through NIF)	-		
3. UW (including Director time)	2,248		2,248
4. Cubesat Supplies	4,000		4,000
Total Cubesat Development	**6,248**		**6,248**
TOTAL DIRECT COSTS	**668,280**	**447,370**	**1,115,650**
Base Subject to RCR	**209,000**		
Indirect costs at 37% MTDC (8% UW, 29% Unrecovered RCR for cost sł	**16,720**	**60,610**	**77,330**
TOTAL Funds Reqested	**685,000**	**507,980**	**1,192,981**

Total Cost **1,192,981**

Table 2e: Budget NASA Topic BreakOut Cummulative

Space Grant College and Fellowship Program 8
6/1/20 to 05/31/24

		Cummulative NASA Funds	2020-2024 Cost Share	Total Cost
Adminstrative Staff				
Program adminstrator (12 mos @ 40%)** 4 MM/yr		106,450	-	106,450
Fiscal Specialist (12 mos @ 33%)*** 2 MM /yr		35,993	-	35,993
Public Information Specialist** 4 months/yr		102,136	-	102,136
TOTAL Salary		**244,579**		**244,579**
BENEFITS				
*Faculty Benefits @23.9% (PI)		-	-	
**Professional staff benefits @ 32.1% (co-I)		-	-	
**Professional staff benefits @ 32.1% (Program Admin)		34,171	-	34,171
**Professional staff benefits @ 32.1% (Public Info Spec)		32,786	-	32,786
**Professional staff benefits @ 32.1% (Academic Adviser)		-	-	-
***Classified staff Benefits @ 41.2% (fiscal Specialist)		14,829	-	14,829
	Total	**81,785**		**81,785**
TOTAL SALARIES & BENEFITS		**326,365**		**326,365**
SERVICES				
Campus Services		21,200	-	21,200
Computer Services		8,000	-	8,000
Event fees (room rental, parking)		7,200	-	7,200
Longitudinal Tracking		17,600	-	17,600
TOTAL SERVICES		**54,000**		**54,000**
TRAVEL				
Travel to Directors Spring Meeting (2 persons/yr)		13,560	-	13,560
Travel to Directors Fall Meeting (2 persons/yr)		12,560	-	12,560
NASA Site visit + Consortium Meeting		4,000	-	4,000
TOTAL TRAVEL		**30,120**		**30,120**
NIF				
Lead Institution				
NASA Internships		128,000	-	128,000
University of Washington SURP		264,000	-	264,000
Cubesat Internships		40,000	-	40,000
Industry Internships		64,000	-	64,000

Seattle Central College Internship	105,472	105,472	210,944
Whitworth University Internship	20,000	20,000	40,000
Western Washington University	137,280	137,280	274,560
Total Interns	**758,752**	**262,752**	**1,021,504**
Washington State University Fellowships	200,000	200,000	400,000
UW Graduate Fellowship	136,234	-	136,234
Total Fellows	**336,234**	**200,000**	**536,234**
Total NIF	**1,094,986**	**462,752**	**1,557,738**

Mutli-disciplinary; 70% SMD, HEOM 10%, STMD 10%: Studentships; faculty support			
1. Peninsula College	40,000	40,000	80,000
2. Seattle Central College	-	-	-
4. University of Puget Sound	40,000	40,000	80,000
5. Western Washington Univ	18,000	18,000	36,000
6. UW Undergrad Scholars	240,000	715,000	955,000
7. UW Consortium-wide Community College Undergrads	80,000	140,000	220,000
6. Training of students provided by UW (including student adviser time)	240,668	-	240,668
Total Mutli-Disciplinary Studentship Support	**658,668**	**953,000**	**1,611,668**

AMD 80%; HEOMD 20%: Supersonic Rocket Development			
1. Bellevue College	34,000	34,000	68,000
2. Everett College	16,000	16,000	32,000
3. Central Washington University	45,600	48,000	93,600
4. Piece College	30,400	31,200	61,600
5. Seattle Central College	74,528	74,528	149,056
6. UW (including Director time for workshops and onsite launch events)	34,427	-	34,427
7. Rocket Supplies	7,324	-	7,324
Total Supersonic Rocket Development	**242,279**	**203,728**	**446,007**

SMD: High Altitude Balloons			
1. Everett College	4,000	4,000	8,000
2. Central Washington Univ.	2,400	-	
3. Univ. of Washington	4,000	-	
2. Constorium Wide Balloon Supplies	3,900	-	3,900
Total High Altitude Balloons	**14,300**	**4,000**	**18,300**

