

# **NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**

**FISCAL YEAR 2002 ANNUAL PERFORMANCE REPORT TO  
THE WHITE HOUSE INITIATIVE OFFICE ON  
HISTORICALLY BLACK COLLEGES AND UNIVERSITIES**

*Office of Education*  
**December 2003**

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)  
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 TO THE WHITE HOUSE INITIATIVE OFFICE ON  
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**TABLE OF CONTENTS**

		<b>Page</b>
<b>A.</b>	<b>EXECUTIVE SUMMARY</b>	3
<b>B.</b>	<b>SUMMARY OF AGENCY AWARDS TO HCBU'S BY CATEGORY</b> FY 2002 Discretionary Awards (dollars in thousands)	4
<b>C.</b>	<b>SUMMARY OF AWARDS BY INSTITUTION</b>	6
	FY 2002 Summary of Awards to Institutions by NASA Center and Enterprise	10
<b>D.</b>	<b>AWARDS BY OBJECT CATEGORY</b>	11
	Research and Development	12
	Program Evaluation	16
	Training	18
	Facilities and Equipment	20
	Fellowships, Internships, Traineeships, Recruitment, and Arrangements under the Intergovernmental Personnel Act (IPA)	21
	Student Tuition Assistance, Scholarships, and Other Aid	22
	Direct Institutional Subsidies	23
	Third-Party Awards	24
	Private-Sector Involvement	25
	Administrative Infrastructure	26
	Other Activities	27
	<b>AWARDS AND EXEMPLARY PROJECTS</b>	29
	Institutional Science, Engineering and Technology (ISET) Awards	29
	Principal Investigator (PI) Awards	36
	Mathematics and Science Education (MSE) Awards	39
	Partnership Awards	46
	<b>NASA CENTER AND ENTERPRISE INVOLVEMENT</b>	52

## EXECUTIVE SUMMARY

The National Aeronautics and Space Administration (NASA) has a commitment to ensure that Historically Black Colleges and Universities (HBCU) broaden their participation in the Agency's research programs and its overall mission. The goals for HBCUs emphasized by NASA in Fiscal Year (FY) 2002 were as follows:

- To facilitate research and development activities at HBCUs that contribute substantially to NASA's mission.
- To create systematic and sustainable change at HBCUs through partnerships and programs that enhance research and educational outcomes in NASA-related fields.
- To prepare faculty and students at HBCUs to successfully participate in the competitive research and educational processes of the NASA Strategic Enterprises.
- To partner with HBCUs to increase the number of students who are prepared to enter college and successfully pursue and complete undergraduate degrees in NASA-related fields.

NASA's commitment is evidenced by the significant progress made toward the Agency's FY 2002 Annual Plan to Assist HBCUs. NASA's investment in HBCUs grew from its planned investment of \$51 million for FY 2002 to an actual investment of \$64.6 million, a 26.7 percent increase over the expected investment. The primary reason for the increased FY 2002 funding was more technical assistance and outreach to the HBCU community. Evidence of the Agency's funding commitment is seen in the research that was conducted through University Research Centers, Faculty Awards for Research, and research-oriented Partnership Awards programs. Further evidence is the expanded participation of HBCUs in the Curriculum Improvement Partnership Award program. As a result of sustained NASA funding in FY 2002, HBCUs reported 302 refereed publications, 2 patents, 10 copyrights, and 15 African Americans who received doctoral degrees in NASA-related scientific and technical areas.

During FY 2002, HBCUs were recognized nationally for their outstanding accomplishments and increased participation in NASA's Strategic Enterprise activities. For example, the High Performance Polymers and Composites Center at Clark Atlanta University was recognized for its collaborations with industry, Federal laboratories, major research universities, NASA Centers and other minority institutions. The Center has significant instrumentation capabilities for mechanical testing, rheology and processing, surface analysis, vibrational spectroscopy, thermal analysis, nuclear magnetic resonance (NMR), x ray, and particle size analysis. Likewise, Tuskegee University's Environmental Systems for NASA Center for Food and Human Exploration of Space (CFESH) was recognized for its work and close partnership with NASA scientists, engineers, and administrators to address targeted goals related to advanced human support technology and advanced life support programs for long duration space missions. The Center emphasizes research in advanced life support system development to support NASA's vision for a sustained human presence in space. Hampton University's Aeronomy of Ice in the Mesosphere (AIM) mission for flight under the Small Explorers (SMEX) Program was also recognized for its outstanding accomplishment, which makes Hampton University the first HBCU ever to have the lead responsibility for conducting a flight mission. It is important to note that this selection came as a result of peer-reviewed, open competition among all categories of domestic institutions. Hampton earned the privilege of flying this mission on the scientific and technical strength of their initial proposal and subsequent concept study report.

NASA values its partnership with HBCUs and the contributions they make to NASA's mission and the scientific endeavors of the Nation. Finally, NASA commends the HBCUs on the training provided to future scientists, engineers, and technicians for NASA and the Nation.

**SUMMARY OF AGENCY AWARDS TO HBCUs BY CATEGORY: FY 2002**

1. Agency: National Aeronautics and Space Administration

2. Agency Representative: Adena Williams Loston \_\_\_\_\_ (Signature)  
 Associate Administrator  
 for Education

3. Total Funds for Institutions of Higher Education (IHE): **\$ 1,237,407,989**

DISCRETIONARY AWARDS (dollars in thousands)

<b>CATEGORY</b>	<b>AWARDS TO IHE's+</b>	<b>AWARDS TO HBCUs*</b>	<b>AWARDS TO HBCUs AS % OF TOTAL AWARDS TO IHE's</b>
1. Research & Development	\$1,074,802	\$25,823	2.4%
2. Program Evaluation		\$15	
3. Training	\$36,127	\$14,197	39.3%
4. Facilities and Equipment	\$3,213	\$2,252	70%
5. Fellowships, Internships, Traineeships, Recruitment, and Arrangements under the Intergovernmental Personnel Act (IPA)		\$4,161	
6. Student Tuition Assistance, Scholarships, and Other Aid		\$4,270	
7. Direct Institutional Subsidies			
8. Third-Party Awards		\$10,224	
9. Private-Sector Involvement		\$969	
10. Administrative Infrastructure			
11. Other	\$123,264	\$2,699	2.2%
<b>TOTAL</b>	<b>\$1,237,407</b>	<b>\$64,610</b>	<b>5.22%</b>

Sean O'Keefe  
 Administrator

\_\_\_\_\_  
 (Signature)

+ IHE=Institutions of Higher Education  
 \* HBCUs=Historically Black Colleges and Universities

**TOTAL FY 2002 AWARDS TO  
HISTORICALLY BLACK COLLEGES AND UNIVERSITIES**

	<i>Institutions of Higher Education</i>	<i>Historically Black Colleges and Universities</i>
<b>DISCRETIONARY AWARDS:</b>	\$1,237,407,989	\$64,610,339
<b>LEGISLATED AWARDS:</b>	\$0	\$0
<b>TOTAL AWARDS:</b>	\$1,237,407,989	\$64,610,339

**FY 2002 SUMMARY OF AGENCY AWARDS TO HBCUs BY INSTITUTION**

<b>STATE/INSTITUTION</b>	<b>R&amp;D</b>	<b>PE</b>	<b>TRAINING</b>	<b>FE</b>	<b>FELLOWS</b>	<b>STA</b>	<b>DIS</b>	<b>TPA</b>	<b>PSI</b>	<b>AI</b>	<b>OTHER</b>	<b>TOTAL</b>
<b>ALABAMA</b>												
Alabama A&M University	\$1,676,205		\$453,357	\$147,963								\$2,277,525
Lawson State Community College			\$98,110								\$40,000	\$138,110
Oakwood College	\$164,698		\$100,000								\$397,679	\$662,377
Stillman College											\$99,818	\$99,818
Tuskegee University	\$1,386,609		\$446,309		\$911,142							\$2,744,060
<b>DISTRICT OF COLUMBIA</b>												
Howard University	\$2,082,392			\$93,865	\$220,000						\$53,600	\$2,449,857
University of the District of Columbia											\$64,000	\$64,000
<b>FLORIDA</b>												
Bethune-Cookman College			\$404,096									\$404,096
Florida A&M University	\$1,810,529		\$442,307		\$494,610	\$1,270,000						\$4,017,446
<b>GEORGIA</b>												
Albany State University											\$99,107	\$99,107
Clark Atlanta University	\$1,204,712		\$668,436									\$1,873,148
Morehouse College						\$1,500,000						\$1,500,000
Morehouse School of Medicine	\$1,655,522											\$1,655,522
Spelman College	\$62,600		\$1,470,400			\$1,500,000						\$3,033,000
<b>LOUISIANA</b>												
Southern University and A&M College-Baton Rouge	\$416,523		\$185,000								\$107,000	\$708,523
Xavier University-LA			\$54,758								\$150,000	\$204,758
<b>MARYLAND</b>												
Bowie State University	\$190,200		\$3,247,472	\$3,648								\$3,441,320
Coppin State College											\$15,000	\$15,000
Morgan State University	\$267,925		\$1,215,000	\$1,740,550								\$3,223,475
University of Maryland-Eastern Shore	\$15,000				\$50,000						\$299,935	\$364,935
<b>MISSISSIPPI</b>												
Jackson State University	\$246,674										\$278,854	\$525,528
Mississippi Valley State University											\$299,259	\$299,259
<b>NORTH CAROLINA</b>												
Elizabeth City State University	\$112,000		\$445,000								\$8,188	\$565,188
Fayetteville State University											\$120,000	\$120,000
North Carolina A&T State University	\$2,165,122		\$389,527	\$11,590	\$647,000							\$3,213,239
North Carolina Central University			\$300,000									\$300,000
Shaw University											\$87,446	\$87,446
<b>OHIO</b>												
Central State University-Ohio	\$50,000											\$50,000
<b>PENNSYLVANIA</b>												
Lincoln University-PA											\$199,482	\$199,482

STATE/INSTITUTION	R&D	PE	TRAINING	FE	FELLOWS	STA	DIS	TPA	PSI	AI	OTHER	TOTAL
<b>SOUTH CAROLINA</b>												
Clafin College											\$100,000	\$100,000
South Carolina State University			\$1,379,246									\$1,379,246
<b>TENNESSEE</b>												
Fisk University	\$1,000,000											\$1,000,000
Meharry Medical College					\$109,004							\$109,004
Tennessee State University	\$3,300,975		\$571,800								\$29,574	\$3,902,349
<b>TEXAS</b>												
Paul Quinn College											\$100,000	\$100,000
Prairie View A&M University	\$2,333,308		\$350,000									\$2,683,308
Texas College											\$99,785	\$99,785
Texas Southern University	\$164,601											\$164,601
<b>VIRGINIA</b>												
Hampton University	\$4,475,757		\$634,614		\$1,729,151							\$6,839,522
Norfolk State University	\$1,041,629		\$1,341,698	\$254,355							\$50,000	\$2,687,682
<b>WEST VIRGINIA</b>												
West Virginia State College		\$15,000										\$15,000
<b>OTHER HBCU AWARDS</b>												
American Society for Engineering Education								\$50,000				
Global Science & Technology, Inc. / NASA Peer Review Services									\$969,064			\$969,064
Louisiana Research Consortium								\$20,000				
Minority Access, Inc.								\$815,500				
Mississippi Research Consortium								\$81,000				
Mississippi Space Commerce Initiative								\$300,845				
National Action Council for Minorities in Engineering (NACME)								\$855,000				
National Association for Equal Opportunity in Higher Education (NAFEO)								\$2,464,108				
Paragon Tech, Inc. – Science, Engineering, Mathematics and Aerospace Academy (SEMAA)								\$733,500				
Space Grant College Fellowship Program								\$519,460				
Summer High School Apprentice Research Program (SHARP) PLUS								\$390,000				
Tennessee State University – Diversified Career and Educational Services (DCES)								\$770,000				
United Negro College Fund Special Programs, Inc.								\$3,225,206				
<b>Grand Total</b>	<b>\$25,822,981</b>	<b>\$15,000</b>	<b>\$14,197,130</b>	<b>\$2,251,971</b>	<b>\$4,160,907</b>	<b>\$4,270,000</b>		<b>\$10,224,619</b>	<b>\$969,064</b>		<b>\$2,698,727</b>	<b>\$64,610,339</b>

ABBREVIATIONS KEY	
R&D	Research & Development
PE	Program Evaluation
TRAINING	Training
F&E	Facilities and Equipment
FELLOWS	Fellowships, Internships, Traineeships, Recruitment, and Arrangements under the Intergovernmental Personnel Act (IPA's)
STA	Student Tuition Assistance, Scholarships, and Other Aid
DIS	Direct Institutional Subsidies
TPA	Third-Party Awards
PSI	Private-Sector Involvement
AI	Administrative Infrastructure
OTHER	Other Activities

## SUMMARY OF FY 2002 AWARDS TO HBCUs BY NASA CENTER AND ENTERPRISE

NASA CENTER	AA	OEOP	OMS	OAT	OES	OHRE	OBPR	OSF	OSMA	OSS	GRAND TOTAL
ARC		\$921,166		\$891,023			\$153,522			\$51,801	\$2,017,512
DFRC		\$388,331									\$388,331
GRC	\$132,400	\$3,408,763		\$1,015,571			\$163,145				\$4,719,879
GSFC	\$15,000	\$14,827,742		\$127,773	\$833,344	\$5,355		\$271,800	\$300,000	\$1,597,624	\$17,978,638
JSC		\$3,669,785					\$208,596	\$666,618			\$4,544,999
KSC		\$1,714,838				\$32,000	\$38,309	\$710,701			\$2,495,848
LaRC	\$152,990	\$6,036,865		\$1,140,279	\$2,519,689	\$451,060	\$46,300	\$269,760	\$5,200	(\$123,300)	\$10,498,843
MSFC		\$7,707,213			\$122,610	\$48,000		\$337,791		\$118,196	\$8,333,810
SSC		\$504,730			\$84,000						\$588,730
HQ		\$9,882,378	\$2,251,971			\$909,460					\$13,043,809
<b>TOTAL</b>	\$300,390	\$49,061,811	\$2,535,271	\$3,174,646	\$3,559,643	\$1,445,875	\$609,872	\$2,256,670	\$305,200	\$1,644,321	\$64,610,339

ARC Ames Research Center  
DFRC Dryden Flight Research Center  
GRC Glenn Research Center  
GSFC Goddard Space Flight Center  
JSC Johnson Space Center  
KSC Kennedy Space Center  
LaRC Langley Research Center  
MSFC Marshall Space Flight Center  
SSC Stennis Space Center  
HQ Headquarters

AA Associate Administrator  
OEOP Office of Equal Opportunity Programs  
OMS Office of Management Systems  
OAT Office of Aerospace Technology  
OES Office of Earth Science  
OHRE Office of Human Resources and Education  
OBPR Office of Biological and Physical Research  
OSF Office of Space Flight  
OSMA Office of Safety and Mission Assurance  
OSS Office of Space Science

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Adena Williams Loston  
Associate Administrator for Education

***AWARDS***

***BY***

***OBJECT***

***CATEGORY***

## AWARDS BY OBJECT CATEGORY

### Research and Development

STATE	INSTITUTION	DESCRIPTION	AWARD
AL	Alabama A&M University	Genetic Effects of Neutron Radiation In Drosophila	\$37,905
AL	Alabama A&M University	Center for Hydrology, Soil Climatology, and Remote Sensing (HSCARS)	\$999,979
AL	Alabama A&M University	Characterizing Electro-Optical Properties	\$100,000
AL	Alabama A&M University	R&D Required to Provide Essential Inputs to Support the Development of Guidance & Practices	\$30,785
AL	Alabama A&M University	Cytogenetic Investigations into Radiosensitivity	\$59,686
AL	Alabama A&M University	Investigation of Structural Properties of Composite Smart Materials	\$99,264
AL	Alabama A&M University	FASAT Reaction Spatial-Temporal Light Modulators for Optical Recognition and Image Processing	\$99,895
AL	Alabama A&M University	Numerical Predication of Drag of Ajax Type Vehicles	\$75,000
AL	Alabama A&M University	Weakly Ionized Gas Characteristics and Effect on the Shock Wave Structure	\$50,000
AL	Alabama A&M University	Directionally Sensitive Silicon Radiation Sensor	\$99,691
AL	Alabama A&M University	Fabrication and Optical and Electrical Characterization of the Diffractive Holographic Optical Element	\$24,000
AL	Oakwood College	Development of Ultra-Light Normal Incidence Mirror Electrochemical Aspects	\$115,030
AL	Oakwood College	Evaluation of Numerical Techniques for Managed Propulsion Simulation	\$49,668
AL	Tuskegee University	Polymide Based Nanocomposites for Affordable Space Transport	\$100,000
AL	Tuskegee University	Survivability of Affordable High Temperature Polymer Matrix Composites for Propulsion Engine Components	\$100,000
AL	Tuskegee University	A Nonlinear Model for Fuel Atomization in Spray Combustion	\$87,278
AL	Tuskegee University	Development and Assessment of a Novel Training Package for Basic Maneuvering Tasks on a Flight Simulation	\$99,331
AL	Tuskegee University	Environmental Systems for Center for Food and Human Exploration of Space (CFESH)	\$1,000,000
DC	Howard University	Detection, Diagnosis, Location and Recommendation of Remedial Actions for Corona/Soft Faults	\$40,000
DC	Howard University	Nanocomposite-Based Compact Thermomagnetic Cryocoolers	\$109,773
DC	Howard University	Renewable Energy and Teaching Utilization Project	\$567,166
DC	Howard University	Magnetic Properties of Primitive Chondrites	\$75,000
DC	Howard University	Development of Hybrid Beowulf/Apple Macintosh Operating System X Cluster	\$15,000
DC	Howard University	Hierarchical Algorithms and Their Embedded Computational Realization in Reconfigurable H/W	\$239,515
DC	Howard University	Center for the Study of Terrestrial and Extraterrestrial Atmospheres	\$1,000,000
DC	Howard University	Howard/GSFC Meteoritic Craters & Meteorites Project	\$35,938
FL	Florida A&M University	Active Control of Boundary-Layer Separation and Flow Distortion in Adverse Pressure Gradient Flows	\$80,103
FL	Florida A&M University	Active-Adaptive Control of Inlet Separation Using Supersonic Microjets	\$65,000
FL	Florida A&M University	Investigation of the Electronic Properties of Distorted Carbon Nanotubes	\$90,584
FL	Florida A&M University	Electrochemical Capacitors & Hybrid Power Sources for Space Applications	\$98,329

STATE	INSTITUTION	DESCRIPTION	AWARD
FL	Florida A&M University	Wireless Spread-Spectrum Intercommunication System	\$97,939
FL	Florida A&M University	Center for Nonlinear and Nonequilibrium Aerosciences (CENNAS)	\$1,000,000
FL	Florida A&M University	A Cooperative Research Program in Aeronautical Information Science Technologies	\$354,574
FL	Florida A&M University	Determining Mechanical Properties of Nano Materials Using Nanoindentation and a Finite Element Method	\$24,000
GA	Clark Atlanta University	Commercial Process Development for Polyimide Foams	\$75,000
GA	Clark Atlanta University	Electron Collisional Excitation Strengths for Ions of Astrophysical Interest	\$65,000
GA	Clark Atlanta University	Resin Transfer Molding and Vacuum Assisted Resin Transfer Molding Program	\$125,001
GA	Clark Atlanta University	PEM-FAN All Composite Electric Aircraft Engine Concept	\$99,786
GA	Clark Atlanta University	High Performance Polymers and Composites Center	\$799,925
GA	Clark Atlanta University	Development of Thermally Stable and Highly Fluorescent IR Dyes	\$20,000
GA	Clark Atlanta University	Developing Novel Fluorescent Materials With Near Infrared Emission By Using M-Pheylene	\$20,000
GA	Morehouse School of Medicine	Gravitational Effects on Nutrient Diffusion Through Cartilage Matrix	\$100,000
GA	Morehouse School of Medicine	Telemedicine Application of Autogenic Feedback Training Exercise as a Treatment for Patients	\$146,926
GA	Morehouse School of Medicine	Space Medicine and Life Sciences Research Center	\$1,408,596
GA	Spelman College	Continued Development of a Probe for Determining Fuel-to-Oxygen Ratios in Airplane Fuel Tanks	\$62,600
LA	Southern University and A&M College-Baton Rouge	Integrated Approach to Reasoning Under Multiple Perspectives	\$112,650
LA	Southern University and A&M College-Baton Rouge	Development of Computer-Aided Risk Mitigation and Categorization Product	\$50,000
LA	Southern University and A&M College-Baton Rouge	Virtual Reality Innovations in Training and Science, Engineering and Mathematics Education	\$100,000
LA	Southern University and A&M College-Baton Rouge	Development of a Smart Material Integrated Sensor Thermal Switch for Cryogenic Systems	\$100,000
LA	Southern University and A&M College-Baton Rouge	Predictive Calculation and Simulation for Nano Semiconductors and Related Heterostructures	\$53,873
MD	Bowie State University	Bi-Molecular Recognition of Fullness and Carbon Nanotubes	\$100,000
MD	Bowie State University	Locating Human Risks to Biodiversity, a Carbon Balance Approach	\$75,200
MD	Bowie State University	Program Development in Microelectromechanical Systems (MEMS)	\$15,000
MD	Morgan State University	Investigation of the Magnetic and Electronic Properties of Metal and Metal Oxide Films	\$100,000
MD	Morgan State University	Image Registration and Fusion for Future Formation Flying Systems	\$18,000
MD	Morgan State University	Design of High Speed Comparator Architectures for Analog-to-Digital Converters	\$50,000
MD	Morgan State University	Polymerization of Advanced Thermosets in Microgravity to Develop Ultra Low Polymers	\$99,925
MD	University of Maryland-Eastern Shore	UMES/NASA Collaborative Research in Computational Sciences	\$15,000
MS	Jackson State University	Non-Contract Precision Actuation and Structural Control Using Opto-Mechanical Actuators	\$99,674
MS	Jackson State University	Network Storage Management in the Data Grid Environment	\$147,000
NC	Elizabeth City State University	Mathematics of the Great Dismal Swamp	\$102,000

STATE	INSTITUTION	DESCRIPTION	AWARD
NC	Elizabeth City State University	Cloning, Expression and Growth of H Pylori-Protein Crystals in Microgravity	\$10,000
NC	North Carolina A&T State University	Performance Evaluation and Modeling of Affordable Composites Manufactured Using Stitching and Z-Pinning Processes	\$100,000
NC	North Carolina A&T State University	Advanced Cross Enterprise Technology	\$309,802
NC	North Carolina A&T State University	Carbon Fiber Reinforced Ceramic Composites for Propulsion Application	\$75,000
NC	North Carolina A&T State University	Study of GAASSBN Alloys for Solar Cell Applications	\$99,990
NC	North Carolina A&T State University	Development and Evaluation of Fault-Tolerant Flight Control Systems	\$100,000
NC	North Carolina A&T State University	Low-Power RF SOI-CMOS Technology for Distributed Sensor Networks	\$200,000
NC	North Carolina A&T State University	Investigation of the Next-Generation Design Tool for Aerospace	\$80,788
NC	North Carolina A&T State University	Analytic Solution Algorithms and Simulation for Compressible Flow Models: Computational Benchmarks	\$100,000
NC	North Carolina A&T State University	A Wireless Radio Location System for Use in an Indoor Environment	\$99,542
NC	North Carolina A&T State University	The Center for Aerospace Research	\$1,000,000
OH	Central State University	Analysis and Development of a Piezoresistive Probe for Measuring Turbulent Intensity	\$50,000
TN	Fisk University	Center for Photonic Materials and Devices	\$1,000,000
TN	Tennessee State University	Embodiment of Intelligent Behaviors on Mobile Robots	\$147,000
TN	Tennessee State University	The NASA Engineering and Science Collaborative	\$1,453,975
TN	Tennessee State University	Center for Automated Space Science	\$1,700,000
TX	Prairie View A&M University	Mitigation of High Altitude and Low Earth Orbit Radiation Effects on Microelectronics Via Shielding	\$100,000
TX	Prairie View A&M University	Exploratory Algorithm Development Study of a Wavelet-Based Adaptive Smart Scheme for Vibration Determination	\$15,000
TX	Prairie View A&M University	Advanced Fuel Injector Optimization for RBCC Engine Concept	\$100,000
TX	Prairie View A&M University	Studies of Solar Prominences and Filaments	\$100,000
TX	Prairie View A&M University	Observation and Research Program at Prairie View Solar Observatory	\$70,000
TX	Prairie View A&M University	Effects of Service Conditions on the Morphology and Properties of Advanced Composites	\$99,761
TX	Prairie View A&M University	Research to Significantly Enhance Composites Survivability at 550 Degrees Fahrenheit in an Oxidative Environment	\$46,530
TX	Prairie View A&M University	Further Improvement of the Solar Observation Instrument	\$25,000
TX	Prairie View A&M University	Software Engineering Initiative	\$577,017
TX	Prairie View A&M University	Center for Applied Radiation Research	\$1,200,000
TX	Texas Southern University	NASA Center on Model-Based Simulation - Structural and Materials Systems	\$100,000
TX	Texas Southern University	Studies In Vivo Model of Simulated Microgravity on Calcium Homeostasis	\$64,601
VA	Hampton University	Theoretical and Observational Determinants of Global and Regional Radiation Budget, Forcing and Feedback Top-of-Atmosphere	\$750,169
VA	Hampton University	Top-of-Atmosphere Albedo Estimation from Polder Multi-Angle Measurements: Evaluation of Water	\$54,541
VA	Hampton University	Statistical Methods for Rapid Aerothermal Analysis and Design Technology	\$59,999
VA	Hampton University	Contrail Tracking and Arm (Atmospheric Radiation Measurements) Data Product Development	\$109,361

STATE	INSTITUTION	DESCRIPTION	AWARD
VA	Hampton University	Optical Electronic Bragg Reflection Sensor System With Hydrodynamic Flow Applications	\$30,000
VA	Hampton University	Numerical Simulation of One-and Two-Phase Flows in Propulsion Systems	\$100,000
VA	Hampton University	Analysis of Antioxidant and Phosphoinositol Signal Transduction Pathway (S) in Plants After Exposure	\$33,145
VA	Hampton University	Upper Air Instrumentation Anomalies	\$11,389
VA	Hampton University	Standards of Climatology and Long-Term Changes of Chemical Tracers in the Middle Atmosphere Using UARS Data and HALOE	\$39,766
VA	Hampton University	Timed Phase E Saber - Russell	\$156,973
VA	Hampton University	Real-Time Very High Resolution Regional 4d Assimilation in Supporting NASA Crystal-Face Experiment	\$71,789
VA	Hampton University	Heliospheric Hydrogen and Helium	\$53,166
VA	Hampton University	Principal Investigator Services to Support SAGE II and III, SABER, HALOE, LITE and LIDAR Programs	\$155,090
VA	Hampton University	Picasso-Cena International Science Advisory Panel, Science Activities, Algorithm Implementation	\$1,219,400
VA	Hampton University	Research Center for Optical Physics	\$969,000
VA	Hampton University	Center for LIDAR and Atmospheric Sciences Students	\$661,969
VA	Norfolk State University	Characterization of Smart Optical Materials Using Ellipsometry	\$10,000
VA	Norfolk State University	Scenario Based Learning: Inquiry for a Digital Earth	\$81,629
VA	Norfolk State University	Growth and Characterization of Organic Crystals	\$10,000
VA	Norfolk State University	Development of Novel Composite and Random Material for Nonlinear Optics and Lasers	\$940,000
<b>TOTAL</b>			<b>\$25,822,981</b>

## AWARDS BY OBJECT CATEGORY

### Program Evaluation

STATE	INSTITUTION	DESCRIPTION	AWARD
WV	West Virginia State College	Review of Business Practices of the NASA IV and V Facility	\$15,000
<b>TOTAL</b>			<b>\$15,000</b>

### Performance Outcomes

In order to monitor the progress of NASA HBCU programs, all grant recipients were required to submit a Performance Outcomes Report as part of their annual performance report. The Performance Outcomes Report consists of both numerical outcomes data and a narrative summary of project accomplishments covering Academic Year (AY) 2001-2002 and the summer of 2001. The data were collected electronically via the World Wide Web. This single annual collection of data is used to provide the information necessary for annual Minority University Research and Education Programs (MUREP) reports, required White House reports, budget submissions and justifications, and responses to congressional inquiries and comparative assessments of programs and projects.