SMD: In-Service Teacher Support for ROADS on Mars			
2. Pacific Science Center	37,000	37,000	74,000
3. Whitworth University	30,000	30,000	60,000
4. K-12 Educator Addition Support (competitive)	31,774	-	31,774
5. Heritage University	58,000	58,000	116,000
6. Challenge Supplies	9,000	-	9,000
7. UW (including Associate director time running PD)	48,634	-	48,634
Total K-12 Student Challenge	**214,407**	**125,000**	**339,407**
STMD: Cubesat Development			
1. CubeSat internships (through NIF)	-		
2. Grad Student support (included through NIF)	-		
3. UW (including Director time)	8,607		8,607
4. Cubesat Supplies	24,357		24,357
Total Cubesat Development	**32,964**		**32,964**
TOTAL DIRECT COSTS	**2,668,088**	**1,748,480**	**4,416,568**
Base Subject to RCR	1,086,401		
Indirect costs at 37% MTDC (8% UW, 29% Unrecvoered RCR for cost s	**86,912**	**315,056**	**401,968**
TOTAL Funds Reqested	**2,755,000**	**2,063,536**	**4,818,537**
Total Cost		**4,818,537**	

Consortium: WSGC

Year	20- 21				21- 22				22- 23				23- 24			
Qtr	Sum	Fall	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win	Spr
	Jun,Jul,Aug	Sep,Oct,Nov	Dec,Jan,Feb	Mar,Apr,May	Jun,Jul,Aug	Sep,Oct,No	Dec,Jan,Fet	Mar,Apr,May	Jun,Jul,Aug	Sep,Oct,Nov	Dec,Jan,Feb	Mar,Apr,May				
NASA Internships and Fellowships																
NASA Internships (Consortium Wide)			Ap Opens - Student recruit	Ap Opens - Student recruit			Ap Opens - Student recruit	Ap Opens - Student recruit			Ap Opens - Student recruit	Ap Opens - Student recruit			Ap Opens - Student recruit	Ap Opens - Student recruit
	Student effort				Student effort				Student effort				Student effort			
Internships (SCC, UW, WWU, WU)	"	"	Ap Opens - Student recruit	Ap Opens - Student recruit	"	"	Ap Opens - Student recruit	Ap Opens - Student recruit	"	"	Ap Opens - Student recruit	Ap Opens - Student recruit	"	"	Ap Opens - Student recruit	Ap Opens - Student recruit
	Student effort			Student effort	Student effort			Student effort	Student effort			Student effort	Student effort			Student effort
Graduate Research Fellowships (UW, WSU)		Ap Opens - Student recruit	Ap Opens - Student recruit	Ap Opens - Student recruit		Ap Opens - Student recruit	Ap Opens - Student recruit	Ap Opens - Student recruit		Ap Opens - Student recruit	Ap Opens - Student recruit	Ap Opens - Student recruit		Ap Opens - Student recruit	Ap Opens - Student recruit	Ap Opens - Student recruit
	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort
Studentships (Competitively Awarded)																
Studentships (UW)			Ap Opens - Student recruit	Ap Opens - Student recruit			Ap Opens - Student recruit	Ap Opens - Student recruit			Ap Opens - Student recruit	Ap Opens - Student recruit			Ap Opens - Student recruit	Ap Opens - Student recruit
	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort	Student effort
Studentships (BC,SCC,PC, UPS, CWU, WU)		Ap Opens - All Year recruitment	Student effort	Student effort	Student effort	Ap Opens - All Year recruitment	Student effort	Student effort	Student effort	Ap Opens - All Year recruitment	Student effort	Student effort	Student effort	Ap Opens - All Year recruitment	Student effort	Student effort
Studentships (PSC)				Ap Opens	Student effort			Ap Opens	Student effort			Ap Opens	Student effort			Ap Opens
Group Projects																
Supersonic Rocket Student Research Program		Recruit Students	Prelim Design	Fly System		Recruit Students	Prelim Design	Fly System		Recruit Students	Prelim Design	Fly System		Recruit Students	Prelim Design	Fly System
High Altitude Balloon Research Program			Recruit Students	Fly System			Recruit Students	Fly System			Recruit Students	Fly System			Recruit Students	Fly System
CubeSat Development and Plasma Thrusters		Recruit Students	Prelim Design	Subsys Develo	Subsys Develo	Recruit Students	Prelim Design	Subsys Develo	Subsys Develo	Recruit Students	Prelim Design	Subsys Develo	Subsys Develo	Recruit Students	Prelim Design	Subsys Develo
Professional Development Student Challenges		Work-shop	Work-shop			Work-shop	Work-shop			Work-shop	Work-shop			Work-shop	Work-shop	

Consortium: WSGC - NIF

The Information is the same for all four years

Activity	Strategic Priority Alignment	Space Grant Objective Alignment	Goal	Objective	Metrics	Target Number	Deadline
NASA Internships (Consortium Wide)	1,2,3	2,3,4,5,6,7	To have internships and fellowships at four WSGC institutions (UW, WWU, SSC and WU) that are competitively awarded	Provide immersive experiences for undergraduate and graduate students in topic areas of focus for NASA, through the placement of students at NASA, the private sector, and university research laboratories	Award WSGC NIF direct student awards to underrepresented minority students at or above 20 % and to women undergraduates at or above 50%	4	Offer all NIF by May of each year; Results present in Sept/Oct
Internships (UW)	"	"	"	"	"	24	"
Internships (WWU)	"	"	"	"	"	6	"
Internships (WU)	"	"	"	"	"	2	"
Internships (SCC)	"	"	"	"	"	4	"
Internships (Industry)	"	"	"	"	"	4	"
Graduate Research Fellowships (WSU)	"	"	"	"	"	20	"
Graduate Research Fellowships (UW)	"	"	"	"	"	3	"