The numerical data measure program performance against metrics that apply to all NASA MUREP projects. These metrics reduce the collection of data to the minimal amounts possible, emphasize outcome over process, and are applicable to any project. They are aggregable both horizontally and longitudinally, and they allow adjustable benchmarking standards to be applied. For research projects, including University Research Centers (URC), Institutional Research Awards (IRA), and Faculty Awards for Research (FAR), the metrics track two basic areas--student outcomes (degrees awarded and post-degree plans), and research outcomes (refereed publications, leveraged funding, patents, and commercial products). Vital process information, such as numbers of faculty and students supported and the gross categories in which funds are spent, is also collected. For education projects, the Performance Outcomes Report not only continues to collect data on numbers and demographics of students supported, but primarily focuses on measurable improvements in student performance. Both short-term metrics and long-term metrics are utilized in the collection of data that pertains to education projects.

The narratives on each project provide information on accomplishments that are relative to that project, and are therefore not necessarily captured in the Performance Outcomes data. These narratives serve as input for the annual MUREP Hispanic-Serving Institutions (HSI) and Tribal Colleges and Universities (TCU) Performance Reports, Research and Technology Performance Report, Education and Training Performance Report, as well as this HBCU Performance Report and other such reports, as required.

## **Site Visits**

Independent peer reviewers conducted onsite reviews of MUREP grants at many HBCUs during FY 2002. The purposes of the visits were to ascertain the projects' accomplishments to date, to identify any potential barriers to achieving project objectives, to determine whether collaboration between the institution and NASA is sufficient to achieve maximum benefits for the university and for NASA, and to allow NASA personnel an opportunity to review the financial management of the grant, focusing on processes such as costing. The results of the reviews showed that most grantees were operating efficiently and were effectively achieving the objectives of their projects. As a result of the emphasis on the issue of grant-costing over the past few years, the Agency has noted significant improvements in the rates of costing the grants by the institutions.

## AWARDS BY OBJECT CATEGORY

### Training

STATE	INSTITUTION	DESCRIPTION	AWARD
AL	Alabama A&M University	The 16th National Conference of the Black Physics Students (NCBPS) National Society of Black Physicists	\$85,000
AL	Alabama A&M University	Student Preparation and Participation in Internships for Applied Statisticians	\$119,357
AL	Alabama A&M University	Space Science Education and the Sun-Earth Connection	\$225,000
AL	Alabama A&M University	Urban Sprawl and the Development of a Leapfrog Index	\$24,000
AL	Lawson State Community College	Infusing Technology, Engineering, Mathematics, and Science in the Dual Enrollment/Accelerated Student	\$98,110
AL	Oakwood College	Minority Student Development Program in Science and Engineering	\$100,000
AL	Tuskegee University	NASA's SLSTP Academic Partner Alliance (NSAPA)	\$180,000
AL	Tuskegee University	NASA Spaceflight and Life Sciences Training Program	\$266,309
FL	Bethune-Cookman College	Operation of the Center for Space Education	\$404,096
FL	Florida A&M University	Collision Processes in Astrophysical Plasmas	\$175,427
FL	Florida A&M University	Partial Support to the 2002 National Teacher Preparation Symposium	\$16,880
FL	Florida A&M University	Linkages 2001 Project	\$250,000
GA	Clark Atlanta University	Integration of Research and Education in the Area of Earth Systems Science	\$469,658
GA	Clark Atlanta University	Clark Atlanta University and Partners Center for Preparing Mathematics and Science Teachers	\$198,778
GA	Spelman College	Spelman College Model Institutions for Excellence	\$1,470,400
LA	Southern University and A&M College-Baton Rouge	Partnerships in Astronomy and Astrophysics Education and Research at Southern University	\$185,000
LA	Xavier University-LA	2002 Pre-Service Teacher Institute (PSTI)	\$54,758
MD	Bowie State University	Bowie Seeks to Integrate the Wire Mission Into Its BSOCC Program to Provide Student Opportunities	\$29,847
MD	Bowie State University	A 2002 Summer Institute in Engineering and Computer Applications Program	\$216,655
MD	Bowie State University	Utilizing College Student Science Mentors to Develop Research Skills of Secondary Public School Students	\$29,970
MD	Bowie State University	Model Institutions for Excellence	\$2,971,000
MD	Morgan State University	Forging a Partnership	\$850,000
MD	Morgan State University	A Planning Grant Proposal for Faculty Research Development and Capacity Building for NASA-Related Research	\$15,000
MD	Morgan State University	NRTS Continuation/MU-SPIN NRTS Program	\$350,000
NC	Elizabeth City State University	You Be the Scientist With Satellite Imagery In EZ/EC Communities	\$95,000
NC	Elizabeth City State University	ECSU - NRTS Continuation/MU-SPIN NRTS Program	\$350,000
NC	North Carolina A&T State University	Integration of NASA Research in Undergraduate Education In Mathematics, Science, Engineering and Technology	\$389,527
NC	North Carolina Central University	Integration of Nanotechnology and Computational Modeling	\$300,000
SC	South Carolina State University	Enhancement of the Space Science Research Program	\$230,000
SC	South Carolina State University	Curriculum Enhancement Through Space Science Research	\$600,000
SC	South Carolina State University	The Center for NASA Research and Technology (CNRT)/MU-SPIN NRTS Program	\$350,000

STATE	INSTITUTION	DESCRIPTION	AWARD
SC	South Carolina State University	Share With a Pair of Peers II	\$199,246
TN	Tennessee State University	TSU Research Projects for Increasing the Pool of Minority Engineers	\$82,400
TN	Tennessee State University	Inspiring Careers in Engineering, Mathematics Science	\$100,000
TN	Tennessee State University	NASA/TSU Minority Universities Information Network for Research and Education/MU-SPIN NRTS Program	\$350,000
TN	Tennessee State University	Minority Institution Collaboratory	\$39,400
TX	Prairie View A&M University	NASA Southwest Regional Network Resources and Training Site/MU-SPIN NRTS Program.	\$350,000
VA	Hampton University	Program for Improving Success in Science, Engineering, and Mathematics (PRISEM)	\$89,618
VA	Hampton University	Hampton University College of Continuing Education Aerospace Center	\$300,000
VA	Hampton University	Development of a Space Science Curriculum at Hampton University	\$244,996
VA	Norfolk State University	Bringing Education and Science Together for Systemic Training and Empowerment of Preservice Teachers	\$196,991
VA	Norfolk State University	A NASA-HBCU Partnership to Enhance Minority Education and Research Participation in Space Science	\$202,662
VA	Norfolk State University	Mission-Leveraged Education: NSU-NASA Innovative Undergraduate Model Millennium, a NASA Pair Project	\$298,274
VA	Norfolk State University	2001 Pre-Service Teacher Conference	\$168,771
VA	Norfolk State University	2002 Pre-Service Teacher Program (Institute and Conference)	\$475,000
<b>TOTAL</b>			<b>\$14,197,130</b>

## AWARDS BY OBJECT CATEGORY

### Facilities and Equipment

STATE	INSTITUTION	AWARD
MD	Bowie State University	\$3,648
MD	Morgan State University	\$1,740,550
AL	Alabama A&M University	\$147,963
DC	Howard University	\$93,865
VA	Norfolk State University	\$254,355
NC	North Carolina A&T State University	\$11,590
<b>TOTAL</b>		<b>\$2,251,971</b>

## AWARDS BY OBJECT CATEGORY

### Fellowships, Internships, Traineeships, Recruitment, and Arrangements under the Intergovernmental Personnel Act (IPA)

STATE	INSTITUTION	DESCRIPTION	AWARD
AL	Tuskegee University	2002 University Internship Program	\$25,000
AL	Tuskegee University	Cooperative Agreement	\$886,142
DC	Howard University	Goddard Space Flight Center/Howard University Fellowship in Atmospheric Science (GOHFAS)	\$220,000
FL	Florida A&M University	A Graduate Fellowship Component to Augment Program IMAGE	\$356,005
FL	Florida A&M University	Discover II SBI/NASA Internships	\$138,605
MD	University of Maryland – Eastern Shore	UMES Student Internships at NASA Wallops: An Outreach Proposal	\$50,000
NC	North Carolina A&T State University	NASA Ronald E. McNair Graduate Research Fellowship Program	\$647,000
TN	Meharry Medical College	NASA/Meharry/Vanderbilt Summer Research Apprenticeship Program	\$108,004
VA	Hampton University	Langley Aerospace Research Summer Scholars (LARSS) Program	\$1,729,151
<b>TOTAL</b>			<b>\$4,159,907</b>

## AWARDS BY OBJECT CATEGORY

### Student Tuition Assistance, Scholarships, and Other Aid

STATE	INSTITUTION	DESCRIPTION	AWARD
GA	Morehouse College	Strategic Preparedness Advancing Careers In Engineering/Sciences (SPACE)	\$1,500,000
GA	Spelman College	Women In Sciences and Engineering Scholars Program	\$1,500,000
FL	Florida A&M University	Minority Access To Graduate Engineering Program (IMAGE)	\$1,270,000
<b>TOTAL</b>			<b>\$4,270,000</b>

## **AWARDS BY OBJECT CATEGORY**

### **Direct Institutional Subsidies**

There were no grants funded specifically for Direct Institutional Subsidies at HBCUs during FY 2002.

## AWARDS BY OBJECT CATEGORY

### Third-Party Awards

American Society for Engineering Education (ASEE)	
Helen T. Carr Fellowship	\$50,000
National Association for Equal Opportunity in Higher Education (NAFEO)	
Louis Stokes Professional Leadership Program	\$1,494,000
NASA Summer Internship Program	\$125,000
NAFEO/NASA Research Academy	\$845,108
Minority Access, Inc.	
Paragon Tech, Inc. – Science, Engineering, Mathematics and Aerospace Academy (SEMAA)	
	\$815,500
	\$733,500
United Negro College Fund Special Programs, Inc.	
Harriett G. Jenkins Predoctoral Fellowship Program	\$1,600,000
Curriculum Improvement Partnership Awards (CIPA)	\$888,206
NASA Administrator’s Fellowship Program (NAFP)	\$737,000
Mississippi Research Consortium	
	\$81,000
Louisiana Research Consortium	
	\$20,000
Mississippi Space Commerce Initiative	
	\$300,845
Space Grant College Fellowship Program	
	\$519,460
Summer High School Apprenticeship Research Program (SHARP) PLUS	
	\$390,000
Tennessee State University – Diversified Career and Educational Services (DCES)	
	\$770,000
National Action Council for Minorities in Engineering (NACME)	
	\$855,000
<b>THIRD-PARTY TOTAL</b>	
	<b>\$10,224,619</b>

## AWARDS BY OBJECT CATEGORY

### Private-Sector Involvement

ORGANIZATION	DESCRIPTION	AWARD
Global Science & Technology, Inc.	NASA Peer Review Services	\$969,064
<b>TOTAL</b>		<b>\$969,064</b>

NASA's Minority University Research and Education Programs (MUREP) are supported by NASA Peer Review Services (NPRS), a consolidated contract, of which Global Science & Technology, Inc. is the prime contractor. NPRS' functions include the development and enhancement of an internet-based electronic management system to support solicitation development, peer review and selection, post-award evaluation, and grants/cooperative agreements management with HBCUs and Other Minority Universities (OMU). Additionally, NPRS provides technical assistance to HBCUs and ensures that HBCUs are familiar with and capable of accessing the NASA HBCU programs online via the electronic management system to receive announcements of opportunity and to submit proposals, evaluations, and post-award management processes.

## **AWARDS BY OBJECT CATEGORY**

### **Administrative Infrastructure**

There were no grants funded specifically for Administrative Infrastructure at HBCUs during FY 2002.

## AWARDS BY OBJECT CATEGORY

### Other Activities

STATE	INSTITUTION	DESCRIPTION	AWARD
AL	Lawson State Community College	Girls Leading Others By Example (GLOBE) Project	\$40,000
AL	Oakwood College	Enhancing Mathematics and Science Education Through Research (EMSER)	\$350,829
AL	Oakwood College	2002 Pre Service Teacher Institute (PSTI)	\$46,850
AL	Stillman College	Project Mi Futuro	\$99,818
DC	Howard University	Public Service Intern Program	\$53,600
DC	University of the District of Columbia	Science and Engineering Center's Summer Academic Enrichment Program	\$64,000
GA	Albany State University	Precollege Achievement of Excellence in Mathematics, Science, Engineering and Technology (PACE/MSET)	\$99,107
LA	Southern University and A&M College-Baton Rouge	Building the Capacity of HBCUs for Establishing Effective Global Partnerships	\$20,000
LA	Southern University and A&M College-Baton Rouge	Program to Increase the Pursuit of Education and Learning In Engineering and Sciences (PIPELINES)	\$87,000
LA	Xavier University-LA	SOAR 2 Summer Bridge Program	\$150,000
MD	Coppin State College	Education and Research Merit of Proposed Coppin/GSFC Activities	\$15,000
MD	University of Maryland-Eastern Shore	Pre-College Activities for Enhancing Minority Participation In Engineering	\$99,969
MD	University of Maryland-Eastern Shore	Eastern Shore Mathematics Teacher Education Project	\$199,966
MS	Jackson State University	Science and Technology Enhancement Pre-College Program	\$99,885
MS	Jackson State University	Science and Mathematics Initiative for Learning Enhancement	\$178,969
MS	Mississippi Valley State University	Mississippi Valley State University PACE Program	\$99,375
MS	Mississippi Valley State University	Developing and Improving Teacher Education In Mathematics, Science, and Technology	\$199,884
NC	Elizabeth City State University	Planning and Development of Conference Activities Relating to Public School Curricula Enhancement	\$8,188
NC	Fayetteville State University	Pre-College Program - Human Space Flight Institute	\$20,000
NC	Fayetteville State University	Mathematics/Science Education Center Precollege Program	\$100,000
NC	Shaw University	Shaw University MSET Pre-College Experience	\$87,446
PA	Lincoln University-PA	University Teacher Education Partnership: Minority University Mathematics, Science, and Technology	\$199,482
SC	Clafin College	Astrochemical Project	\$100,000
TN	Tennessee State University	College Bound	\$29,574
TX	Paul Quinn College	MSET Institute for Attracting Students to the Sciences	\$100,000
TX	Texas College	Pre-College Placement for Achievement of Excellence in Mathematics, Science, Engineering and Technology	\$99,785
VA	Norfolk State University	NASA's Center of Excellence for Structures and Materials Technical Education Outreach	\$50,000
<b>TOTAL</b>			<b>\$2,698,727</b>

***AWARDS***

***AND***

***EXEMPLARY***

***PROJECTS***

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**Institutional Science, Engineering and Technology (ISET)**

**Principal Investigators (PI)**

**Mathematics and Science Education (MSE)**

**Partnerships**

## AWARDS AND EXEMPLARY PROJECTS

NASA employs a comprehensive and complementary array of strategies to achieve its established goals for minority institutions (MI). The successful deployment of these strategies has resulted in the establishment of four different programmatic award categories that apply equally to the HBCU and OMU Programs: **Institutional Science, Engineering and Technology (ISET) Awards**; **Principal Investigator (PI) Awards**; **Mathematics, Science, and Engineering (MSE) Awards**; and **Partnership Awards**. These programmatic initiatives are carried out in close collaboration with the NASA Strategic Enterprises and Centers/JPL. The Strategic Enterprises and Centers/JPL support minority university programs through direct funding, use of their facilities, and commitment of their personnel to serve on Technical Review Committees (TRC) and assist in other facets of program implementation. As a result of the involvement of the Strategic Enterprises and NASA Centers/JPL in the MUREP, numerous students and PIs from MIs are knowledgeable about and make significant contributions to the aeronautics and space community.

Outreach to MIs will continue to be made in collaboration with the Strategic Enterprises and Centers/JPL to ensure that MIs are knowledgeable of and responsive to the Agency's Strategic Plan. The Office of Education will continue to set specific program goals that lead to measurable program outcomes that are consistent with the Agency's investment in MIs. Awards from the four programmatic categories are listed below.

### ISET Awards

ISET Awards combine the URCs and IRAs under one award category. This adjustment was made to better reflect the emphasis on strengthening the institution's research capability and achieving outcomes that enhance the institution and support NASA's mission. The ISET awards receive technical guidance and annual onsite reviews by TRCs.

#### **University Research Centers**

The URC Awards are collaborative programs conducted in cooperation with the Strategic Enterprises. These awards are designed to achieve a broad-based, competitive aerospace research capability among the Nation's MIs that will foster new aerospace science and technology concepts; expand the Nation's base for aerospace research and development; develop mechanisms for increased participation by faculty and students in mainstream research; and increase the productivity of students (who are U.S. citizens and who have historically been underrepresented) with advanced degrees in NASA-related fields.

Together, the 11 HBCU URCs achieved the following outcomes in AY 2001-2002 and the summer of 2001:

- 272 students from underrepresented minority groups participated in URC research
- 87 faculty members, 29 research associates, and 11 postdoctoral researchers conducted NASA-related research at URCs
- 165 degrees were awarded to disadvantaged/underrepresented students as follows: 75 bachelors degrees, 81 masters degrees, and 9 doctoral degrees

- 191 refereed papers and/or book chapters were published or accepted for publication. There were 56 student authors or coauthors of these papers/chapters
- 355 technical presentations were given including 105 student presenters
- 1 patent and 1 copyright were awarded
- Students and faculty members participated in 71 panels, 2 sponsored by MUREP, 12 by other NASA programs, and 56 by other Federal agencies
- 31 community partnerships were developed

HBCU URCs include the following institutions: Alabama A&M University, Clark Atlanta University, Fisk University, Florida A&M University, Hampton University, Howard University, Morehouse School of Medicine, North Carolina A&T State University, Prairie View A&M University, Tennessee State University, and Tuskegee University.

### **An Exemplary URC**

#### ***TENNESSEE STATE UNIVERSITY (TSU) Center for Automated Space Science (CASS)***

##### **Program Description**

The mission of the TSU Center for Automated Space Science (CASS) parallels NASA's mission by seeking to advance and communicate scientific knowledge and understanding of the Earth, the solar system, and the universe and to use the environment of space for research. The CASS objective is to achieve a broad-based aerospace research capability which (a) fosters new science and technology concepts featuring autonomous operations; (b) expands the Nation's base for aerospace research and development; (c) develops methods for increased participation by faculty and students; and (d) increases the production of underrepresented minority, U.S. citizens, having advanced degrees in NASA-related fields. CASS not only expands the TSU Center of Excellence's (COE) existing strengths in control systems research and automated astronomy, but also provides the funding to develop a new astrobiology emphasis.

The CASS research consists of five participating research groups:

- Automatic Control Systems
- Automated Astronomy
- South Carolina State University Partnership
- Western Kentucky University Partnership
- Astrobiology

TSU has high expectations for long-term growth for CASS. At the completion of the Phase II funding period, it is anticipated that the TSU Autonomous Observatory at Washington Camp, Arizona, will be fully operational with the seven automatic photometric telescopes (APT), one 24-inch automatic imaging telescope, and a 2-meter automatic spectroscopic telescope. This superb ground-based telescope will not only facilitate long-term observing campaigns of solar-type and

chromospherically active stars, but will be available to support relevant observations for NASA space-based missions.

TSU's collaboration with the Structural Dynamics Branch at LaRC should result in the control systems researchers becoming members of the Gossamer Spacecraft Initiative and either PIs or Co-Is on proposals related to the control of large, ultralight space structures.

The CASS student program uses a holistic approach that focuses on research, professional growth, and personal development. As students progress from freshmen to seniors, they participate in a series of skill development activities during the fall and spring academic sessions and a summer institute. Students are introduced to meta-cognitive tools available on Exploring Minds, a COE interactive Web site. The interaction among the students with the Program Coordinator and CASS researchers enhances students' understanding and use of research techniques. Students are guided through critical reviews of research leading to the development of their own projects and are assigned to a CASS researcher who mentors them. Students are expected to present their research at one of the two university research forums available each spring. The program also supports students by sponsoring attendance at technical conferences and travel to visit research sites.

#### **Program Relevance to NASA**

CASS' research interests are closely related to the goals of the NASA Space Science Enterprise. This Enterprise has identified several areas of enabling technologies, and the TSU CASS Control Systems Group has capabilities in several of these, specifically in advanced structures deployment and control, vibration isolation, structural quieting systems, and damage detection.

Other CASS research interests also align closely with the goals of the Space Science Enterprise, specifically within the science themes of the Astronomical Search for Origins and Sun-Earth Connection. The automated astronomical observatory is used to understand how stars and planetary systems form and to understand the mechanisms of long- and short-term stellar variability of solar-type stars. Having obtained the first direct evidence confirming the existence of an extrasolar planet by detecting a planetary transit in the HD209458 system, CASS astronomers continue to pursue the Office of Space Science (OSS) objective of detecting and characterizing planets around other stars. The long-term studies of brightness changes in Sun-like stars will allow the placement of the Sun's behavior in the context of the broader sample of Sun-like stars in the galaxy.

The CASS education goal parallels exactly the OSS objective to provide for minority universities in particular, and for underserved/underutilized groups in general, to compete for and participate in OSS missions and research programs. During the past 7 years, 73 bachelor of science and

14 master of science degrees were awarded to CASS participants. With the recent approval of the Ph.D. in computer and information systems engineering (CISE), the CASS research areas will provide a strong and viable resource for minority students to earn a terminal degree in this MSE discipline.

### **Program Benefits to Society**

The origin and distribution of life in the universe has intrigued civilizations since earliest times. The questions “Are we alone?,” “How does life begin and evolve?,” and “What is the future of life on Earth and beyond?,” continue to fascinate the average citizen. In seeking the answers to these questions, the CASS Automated Astronomy Group plays a critical role in its search for other planetary systems. The research in control of ultra-lightweight space structures by the Automatic Control Systems Group will aid in laying the foundation for future, large space-based observatories to enhance the search for other planetary systems and to determine the properties of those planets orbiting their parent stars. The Astrobiology Group’s research in examining the adaptation, survival, and evolution of microbial life will aid in the understanding of conditions necessary to support life under environmental conditions that simulate those in space.

Global environmental change affects all humans whether the primary driver has anthropogenic, natural, or solar origins. The CASS Automated Astronomy Group’s research on luminosity cycles in solar duplicates aids in determining the relative importance of this possible climate driver.

### **Research Accomplishments**

TSU’s Automated Astronomy Group telescopes are dedicated to expanding programs to characterize the photometric changes associated with magnetic activity cycles in solar-type stars, to search for evidence of planets around other stars, and to expand the capability to observe newly emerging classes of variable stars. Information about the telescopes and their observing programs can be found on the Web at <http://schwab.tsuniv.edu/>.

The Automatic Control Systems Group continued its collaboration with Texas A&M University. In collaboration with the Structural Dynamics Branch at LaRC, the TSU control group supervised the construction of a testbed for experiments on inflatable rigidizable structures. Researchers are currently studying the modeling, structural design, control, and testing of these structures.

### **Student Achievements**

The goal of the CASS student development program is to increase the number of underrepresented students majoring in STEM fields and to pursue advanced degrees. An African-American electrical engineer is the program coordinator. The focus of all planned activities is to improve the skills of the students so they can become successful candidates in master of science and Ph.D. programs in STEM areas. The student development

program uses a holistic approach that focuses on research, professional growth, and personal development. The areas of research include astronomy, astrobiology, applied mathematics, control systems, network security, and information systems.

In Phase II of the second year, 44 undergraduate and 11 graduate students participated in CASS. Eighteen undergraduate CASS-funded students graduated and two graduate students completed their master of science degrees. CASS researchers mentored at least one student in a research project. These projects resulted in 14 student papers presented by TSU CASS students at the 24<sup>th</sup> Annual TSU Research Day. The 2<sup>nd</sup> Annual NASA/National Science Foundation Student Research Symposium was held at the Marriott Airport Hotel in Nashville, Tennessee. CASS students presented 21 papers (16 from TSU, 4 from South Carolina State University, and 1 from Western Kentucky University).

A total of 37 undergraduate and 5 graduate students participated in the 2001 Student Summer Program, all of whom were African-American. During the Students of Technology Advancing Research in Space (STARS) Summer Institute, students met daily for 8 weeks. At the end of the summer program, there was a culminating project in which students presented their research to the other institute participants.

An African-American faculty member in the Department of Electrical Engineering and an African-American faculty member from the Department of History, Geography, and Political Science were student mentors in addition to the CASS researchers. A total of 13 undergraduates were funded by the South Carolina State University CASS grant during FY 2002. The students carried out astrophysical research projects in radio astronomy, robotics, Web-based instrument control, processing of Charge-Coupled Device images, and data analysis.

### **Institutional Research Awards (IRA)**

IRAs improve academic, scientific, and technological infrastructure and broaden the NASA-related science and technology base at MIs. The first IRA was made in FY 1994 and was limited to only OMUs. The most recent competitively selected IRAs were made in FY 2000 to both OMUs and an HBCU. These awards provide OMUs and HBCUs with an opportunity to provide a quality learning and research environment in NASA-related areas. As a result of participating in this program, OMUs and HBCUs contribute directly to NASA research and human resources requirements; support the development of the institution's NASA-related research capabilities; and increase the number and percentage of underrepresented minorities who are U.S. citizens with advanced degrees in NASA-related fields.

During FY 2002, only one HBCU, Norfolk State University, was an IRA recipient.

The outcomes achieved by this project included the following:

- 7 graduate students and 16 undergraduate students participated in IRA research
- 21 of the HBCU student participants were members of underrepresented minority groups
- Publications included one book chapter, two publications in peer-reviewed journals, and one publication in the proceedings of a professional society
- 8 conference presentations were made by students

### **An Exemplary IRA**

#### ***NORFOLK STATE UNIVERSITY (NSU) Development of Novel Composite and Random Material for Nonlinear Optics and Lasers***

##### **Program Description**

The research is focused on the development of unique robust in operation-random and composite-laser sources and nonlinear optical materials. In this research effort, researchers use the mixtures of pulverized and scattering solid-state laser materials with fractal metallic aggregates to improve the efficiency and reduce the threshold of random lasers via localization of electromagnetic field. Researchers also develop and characterize composite sintered active optical media including inorganic dielectrics, optically clear ceramics with embedded metallic and ceramic aggregates for application in NASA's nonlinear optical devices and lasers.