Total Interns **44**

Total Fellows **23**

Consortium: WSGC - Multi-disciplinary Studentships (HEOM, SMD, STMD)

The Information is the same for all four years

Activity	Strategic Priority Alignment	Space Grant Objective Alignment	Goal	Objective	Metrics	Target Number	Deadline
Studentships (BC)	1,2,3	2,3,4,5,6,7	To have studenships at nine WSGC institutions (BC, CWU, PC, SSC, WWU, WU, UW, UPS and PSC) that are competitively awarded	Provide introductory research experiences for undergraduate topic areas of focus for NASA STEM research opportunities with less time commitment than internships	Award WSGC NIF direct student awards to underrepresented minority students at or above 20 % and to women	2	Offer all studentships by May of each year; Results present in Sept/Oct
Studentships (CWU)	"	"	"	"	"	4	"
Studentships (PC)	"	"	"	"	"	3	"
Studentships (SCC)	"	"	"	"	"	8	"
Studentships (WWU)	"	"	"	"	"	3	"
Studentships (WU)	"	"	"	"	"	10	"
Studentships (UW)	"	"	"	"	"	16	"
Studentships (UPS)	"	"	"	"	"	6	"
Studentships (PSC)	"	"	"	"	"	3	"
Studentships (constorium wide)	"	"	"	"	"	4	"
					Total Studentships	**59**	

Consortium: WSGC - High Altitude Research Balloon Research Program (SMD)

The Information is the same for all four years

Activity	Strategic Priority Alignment	Space Grant Objective Alignment	Goal	Objective	Metrics	Target Number	Deadline
High Altitude Research Balloon Program	1,2,3	2,3,4,5,6,7	To set up high altitude balloon programs at four WSGC institutions to provide studies in dust altitude profiles at several locations in Washington over a long period of time to investigate potential influences from climate change.	Provide initial workforce development that would aid students in gaining more immersive experiences for secondary school students and undergraduates in the focus area of climate change in SMD	Take data from at least four launches per year in Washington, with 20% URM and 50% women participation	Have 60 secondary school students participating in launches, and 30 undergraduates.	Develop initial prototype for dust collection in Year 1 and distribute to affiliates in subsequent years with launches primarily in spring and summer.
					Total Participants	**60**	

Consortium: WSGC - CubeSat Research Program (SMD, STMD)

The Information is the same for all four years

Activity	Strategic Priority Alignment	Space Grant Objective Alignment	Goal	Objective	Metrics	Target Number	Deadline
CubeSat Technology Development Program	1,2,3	2,3,4,5,6	To sustain a CubeSat Technology Development Program leading to a Cubesat that could potentially reach a near-earth asteroid	Provide initial workforce development that would aid students in gaining more immersive experiences for undergraduates in the focus area of space technology and space sciences.	Develop a preliminary design for space launch system and develop and test subsystems as needed.	40 undergrads per year	Preliminary design would be developed at the end of Year 1, with subsystems developed in subsequent years. Additional preliminary designs would be developed as opportunities for space flight become available.
					Total Participants	**40**	

Consortium: WSGC - Student Challenge Professioanl Development Program (SMD)

The Information is the same for all four years

Activity	Strategic Priority Alignment	Space Grant Objective Alignment	Goal	Objective	Metrics	Target Number	Deadline
Professional Development Asscoiated with SMD Student Challenges	1,2,3	1,2,3,6	To support educators and teams across Washington who wish to participate in student challenges that are being run as part of sponsored programs within SMD	To provide professional development for K-12 educators with the STEM components associated with student challenges	Provide at least 4 professional development workshops in Washington that would aid in the recruit of teams with> 25% URM participation	Support 20 educators and 8 teams, each team with 5 members	Host professional development workshops in Fall and Winter to support educators.
				Total Participants	**20 educators** **8 teams** **40 students**		

Consortium: WSGC - Supersonic Rockets ARMD

The Information is the same for all four years

Activity	Strategic Priority Alignment	Space Grant Objective Alignment	Goal	Objective	Metrics	Target Number	Deadline
Supersonic Rokcet Research Program	1,2,3	2,3,4,5,6,7	To set up supersonic rocket research programs at five WSGC institutions: (BC, Pierce College, NSC, SCC, and UW)	Provide initial workforce development that would aid students in gaining more immersive experiences, particularly undergraduates, in the focus area of supersonic flight performance within ARMD	Take data from at least 5 supersonic systems each year, with different flight characteristics in terms of peak altitude reached, peak speed, and size of payload	Have 60 students participate in launches	Provide workshop for students across WSGC in Fall with launches performed in Spring/Summer in the following year
					Total Participants	**60**	

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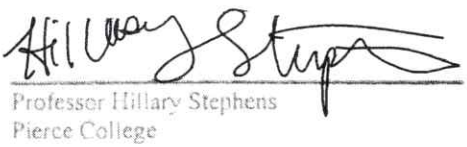

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