##### **Program Relevance to NASA**

The research presents a roadmap for developing novel, robust, composite and random order materials for NASA nonlinear optics and materials. These optics and materials will offer new photonic light sources for applications in NASA's Earth Science and Space Science Enterprises' remote sensing of atmospheres. The optics will provide a wide range of wavelengths for probing the content and density of a large number of atmospheric species. Due to their robust nature, they are ideal for deployment to harsh environments with minimal mechanical and thermal engineering concerns. The proposed materials can also support the Space Flight Enterprise by providing sensor technology for detection of harmful gases and by enhancing optical communication capabilities. The Office of Aerospace Technology will be interested in developing these materials for application in noninvasive monitoring of structural and material properties.

##### **Program Benefits to Society**

The developed novel and nonlinear optical materials can find applications in various commercial laser systems, high-brightness display screens, and airport security.

## **Research Accomplishments**

### *Diffused Reflection Off Absorbing Random Laser Material*

Comparing the diffused reflection spectrum of  $\text{NdAl}_3(\text{BO}_3)_4$  powder with the absorption spectrum of the same bulk material, an empirical formula has been obtained for the diffused reflection coefficient. This formula, which slightly resembles the Lambert-Beer law for transmission, does not correspond to diffusion-dominated migration of photons in a scattering medium.

### *Determination of the Transport Mean Path in Tightly Packed Powders of Optical Materials*

NSU has developed a model allowing one to calculate the transport mean free path in tightly packed powder of optical material as a function of the mean particle size and the index of refraction. The model predictions are in a good agreement with the results of the coherent backscattering measurements.

### *Random Laser Without Diffusion*

Random laser emission can be observed when the photon residence time is proportional to the size of the pumped volume  $r$  but not to  $r^2$ , as it could be expected in the case of diffusion. Phase synchronization and coherent mode formation in random laser. A qualitative model explaining sharp spectral peaks, which are observed in many experimental works in stimulated emission of solid-state random laser materials, is proposed. The suggested mechanism of coherent emission relies on synchronization of phases in an ensemble of emitting centers via time delays provided by a network of random scatterers.

### *Sub-Wavelength Localization of Plasmon in Metal-Dielectric Percolation Films*

Research has shown that in metal-dielectric percolation films, sub-wavelength localization of plasmon modes in the space domain may result in sub-cycle field fluctuations in the time domain. The modes in such semi-continuous metal films are localized in nm-sized areas, "hot-spots," where EM-field is extremely enhanced. When the excitation pulse has a broad spectrum, subfemtosecond optical responses can occur locally on such films. Thus, subwavelength spatial localization and subcycle temporal localizations are both possible simultaneously in metal-dielectric percolation films.

### *Electromagnetic Field Distribution for Thin Metal Nanowires*

The electromagnetic field distribution for thin metal nanowires has been theoretically calculated, by using the discrete dipole approximation. The plasmon polariton modes in wires are numerically simulated. These modes are found to be dependent on the incident light wavelength and direction of propagation. The existence of localized plasmon modes and strong local field enhancement in percolation nanowire composites is demonstrated. Novel left-handed nanowire composite is proposed; this

nanoneedle composite material may have a negative refractive index in the visible and near-infrared spectral ranges, including the telecommunication wavelength 1.5 mm. These novel metamaterials may result in developing optical lenses that allow subwavelength image reconstruction and thus can act as perfect lenses.

### **Student Achievements**

During the reporting period, this research project supported seven graduate and 16 undergraduate research students through stipends and research assistantships. All of the students, except two, are members of an underrepresented minority group. The grant paid travel expenses of one student who attended the Annual Meeting of the Optical Society of America in Long Beach, California. Students who participated in the program coauthored one book chapter, two publications in peer-reviewed journals, one publication in the proceedings of a professional society, one publication in a technical digest, and eight conference presentations. Students attended and presented their works at three national and international conferences.

### **PI Awards**

PI Awards are designed to increase the participation of faculty and other professionals in conducting NASA research, research training and/or administration. Faculty and other professionals can apply to three different programs: Faculty Awards for Research (FAR); NASA Administrator's Fellowship Program (NAFP); and the Louis Stokes Leadership Program.

#### **Faculty Awards for Research**

FAR awards provide new faculty, and those who have limited NASA experience, the opportunity to integrate the research and education components of their careers with the unique mission requirements of a specific NASA Center or JPL. The FAR program provides merit selection of proposals from outstanding and promising science, engineering, and technology (SET)-tenured and tenure-track faculty who are capable of contributing to the Agency's research and education objectives. This award provides faculty members with research support and exposure to the NASA peer review process to enable them to demonstrate creativity, productivity, and future promise in the transition to achieving competitive awards in the Agency's mainstream research processes.

During this program year, the FAR program funded approximately 64 research projects, 41 of which were at 35 HBCUs. The data that follow were obtained from the projects that were funded and reported during FY 2002 and summarize the activities of these FAR projects during AY 2001-02 and the summer 2001 reporting period.

There were 113 participants in the FAR research programs of whom 63 were undergraduates, 27 were masters students, and 5 were doctoral students. Thirty-two students obtained degrees during the reporting period, including 18 bachelors degrees, 13 masters degrees, and one doctoral degree. Fifteen of the

graduates were employed in NASA-related fields, including 7 bachelors, 8 masters, and 1 doctoral degree recipient.

During this period, 44 professional-level investigators were involved in research projects including 26 faculty members, 15 research associates, and 3 postdoctoral fellows. The research accomplishments of the FAR projects were documented in 49 refereed papers or book chapters that were published during this period, including 30 publications with students as authors or coauthors. Additionally, the HBCU participants made 71 presentations at peer-reviewed national and international conferences and NASA Centers where 50 or 70 percent of these presentations included at least 1 student presenter.

### **An Exemplary FAR**

#### ***FLORIDA AGRICULTURAL AND MECHANICAL UNIVERSITY Wireless Spread-Spectrum Intercommunication System***

##### **Program Description**

This project will develop the methods for and prototype elements of a wireless spread-spectrum intercommunication system. This system will provide very reliable, full-duplex voice communication for multiple talk groups with mobile users. It will also add mobility and reliability to existing communication systems used in processing and launch operations. The efficiency of operations will be significantly improved by expanding the coverage of existing wired systems and providing increased mobility for operations personnel. The research will include investigations of spread spectrum and multiple access protocols specifically for voice and low data rate applications, development of efficient signal processing algorithms for reduced cost and reliable communication, and design of networking protocols to support mobility and talk group management. The system will be capable of providing facility-wide coverage and interface with existing wired communication systems. The primary results from this project will be prototype devices for a proof-of-concept demonstration and techniques and technologies for a complete system.

##### **Program Relevance to NASA**

Kennedy Space Center has a number of dedicated voice communication systems designed to support launch and processing operations. The Operational Intercommunication System - Digital (OIS-D) provides very reliable group voice communication over a wired network. It also provides the capability of monitoring and recording all communication. A trunked radio system is currently planned which will allow wide area mobile group voice communication using push-to-talk radios and a network of trunking stations and a central controller. In addition, there are a number of push-to-talk handheld radios sharing a few frequency bands, and ad hoc systems for special purposes. The proposed system will provide mobile voice and light data (low rate) communication using digital spread-spectrum techniques to provide the reliability of wired systems along with the flexibility of other wireless systems.

The techniques developed under this project will provide very reliable, full-duplex voice communication that can be organized into talk groups in much the same manner as trunked radios or the existing OIS-D. In addition, the digital channels are expected to support low to moderate data communications such as paging or short-text messaging. The digital channels will provide consistently clear communication unlike analog radios that degrade slowly with distance. The spread spectrum modulation will provide immunity to multipath and narrow-band interference and hence provide reliable communication. In addition, digital and spread spectrum techniques will allow for full-duplex communication where a user can hear other users while talking and can hear their own voice over the radio channel for validation of system operation. Talk groups can be defined using digital identification numbers allowing multiple talk groups to operate independently in the same geographical area.

The anticipated initial use of the wireless spread-spectrum intercommunication system is to extend the range and flexibility of the OIS-D to include mobile users over large areas. This will improve the efficiency of spacecraft processing and launch by freeing the users from the restrictions inherent in a wired communication system. The techniques developed will provide the capability for center-wide coverage for processing and launch operations. This technology has other industrial and public applications including safety, fire, police and rescue operations, or any application where high reliability and mobility is required. Future NASA applications for similar technologies include voice and data communication for large-scale space exploration.

### **Program Benefits to Society**

The full-duplex, wireless voice communication system envisioned from this project has multiple applications ranging from commercial group radio systems to safety or emergency-related communications systems. In addition, the digital nature of voice communication system allows easy merging to existing wired network systems and thereby extending the geographic range of communications considerably. The full-duplex capability of the voice system gives each user instant feedback on the quality or even existence of their communication with the overall communication system. This is an important feature for emergency or safety-related users who must be sure their transmissions and the information they are relaying is reaching the intended group of users. The simultaneous voice communication features enable true conversations to take place; this is a feature favorable to the average consumer and is a great benefit in emergency situations where it is essential to "interrupt" a speaker. The ability to operate in talk groups allows multiple conversations to take place simultaneously in the same geographic region. This provides more efficient communication as only the speech relevant to the listener is heard.

### **Research Accomplishments**

The research has led to the development of the Adaptive-Rate Delta Modulation technique for full-duplex, simultaneous voice communications. In addition, it has led to the development of rapid direct sequence spread spectrum synchronization using field programmable logic devices using a pipelined matched filter. The program has also investigated voice-over Internet Protocol techniques and voice compression algorithms.

### **NASA Administrator's Fellowship Program (NAFP)**

The NAFP provides opportunities for NASA career employees and the STEM faculty of minority-serving institutions to compete through peer review for placement in a formal professional development program. In addition to individualized professional development enhancement, NASA employees spend a year teaching or conducting research at a minority-serving institution while STEM faculty spends a year conducting research at a NASA Center.

### **Louis Stokes Leadership Program**

The Louis Stokes Leadership Program provides competitive, peer review selection of faculty, educators, and other scientific and technical personnel with an opportunity to participate in a 4-year professional leadership program designed to assist the HBCUs and OMUs in strengthening the delivery and management of NASA-sponsored scientific research and STEM educational and training programs. Participants will spend 2 years at a NASA Center or JPL and 2 years at an HBCU or OMU enhancing their knowledge and ability to lead the institutions in better responses to the Federal Financial Assistance Management Improvement Act, Electronic Grants Initiatives, the Government Performance and Results Act, and achievement of better performance outcomes in conducting NASA-funded research and education programs.

### **Mathematics and Science Education Awards (MSE)**

MSE Awards build upon the institutions' outstanding ability to provide excellence in STEM training while increasing the participation and achievement of socially and economically disadvantaged and/or disabled students in STEM fields at all levels of education. Awards are made in the following three areas: undergraduate and graduate; teacher preparation and enhancement; and precollege activities.

Undergraduate and Graduate Awards, such as the Scholars Program, provide scholarships, fellowships, internships, and research opportunities in NASA-related fields, and other services to enhance retention and increase graduation rates. Teacher Preparation and Enhancement Awards, such as the Mathematics, Science, and Technology Awards for Teacher and Curriculum Enhancement Program (MASTAP), provide opportunities for MIs to develop diverse and exemplary research-based mathematics, science, technology, and geography teacher education curricula that are integrated with content from NASA's mission. Precollege Awards, such as the Precollege Awards for Excellence in Mathematics, Science, Engineering, and Technology (PACE/MSET) offer opportunities for MIs, in collaboration with NASA and local school districts, to provide informal educational opportunities that will enhance the

number and percentage of students enrolled in mathematics and science college preparatory courses.

## **MASTAP**

Each MASTAP award recipient receives up to \$200,000 per year for a maximum of 3 years based on performance and availability of funds under the program. During FY 2002, the HBCU MASTAP awardees were Bowie State University, Jackson State University, Mississippi Valley State University, Norfolk State University, South Carolina State University, and Xavier University of Louisiana.

The program outcomes for the MASTAP program include:

- 931 participants in the MASTAP program: 468 in K-8, 46 in high school, 84 in undergraduate programs, 142 in masters programs, 132 preservice teachers, and 59 inservice teachers
- 24 non-student investigators: 18 faculty and 6 research associates/assistants
- 19 presentations of which 11 had at least 1 student presentation
- 12 community partnerships
- Presentations on 12 panels: 5 sponsored by NASA Minority Programs, 1 by another NASA Program, and by 6 other Federal agencies

As a result of participating in these awards, students will gain awareness of career opportunities in STEM fields, exposure to NASA's mission and scientific and technical personnel role models, and will enter college pursuing NASA-related career fields.

### **An Exemplary MASTAP Project**

#### ***MISSISSIPPI VALLEY STATE UNIVERSITY (MVSU) Improving Teachers and Students Achievement In Mathematics and Science***

##### **Program Introduction/Overview**

For over 3 years, the Mathematics, Science, and Technology Awards for Teacher Education and Curriculum Enhancement Program (MASTAP) at MVSU has implemented a 4-week summer and academic Saturday workshop to increase the number of certified mathematics and science teachers employed in the critical shortage school districts. Preservice teachers and inservice teachers (long-term substitutes) from Holmes, Humphreys, Leflore, Washington, and Sunflower County School Districts are targeted to participate in the program. In the MASTAP program, teachers gain knowledge and skills in the application of enhanced practices in mathematics and biology content areas, pedagogical concepts, and the art and science of test-taking.

##### **Program Goals**

The MVSU MASTAP program involves 4 weeks of summer instruction, 6 hours per day, Monday through Friday. A test-taking skills workshop was conducted for all participants to assess the status of the teachers in test preparation and their levels of anxiety towards taking the Pre-Professional Skills Test (PPST) and the Praxis II specialty area test. Subject content

areas were taught for 3 weeks, 6 hours per day. Mathematics and biology sessions were conducted concurrently during these weeks in the program. Participants traveled to the NASA Teacher Resource Center at the NASA Stennis Space Center to become familiar with the vast array of teaching materials available for educators. Six workshops were conducted during September, October, November, December, and January.

### **Program Outcomes and Accomplishments**

Two preservice teachers—one biology and one mathematics--graduated with bachelors degrees in May 2001. Both are employed as teachers in Leflore and Sunflower County School Districts. Seven preservice teachers, including one biology major, one mathematics education major, and five mathematics majors, graduated with bachelors degrees in May 2002. Four graduates were employed as mathematics teachers in the fall of 2002 in Holmes and Leflore County Public Schools in Canton, Mississippi and Dallas, Texas. Two mathematics graduates pursued graduate degrees in mathematics at Mississippi State University and the University of Southern Mississippi in the fall of 2002, and one mathematics graduate was pursuing a Master of Arts in teaching at MVSU.

Four teachers have a Class A license. A total of 11 teachers passed the Praxis I exam. Two teachers passed the Praxis II exam in mathematics; two teachers passed the Praxis II exam in elementary education and are working towards an add-on endorsement in mathematics; one teacher passed the Praxis II exam in biology; and one teacher missed the cut-off score by one point in mathematics on the Praxis II.

The MVSU MASTAP program has had a significant increase in the number of preservice teachers who declared mathematics or science education as their majors. The MASTAP program accepted nine additional teachers--seven preservice and two inservice--into the program for the summer of 2002 during the no-cost extension. The rationale for this increase was attributable to exposure to the MASTAP program. Teachers had the benefit of resource materials, software, equipment, videos, enrichment activities, and mentoring which were available only through MASTAP.

### **Student Accomplishments**

Teachers reported the MASTAP program as a positive experience on the evaluation form. Two preservice teachers with mathematics education majors participating in the MASTAP program presented and published their senior project research in poster sessions at conferences in Alabama, Mississippi, and Washington, DC. Preservice teachers also attended the National Council of Teachers of Mathematics Conference in Oklahoma City in February 2002.

## **Precollege Awards of Excellence in Mathematics, Science, Engineering, and Technology (PACE/MSET)**

The primary purpose of PACE is to encourage the implementation of innovative projects with collaborative strategies to ultimately increase the pool of talented scientists and researchers in STEM fields. PACE is designed to include any combination of outreach projects such as Saturday Academies, Summer Science Camps, In-School Mathematics and Science Academies, and After-School Enrichment Programs. The program targets hard-to-staff public elementary, middle, and high schools, where 50 percent or more of the students are disadvantaged and have a large number and/or percentage of uncertified mathematics and science teachers. The following HBCUs were the FY 2002 PACE/MSET grant recipients: Fayetteville State University, Hampton University, Jackson State University, Jarvis Christian College, Mississippi Valley State University, Norfolk State University, Paine College, Shaw University, Tuskegee University, and the University of Maryland Eastern Shore.

The program outcomes for the PACE program include:

- 576 participants in the PACE program: 246 in K-8, 217 in high school, 63 in the bridge program, and 50 in the undergraduate program
- 36 non-student investigators: 21 faculty and 15 research associates/assistants
- 2 publications
- 3 presentations, all having at least one student presentation
- 41 community partnerships and 6 initiatives to increase family participation in mathematics and science-related experiences
- 2 panel presentations at other Federal agencies

### **An Exemplary PACE Project**

#### ***JARVIS CHRISTIAN COLLEGE PACE/MSET Summer Camp for Training and Mentoring***

##### **Program Introduction/Overview**

The Jarvis Christian College NASA Center for Academic Excellence is a 6-week, precollege preparatory instructional program in science, engineering, mathematics, and computational science for 30 underrepresented minority and/or disabled students at targeted high schools within the Tyler, Hawkins, and Quitman Independent School Districts. Through group and individual instruction, field and laboratory work, site visits, parental involvement, guest speakers, test preparation and other special programs, high school students received academic instruction, as well as personal and career guidance, through programs specifically designed to meet the needs of each participant. Each year, the program enrolled 30 participants. The core curriculum included biology, algebra, technology (computer science) and pre-engineering. During the 2002 summer component, students were also enrolled in physical science, chemistry, physics, trigonometry, and precalculus. Other program-enhancing courses and activities included scientific reading and

research, computer science, and scientific writing. The program schedule was designed to maximize the achievement of the integration of ideas and concepts expounded in STEM careers. The 2002 program ended with an educational trip to the NASA Johnson Space Center in Houston, Texas.

### **Program Goals**

- To increase the number of targeted students with the prerequisite skills necessary to complete their secondary education program with precollege track mathematics such as algebra and geometry and science courses.
- To increase the ability of the program participants to communicate and collaborate among the STEM areas throughout the college and target public schools.
- To provide program participants with hands-on learning experiences, research, use of advanced technology, peer support groups, and mentoring relationships with professional and college students.
- To motivate participants to complete their secondary programs and enter college, and pursue mathematics and science careers by involving the participant's parents in orientation, awareness, and informing them of the student's academic progress.
- To increase the student's awareness of STEM in the world, multicultural contribution to STEM fields, and career options through career exploration, counseling and discussions of financial assistance.
- To expose participants to educational activities and facilities that are traditionally unavailable to them by involving community groups, businesses, industries, research laboratories, museums and educational and professional organizations.

### **Partnerships**

The success of the STEM program is largely dependent upon cooperative relationships with organizations and individuals that can provide experiential information to program participants. The concept of partnering with these entities has been implemented. During AY 2002, the following organizations have been involved in partnering with the STEM program to provide informative seminars and experiences for program participants:

- Big Sandy High School (text books and curriculum material)
- Jarvis Christian College Research Laboratory (laboratory exercises)
- Tyler Independent School District (students and curriculum materials)
- Hawkins Independent School District (curriculum materials)
- University of Texas Health Center at Tyler (guest lecturers)
- Johnson Space Center, Houston, Texas
- Bell Helicopter
- Textron, Ft. Worth, Texas
- Freshwater Fish Hatchery, Athens, Texas

- Kennedy Space Center, Cape Canaveral, Florida
- Goddard Space Flight Center, Greenbelt, Maryland
- University of Texas Southwestern Medical Center at Dallas (field trip and lecturers)
- University of Texas Health Science Center at Tyler (site visit and lecturers)
- Marshall Space Flight Center, Huntsville, Alabama (field trip/curriculum material)
- Ft. Worth Museum of Science and History
- Jarvis Christian College, Department of Biology, Chemistry, and Physics (lecturers, demonstrations, mentors, and research assistance)

### **Program Outcomes and Accomplishments**

One hundred percent of the students were placed in precollege track mathematics and science courses appropriate with their grade level and were exposed to positive role models through guest speakers, scientists, and science researchers/instructors. All students were enrolled in a computer course that provided hands-on experience. Students participated in a weekly Career Exploration class. There was a 100-percent attendance at the orientation seminar at the beginning of each summer session and the closing banquet at the end of each summer session. Additionally, 40 percent of the parents assisted as chaperones on several trips during the program years. All of the students participated in career counseling, career exploration, and financial aid seminars. The number of students who visit a space center each summer will increase to at least 100 percent. Successful demonstration of mastering the materials in the mathematics and science courses (A & B students) was indicated by 90 percent of the students. All students were presented the opportunity to interact with the seminar presenters. Over 85 percent of the students indicated the seminars were very helpful and informative. Students were given a personality inventory test to determine their compatibility with STEM careers. During 1999-2000, the first group of program participants completed high school. A total of seven students graduated from high school. One hundred percent of the participants are enrolled in post-secondary institutions with 29 percent majoring in computer science and 14.3 percent majoring in biology. Thus, 57.1 percent of program participants have decided to pursue degrees in the disciplines recommended by NASA in the program guidelines. During 2000-2001, 13 students graduated from high school with 100 percent enrolling in a post-secondary institution. The following year, one student graduated from high school and enrolled in a post-secondary institution. All students attended informational sessions relative to history and the future outlook of the NASA program. Afterward, students participated in an "Eye Mac" presentation of highlighting technological advancements in space and during the career exploration course, successful minorities in STEM fields were highlighted. All of the participants attended all cultural events held on campus. Eighty-four percent of the participants visited the Kennedy Space Center in Florida.

## **OTHER MSE AWARDS**

Other exemplary MSE Awards include the ***Model Institutions of Excellence (MIE)***. NASA, in collaboration with the National Science Foundation (NSF) and the Departments of Interior and Agriculture, award collaborative agreements to each institution selected for the MIE Program. Each of the chosen MIE's has a track record of awarding science, education, and mathematics (SEM) degrees; a strong commitment to SEM education and graduate research; and the potential for launching a major enhancement of their current efforts. The NASA-sponsored MIE's are Bowie State University and Spelman College.

Program outcomes for FY 2002 and the summer of 2001 included:

- 299 participants including 67 bridge students and 133 undergraduates
- 66 nonstudent investigators including 35 faculty, 19 research assistants/associates, and 12 postdoctoral fellows
- 2 publications in refereed journals, books, or book chapters
- 16 presentations at peer-reviewed national and international conferences
- 6 panel presentations sponsored by NASA Minority University Programs and other Federal agencies

### **An Exemplary MIE**

#### ***SPELMAN COLLEGE***

##### **Program Introduction/Overview**

The MIE program is designed to increase Spelman College's performance and role as a major conduit for the education of African American women in science, engineering and mathematics. The program activities focus on four areas: Undergraduate Education, Undergraduate Research, Student Development, and Infrastructure Development.

##### **Program Goals**

The goals are to:

- Increase the number of SEM graduates by 15 percent and, by 25 percent, the number of SEM graduates pursuing doctoral degrees in SEM fields or entering SEM professional careers through an aggressive recruitment strategy and increased linkages with community colleges, graduate programs, and professional organizations.
- Engage in a focused plan of curriculum development in order to realize greater technology integration and substantive innovation in the core course sequences.
- Improve and synthesize opportunities for student development, with a particular focus on formalized structures for research training and short-term exchanges with other MIE institutions, and development of graduate articulation agreements.
- Provide increased opportunities for faculty to enhance their pedagogical skills in areas that are consistent with the national undergraduate reform movement for SEM.

- Strengthen the SEM administrative and physical infrastructure by recruiting a corps of skilled personnel and consultants and programming learning spaces to foster greater collaboration and hands-on instruction.
- Improve and fully integrate the STEM database and tracking system with campus-wide Strategic Planning Evaluation and Assessment.
- Identify and develop greater opportunities to work closely with NSF and NASA to position Spelman as a national resource for other educational institutions and organizations.

### **Program Outcomes and Accomplishments**

The SEM programs have increased the number of graduates who enroll in graduate degree programs, especially in the biological sciences and physics.

### **Student Accomplishments**

There has been a significant increase in the number of student scientific presentations at national meetings during the past 3 years. There has also been an increase in the number of faculty-student coauthored publications.

## **PARTNERSHIP AWARDS**

Partnership Awards include the Partnership Awards for the Integration of Research (PAIR) into STEM Undergraduate Education and the Networks Resource and Training Sites (NRTS). The NRTS were moved to Partnership Awards to better reflect this group's contributions to NASA's educational technology goals.

### **PAIR**

The purposes of the PAIR awards are to integrate cutting-edge, NASA-related research into the undergraduate educational experience, to strengthen teaching and research strategies across academic programs, and to enhance collaboration among STEM academic departments, thereby strengthening the STEM baccalaureate degree-producing capacity of many of the Nation's HBCUs and OMUs.

During FY 2002, the HBCUs that were recipients of the PAIR Award included Clark Atlanta University, Hampton University, Norfolk State University, North Carolina A&T State University, South Carolina State University, and Tuskegee University.

## **An Exemplary PAIR Project**

### **NORFOLK STATE UNIVERSITY**

#### ***Mission-Leveraged Education: NSU-NASA Innovative Undergraduate Model Millennium, A NASA PAIR Project***

#### **Program Introduction/Overview**

The BEST Lab (Center for Excellence in Science Education) and the Chemistry, Physics, and Computer Science (CS) Departments at Norfolk State University (NSU) have joined forces to implement MiLEN<sup>2</sup>IUM, an innovative approach to integrate current and emerging research into the undergraduate education and train students in NASA-related fields. Through the participation in an Earth Observing System (EOS) mission, students are educated and trained in many aspects of remote sensing, spectroscopy, signal processing, data conditioning, analysis and visualization, and atmospheric science. This model has significantly enhanced the quality of the Mathematics, Science, Engineering, and Technology (MSET) educational experience and inspired students from historically underrepresented groups to pursue careers in NASA-related fields. The MiLEN<sup>2</sup>IUM model is applicable to other higher education institutions that are willing to make the commitment to this endeavor in terms of faculty interest and infrastructure.

This education model, which uses a remote-sensing mission as the centerpiece, has direct relevance to NASA since it prepares students for graduate work or employment in NASA-related fields in an environment similar to NASA as well as providing them the basics required for a well-rounded higher education experience.

The remote sensing instrument centerpiece of this program is the CIMEL 318-1, the instrument used by NASA's AERONET (AErosol ROBotic NETwork) instrument network. AERONET is an EOS mission based at the Goddard Space Flight Center (GSFC) (<http://aeronet.gsfc.nasa.gov/>). This instrument is also a multichannel ground-based version of the Stratospheric Aerosol and Gas Experiment (SAGE), a mission led by NASA Langley Research Center (LaRC). The proposed mission-based NSU-NASA undergraduate education and research model uses sunphotometry to link the emerging research of the MiLEN<sup>2</sup>IUM team in spectroscopy; signal processing; data conditioning, analysis, and visualization; and atmospheric science.

Involvement of students in atmospheric science investigations and in the development and operation of sunphotometers produces graduates with significant experience in NASA-related fields. Education and training of the future STEM workforce provided by the program has direct relevance to NASA's Earth Science Enterprise, other NASA Enterprises, and any Federal agency or commercial venture which relies on remote sensing and its products.

## **Program Goals**

MiLEN<sup>2</sup>IUM's mission is to implement a nontraditional model to significantly enhance the learning, training, and quantity of STEM baccalaureates in NASA-related fields. In order to fulfill the mission of the program, the following objectives were established:

- Participation in an EOS mission to involve students in all aspects of remote sensing, a NASA-related field. Participation in this mission would be the centerpiece for student recruitment, infusion of cutting-edge concepts and teaching strategies into the curricula, and competitively training students in state-of-the-art technologies through NASA-related work experiences and research.
- Implementation of emerging discoveries in science and technology in the curriculum to enhance student critical thinking and knowledge of state-of-the-art technologies. Increase faculty utilization of these technologies.
- Involvement of students from historically underrepresented groups in EOS mission development and research.
- Dissemination of the model to other institutions, empowering them to achieve excellence in STEM academic infrastructure, undergraduate preparation, and research training in NASA-related fields.

## **Partnerships**

The main partner of MiLEN<sup>2</sup>IUM is LaRC. NSU has had a long-standing partnership with LaRC since 1992. The BEST Lab was founded with the help of LaRC in 1996. Several previous projects have cemented the working relationship between the LaRC Office of Education, the Atmospheric Science Division, the Distributed Active Archive Center, and the BEST Lab. This partnership has grown stronger due to MiLEN<sup>2</sup>IUM. During the summers, students performed research with a scientist of the Radiation and Aerosol Branch. The principal investigator and a student were involved in the preparation and data collection during the Chesapeake Lighthouse Aircraft Measurements for Satellites (CLAMS) campaign, and the principal investigator has continued the collaboration with the SAGE II team. Two advisory board members are scientists at LaRC.

A strong partnership with GSFC has been developed, as NSU becomes an Aerosol Robotic Network (AERONET) site. This collaboration has led to various student research projects with excellent results.

- During the summer, a partnership with the Hampton University's PAIR was forged to obtain atmospheric specie data using NSU CIMEL Sunphotometer and Hampton University Lidar. The instruments were collocated on the NSU campus.
- A private, commercial vendor, Ocean Optics Inc., has contributed matching funds for the purchase of miniature spectrometers as a result of the proposed enhancement of these spectrometers for sunphotometry applications as a part of MiLEN<sup>2</sup>IUM. Ocean Optics Inc., awaits the results of this project. Analytical Graphics Inc., has

extended this partnership by donating their satellite analysis software (Satellite Toolkit) and expertise to integrate this software to the curriculum.

- Through the Accentuating Technical Opportunities for Minorities (A.T.O.M.) project funded by the U.S. Department of Education, MiLEN<sup>2</sup>IUM has enjoyed the partnership of Elizabeth City State University, Fayetteville State University, University of North Carolina at Pembroke, and Virginia State University. STEM faculty members from these schools have attended two workshops at the BEST Lab. The A.T.O.M. project solidified an ongoing partnership with NASA's MU-SPIN program through the Network Resources and Training Site (NRTS) at Elizabeth City State University. The MU-SPIN Program Manager is a member of the MiLEN<sup>2</sup>IUM Advisory Board.

## **Program Outcomes and Accomplishments**

### Institution

- Establishment of a permanent AERONET site at Norfolk State University.
- Cimel 318-1 Sunphotometer installed, calibrated, and is currently operating.
- NSU appears as an AERONET site on the project's Web page, and students have used the data for research.
- NSU embraces innovative models and approaches for science education.
- The School of Science and Technology has created the Teaching and Learning Technology (TLT) Scholars, who are faculty that have attended the TLT workshops given by the MiLEN<sup>2</sup>IUM co-investigator.
- NSU now encourages and supports most aspects of research education. NSU has provided space and resources for the MiLEN<sup>2</sup>IUM project.

### Curricula

- Introduction of principles of sunphotometry, atmospheric science, data visualization, signal processing, and other NASA-related topics of sociological interest into the STEM courses.
- Utilization of active engagement approaches to teaching have increased.
- The TLT workshop for faculty on novel pedagogies has been offered.
- Complete revamping of the Instrumentation course to emphasize NASA-related topics and techniques.

## **Student Accomplishments**

- Enhanced involvement of STEM NSU students in NASA-related research.
- Students have used the data for research.
- 26 students directly participated in MiLEN<sup>2</sup>IUM activities.

- 50-percent increase in STEM students involved in NASA-related research.
- 17 students participated in MiLEN<sup>2</sup>IUM.
- Four graduates to date.
- Students delivered 15 presentations at conferences. MiLEN<sup>2</sup>IUM has increased students of underrepresented groups who will pursue careers in NASA-related fields.

## **NRTS**

In 1994, Minority University-Space Interdisciplinary Network (MU-SPIN) received its core funding from NASA's Minority University Research and Education Programs (MUREP) to increase minority access to science and technology by improving the computer network infrastructure of minority institutions. MU-SPIN oversees seven NRTS that serve as regional hubs that build and maintain connectivity to other minority institutions and predominantly minority-attended elementary and secondary schools.

During FY 2002, five HBCUs received continued funding of their NRTS awards. Participating HBCUs included Elizabeth City State University, Morgan State University, Prairie View A&M University, South Carolina State University, and Tennessee State University.

### **An Exemplary NRTS Project**

#### ***TENNESSEE STATE UNIVERSITY NASA/TSU Minority Universities Information Network for Research and Education/MU-SPIN NRTS Program***

#### **Program Introduction/Overview**

This program was designed to put the first two courses in college astronomy on-line. The targeted population is those minority institutions not able to offer astronomy as a course option. The courses provide streaming video instruction with each learning segment structured to be replayed until understood. The course also has on-line laboratory experiences. Motivation for the students is provided with interview materials from practicing professionals. The offerings can be presented as a traditional 4-semester hour course with instruction and lab, 3-hour course with instruction and no labs required, and as a noncredit class for the students not interested in credit. The interactive features of this streaming video experience make this course unique to the astronomy world.

#### **Program Goals**

- To provide astronomy courses to the underrepresented populations at small institutions unable to provide an astronomy course.
- To support NASA's efforts to increase the number of underrepresented minorities in the space sciences, especially in astronomy.
- To motivate students to pursue STEM careers.

- To continue to support students studying in the STEM areas at Tennessee State University and the partner NRTS institutions.

### **Partnerships**

The partnerships for this project only involve the provisions of funding for student and faculty development in the STEM programs at Lane College, LeMoyne-Owen College, Kentucky State University, and Alabama A&M University. These partnerships were continued at the level of \$25,000 per year at each site.

### **Program Outcomes and Accomplishments**

The program had over 150 hours of tape edited for the courses. The first portions of the first course were scheduled for piloting and testing in January 2003. Over 50 practicing astronomers and engineers working in astronomy have been interviewed for the program. The student funding supported over 80 students this reporting year. The presentation is being placed in Flash MX to allow viewing from any of the major platforms and at the speed best for the line transmission characteristics of the participant's equipment. All of the necessary equipment to produce the courses is in place. This program is the coordinating agency for the Annual NASA/NSF/TSU Research Symposium. This is a national meeting held in Nashville and has participants from multiple institutions. TSU plans to continue this effort.

### **Student Accomplishments**

The students supported by this program and working in the development of the courses have progressed toward their degrees. Several of the students from the previous year have graduated and gone on to careers in the STEM fields. The students working on the program have learned to use several advanced software packages and developed editing and processing skills in multimedia that will apply to their professional efforts in the future.

## **NASA CENTER AND ENTERPRISE INVOLVEMENT**

During FY 2002, the NASA Centers and Enterprises implemented numerous projects that helped to strengthen the infrastructure of HBCUs. These projects better equipped students to pursue degrees and careers in NASA-related fields. The faculty at HBCUs enhanced their ability to conduct NASA-related research and compete for mainstream funds. The following summaries are synopses of the accomplishments of the NASA Centers and Enterprises for FY 2002 pursuant to Executive Order 13256. This Executive Order requires all Federal agencies to plan and report annually on how they increased the capacity of HBCUs to compete effectively for Federal funding.

### **Ames Research Center (ARC)**

In FY 2002, ARC continued to successfully advocate the implementation of Executive Order 13256 and continued to develop new relationships and expand existing relationships with HBCUs. ARC's Minority University Research and Education Program (MUREP) has continued to reach its goals by following a 5-year strategic plan designed to serve and support MIs. The plan calls for developing substantive collaborations with institutions both locally and nationally. It also cited the enhancement and diversification of ARC's summer student internship program. This goal was accomplished in FY 2002. The number of NASA Scholar Students increased by 30 percent. Thirty-three students participated in FY 2001 compared to 43 students in FY 2002. Of the 43 students, there were 19 African-American students.

MUREP at Ames Research Center continues to encourage each Directorate to award multi-year cooperative agreements to MIs in order to reach the Center's objectives. These objectives include:

- Systematic and sustainable changes enhancing the research and educational outcomes in NASA-related fields; and
- Collaboration with other MIs encouraging less-experienced institutions in the access of the Agency's technology, resources, and wealth of information.

### **Dryden Flight Research Center (DFRC)**

During FY 2002, DFRC had a strong and continuing commitment to strengthen its partnerships with HBCUs as well as other minority-serving institutions. The programs and activities continue to build on the significant investments Dryden has made in recent years in the entire range of opportunities to further mutual goals offered by HBCUs. The return on these investments can be seen on campuses in the research, education, and community assistance activities conducted through HBCUs and in the contribution HBCU graduates make as NASA employees.

During FY 2002, considerable consideration was given to identifying the most effective use of available resources to enhance the participation of HBCUs in DFRC's programs. DFRC provided over \$487,331 in support of HBCUs. The following categories of programs were funded during FY 2002:

- Research and Development - five projects at 4 HBCUs
- Fellowships, Internships, Recruitment, and Arrangements under IPAs – three activities (recruitment from minority professional organizations, graduate degrees in engineering and science, and minority studies scholars program).
- Student Tuition Assistance, Scholarships, and Other Aid – funding two students at the graduate level.
- Technical Assistance Workshop for Third-Party Awards - In the short-term, the workshop was designed to position HBCUs and OMUs to increase their knowledge of NASA's technical needs and procurement processes. The long-term goal of this workshop is new and expanded networks of HBCUs/MIs with public and private partners and increased business with DFRC and other NASA Centers in competitive contracts and grants are expected.

### **Glenn Research Center (GRC)**

GRC awarded a total of \$4.7 million in research grants to HBCUs. The Center hosted its annual HBCU Research Forum, which afforded an opportunity for researchers at HBCUs across the Nation to present summaries of their research interests and capabilities to GRC technical managers. The HBCU researchers were given briefings on the GRC R&D agenda. Additionally, time was scheduled for informal discussions on future collaborations. This annual forum is an exemplary vehicle for building partnerships that are sustainable and critical for GRC's achievement of its research and development goals.

GRC proactively recruits students from HBCUs for summer work experiences. The GRC internship program provides students with introductory professional experiences to complement their academic programs. Interns are given assignments in research and development, technical, and administrative projects under the personal guidance of NASA professional staff members. GRC hosted 32 students from HBCUs out of a total of 188 in the program during the summer.

Through a grant to Tennessee State University, GRC supported 40 precollege students in a 2-week on-campus program - College Bound; 80 precollege students for a pre-engineering enrichment program – Minority Introduction to Engineering (MITE); and 4 undergraduates in pursuit of technical degrees in the College of Engineering and Technology. These programs were designed to increase the number of underrepresented minorities graduating with engineering degrees.

GRC awarded grants to Minority Access and NACME which supported over 60 students at HBCUs through subawards. GRC continued a robust K-12 education initiative, the Science Engineering Mathematics and Aerospace Academy (SEMAA) program, which motivates the next generation of students to enter the NASA pipeline and pursue STEM careers. Through Pergon TEC, Inc., National SEMAA Office, GRC funded SEMAA sites at the University of Maryland Eastern Shore, Morgan State University, the University of the District of Columbia, and Winston-Salem State University. These HBCU sites for the SEMAA program served over 4,700 students and parents during FY 2002.

## **Goddard Space Flight Center (GSFC)**

During FY 2002, GSFC continued its efforts to enhance relationships and interactions with HBCUs. GSFC employees have shown a high level of interacting activities and diversity in programs and in the development of the workforce. The activities reflect the Center's commitment to Executive Order 13256.

In support of the overall objectives of the program, GSFC funded seven HBCUs in research and development. These universities included: Alabama A&M University, Elizabeth City State University, Bowie State University, Tennessee State University, Prairie View A&M University, Howard University, and the University of Maryland, Eastern Shore. The funding totaled \$161,296.00.

GSFC has several offices that assist the Center in its commitment to HBCUs. These offices include the Office of Human Resources, the Office of Equal Opportunity Programs, the Office of Education, and the Office of Safety and Mission Assurance. Additionally, the Center has four directorates that have established collaborations with HBCUs. These include the Applied Engineering and Technology Directorate, the Space Science Directorate, the Suborbital and Special Orbital Projects Directorate, and the Earth Science Directorate.

## **Jet Propulsion Laboratory (JPL)**

The primary mission of JPL is to explore the solar system with automated spacecraft. In addition, JPL undertakes other scientific, technological, and education projects to meet national needs. JPL is fully committed to NASA's goal in support of HBCUs. During FY 2002, JPL continued to implement programs to achieve the goals of strengthening the capability of these institutions to provide quality education, and to conduct first-rate research activities for faculty and students. During FY 2002, the significant contributions to HBCUs included the following:

- JPL is the lead Center in robotic exploration of the solar system and participates in international space exploration, Earth observation missions, astrophysical research, and technology development.
- The mission of the Harriett G. Jenkins Predoctoral Fellowship Program is to increase the number of women, minorities, and disabled persons participating in the mathematics, science, engineering, and technology disciplines in the workforce. As part of the selection process, JPL supported the Minority Education Initiatives Manager to assess the effectiveness of this program.
- JPL personnel attended the following conferences to acquire or enhance knowledge or skills at an HBCU:
  - Minority University Presidents' and Administrators' Conference – "Share the Opportunities," a forum for the leadership of the MIs to forge partnerships with the NASA community. NASA will "share the opportunities" by identifying and describing competitive research opportunities in NASA's five strategic Enterprises and by providing opportunities to network with each of its 10 Centers to explore areas of mutual expertise.

- The Preservice Teachers Conference (PSTC) is a 3-day conference for future elementary and middle school teachers and faculty advisors. It is designed to enhance the teaching of science and mathematics by incorporating technology. The conference provides preservice teachers attending HBCUs, HSIs, and TCUs the opportunity to attend general sessions with internationally known guest speakers, and to participate in interactive workshops with educators, scientists, and researchers.
- The American Society for Engineering and Education (ASEE) Summer Faculty Program is awarded to engineering and science faculty members for summer research in a NASA university cooperative program. The overall objectives of the program are to (1) further the professional knowledge of the selected faculty members, (2) stimulate an exchange of ideas between teaching participants and employees of NASA, (3) enrich and refresh the research and teaching activities of the participants' home institution, and (4) contribute to the research objectives of the NASA Center.
- The NASA Faculty Fellowship Program (NFFP) hosts 10-week summer on-site fellowships at various NASA facilities for full-time engineering and science educators from U.S. colleges and universities.
- JPL continues its college recruiting program to identify and select the best candidates available to fill its new graduate hiring requirements. During FY 2002, JPL provided support to MIs by participating in activities supporting science and engineering students and recruitment at national conferences.

### **Johnson Space Center (JSC)**

In FY 2002, JSC continued to develop a successful and vital link with HBCUs. JSC aggressively seeks out new relationships with HBCUs and strengthens existing ones in promoting the development of competitive aerospace research capability in minority institutions of higher education.

During FY 2002, JSC accomplished significant measurable objectives in its goal to assist HBCUs and continued to emphasize the goal of inclusion of HBCUs in its programs. JSC provided support to HBCUs in high-level peer reviewed projects. JSC continued to identify additional fund sources to increase selective support to participating HBCUs in space science and engineering initiatives at JSC.

JSC continued to provide assistance and to seek opportunities to strengthen technology and education outreach partnerships with existing HBCUs, as well as aggressively seek out new relationships with these institutions. JSC managers continue to support the Agency's goal and mission to assist HBCUs. Clear and highly visible policies will permit and encourage the full participation of HBCUs in the JSC program.

### **Kennedy Space Center (KSC)**

During FY 2002, KSC hosted NASA's first all inclusive 3-day conference scheduled around the Shuttle Endeavor launching for the Minority University Presidents "Share the Opportunities Conference." This Conference included delegations from various HBCUs. In addition, KSC's Education Office engaged in several activities that involved all levels of MIs by supporting:

- An IPA to reach out to MIs
- 45 college summer interns to attend the Technical Symposium
- SECME Early College High School Partner's meetings
- 33 minority university internships
- 29 (54 percent) minority high school student internships

Additionally, KSC specifically funded three HBCUs for a total of \$820,705 in 2 of the 11 budget categories. The institutions were Southern University in R&D, Tuskegee University for training, and Bethune-Cookman College for training.

### **Langley Research Center (LaRC)**

LaRC has pursued initiatives that continue to support previously developed relationships with HBCUs. Through Third-Party Awards, LaRC has supported the HBCU Hampton University with two projects in atmospheric sciences and remote-sensing science instruments. Additionally, the Office of Education has provided a wide selection of projects that range from undergraduate preservice teachers, university students and faculty, and general outreach activities. LaRC's commitment to and support of HBCUs was further evidenced as follows:

- Pre-Service Teacher Program (PSTP)
- Pre-Service Teacher Institute (PSTI)
- Langley Aerospace Research Summer Scholars (LARSS) Program
- NASA Faculty Fellowship Program (NFFP)
- Distance-Learning Recruitment Activities

The LaRC Office of Education (OEd) made a concerted effort to increase minority participation in all of its programs. Listed below are additional activities that widely increased their outreach to HBCUs.

- OEd staff participated and exhibited at the National Society for Black Engineers (NSBE) annual conference held in March 2002.
- 7th Annual NASA/NSU Pre-Service Teacher Conference, February 14-16, 2002, in Alexandria, Virginia.
- OEd representatives attended the 18th Annual Cooperating Hampton Roads Organizations for Minorities in Engineering (CHROME) Star Awards presentation in December 2001. Over 125 CHROME clubs attended with approximately 3,100 students participating from the Hampton Roads, Virginia, area.
- HBCU recruitment activities at Florida A&M University, Bethune-Cookman College, Prairie View A&M University, Tennessee State University, Clark Atlanta University, Morehouse College, Spelman College, and North Carolina A&T State University.
- OEd staff participated and exhibited at the New York City Louis Stokes Alliance Career Fair held April 17-20, 2002.
- OEd staff participated and exhibited at the Congressional Black Caucus, held September 13-14, 2002, in Washington, DC.
- Norfolk State Cluster Meetings, spring and fall 2002, that consisted of 2 career days, were represented by the OEd.

## **Marshall Space Flight Center (MSFC)**

MSFC continued to foster strong relationships with local and national HBCUs. The Center's commitment to minority universities is demonstrated in the ability to communicate NASA's and MSFC's strategy and vision for a strong and proactive education program. In FY 2002, significant strides were made in the development of faculty and students in research, development, and other academic fields.

Recognizing the importance of these programs and the development of expertise with faculty and students in STEM fields, programs such as FAR were significant in developing capabilities in support of MSFC's short- and long-term mission objectives. The NASA Administrator's Fellowship Program (NAFP), FAR, Institutional Research Awards, and other NASA HBCU initiatives were connected to create a strong network of faculty and student expertise. MSFC was then permitted to use these programs as a resource to assist NASA in technological breakthroughs as well as establishing positive relationships with HBCUs.

During FY 2002, MSFC funded projects in four of the 11 budget categories at different HBCUs in the region. These programs impact students and faculty at six HBCU institutions and include the following:

- Unsolicited proposal to an NAFP fellow from Tuskegee University to support research in propulsion technology.
- Collaborative research effort between Oakwood College and Alabama A&M University in the evaluation of current numerical techniques on computational magnetogasdynamics.
- Sponsored 48 students from HBCUs for a 10-week intern program by developing skills in research and development which continues to strengthen capabilities and expand the pool of candidates for employment with NASA.
- Continuation of the Minorities In Science and Engineering (MISE) at Oakwood College, one of MSFC's local premier intern programs. This program brings in students from three local universities—Alabama A&M University, the University of Alabama, and Oakwood College.
- Collaborated with Lawson State Community College to increase education opportunities and promote professional career goals in underrepresented minorities.

## **Stennis Space Center (SSC)**

HBCU faculty who participated in the NASA Faculty Fellowship Program (NFFP) at SSC have been quite successful in obtaining NASA grants based on the training and experiences gained during their tenure in the NFFP at SSC. SSC has continued working relationships with the NFFP participants at Jackson State University, Southern University, Mississippi Delta Community College, and Mississippi Valley State University.

SSC has had excellent participation from HBCU faculty as NFFP Faculty Fellows over the years. In FY 2002, 50 percent of the SSC NFFP Faculty Fellows were from HBCUs. An additional 14 percent of the SSC NFFP Faculty Fellows were from OMUs, giving SSC an excellent record of 64 percent for MI involvement in the NFFP Agencywide.

The Mississippi Space Commerce Initiative (MSCI) funding vehicle generally provided for infrastructure development, enhancement, and research in geospatial sciences at all of the public institutions of higher education in the State of Mississippi. There are ongoing efforts between SSC and MSCI. In FY 2002, MSCI provided multiyear ArcView GIS software site licenses, funded from NASA, to all the public HBCUs in the State.

Over several years, the 11 budget categories have been utilized to fund HBCUs, however, for FY 2002 no direct funding was granted. SSC's actions are in support of existing projects at HBCUs focusing on the continuation of previous activities. In one exception, SSC engaged three Third-Party Awards with consortiums that are involved with six HBCUs. The consortiums include Mississippi Research Consortium, Louisiana Research Consortium, and Mississippi Space Commerce Initiative. The institutions include Jackson State University, Southern University, Mississippi Delta Community College, Alcorn State University, Coahoma Community College, and Mississippi Valley State University. These projects received \$401,845 in funding in FY 2002.

## **Office of Space Science (OSS)**

OSS support of HBCUs in FY 2002 was dominated by the award of lead responsibility for a flight project to Hampton University under the Small Explorer (SMEX) Program, and by the continuation of space science capability development grants to six HBCUs under the Minority University Education and Research Partnership Initiative in Space Science.

### **Research and Development**

OSS regularly offers universities, laboratories, and other domestic institutions opportunities to openly compete for awards to conduct space science missions or research projects. As a result of such a competition, Hampton University became the first HBCU ever to be awarded lead responsibility for an entire space flight mission. Their Aeronomy of Ice in the Mesosphere (AIM) mission, selected in FY 2002 for flight under the Small Explorer (SMEX) program, will have a total award value of \$93 million over seven years (FY 2001-2007).

### **Training**

The **Minority University Education and Research Partnership Initiative in Space Science** offers minority universities an opportunity to develop academic programs and/or faculty and student capabilities in space science through close partnerships with major space science research groups. The capabilities developed under this initiative may include research, undergraduate or graduate courses or degree programs, precollege or public outreach programs, and/or teacher training in space science.

In FY 2002, six HBCUs first funded in FY 2001 under this initiative continued to make tremendous progress. By the close of FY 2002, they collectively reported being engaged in research collaborations with eight NASA space science missions or suborbital projects and in 16 working partnerships with major space science research groups. In academic programs, the six HBCUs collectively reported having established on their campuses nine new or redirected space science faculty positions, two new space science degree programs, and 16 new or revised space science courses. The six HBCUs also engaged in a wide variety of teacher training, precollege outreach, and public outreach programs serving constituencies in their local communities.

In FY 2002, the budget awarded \$1,349,996 and of that amount \$1,263,085 (93 percent) was obligated.

## **Office of Biological and Physical Research (OBPR)**

OBPR continues to move forward in its commitment to increase its support of minority universities and minority students by broadening their participation in the OBPR research programs and its overall mission.

OBPR, in collaboration with NASA's Office of Education, supports awards to HBCUs that enhance research and academic infrastructures and expand faculty and student involvement in NASA research and the education community. These awards include teacher and student preparation programs, and undergraduate and graduate student support, all of which focus on OBPR-related disciplines.

Specific examples of OBPR support to minority universities include the Spaceflight and Life Sciences Training Program (SLSTP). Tuskegee University, partnering with the New Jersey-NASA Specialized Center of Research and Training (NJ-NSCORT) and Dine College, performs the administrative duties of the program. The principal purpose of the program is to use the exciting and unique resources of KSC to expose bright, diverse undergraduate students to the possible career paths available in NASA's Life Sciences and Engineering disciplines.

Morehouse College is a member of the National Space Biomedical Research Institute (NSBRI), which receives funding from the Bioastronautics Division. Through its Education and Public Outreach Program, NSBRI supports four ongoing projects that target development of a pipeline of minority group science students.

In conjunction with NSCORT, OBPR supports ongoing research projects related to the biological sciences. These projects are led by PIs at Tuskegee University and Texas A&M University.

OBPR's Educational and Public Outreach program has ranked the increased 'reach' to nontraditional and minority populations as a top priority. OBPR has carried out this goal through aggressive recruitment, presence at conferences, sharing NASA information, training opportunities, and financial support through grants and fellowships.

### **Office of Small and Disadvantaged Business Utilization (OSDBU)**

The Federal Acquisition Regulation authorizes NASA to recognize HBCUs and OMUs as Small Disadvantaged Businesses (SDB). Public Law 101-144 requires the NASA Administrator to ensure that at least 8 percent of prime and subcontract dollars be allocated to business opportunities with SDBs. To that end, OSDBU has developed a series of initiatives focused on increasing NASA's participation level of HBCUs and OMUs in the Agency's contracting opportunities. Listed below are examples of activities to reach out to HBCUs under these initiatives:

- Membership on NASA's Minority Business Resource Advisory Committee.
- Presenting University Capabilities at NASA Aeronautics and Science Forums.
- TADSBAT (Training and Development of Small Business in Advanced Technologies) training classes hosted at HBCUs.
- Developed directory of HBCU/MI capabilities.
- Participants in Cooperative Agreement of International Space Station program performing Software Engineering Initiative.
- Participants in NASA Mentor-Protégé program.
- Participants in Cooperative agreement on Integrated Facility Solutions and Management Options for NASA facilities.
- NASA's University Research Centers (URC) presented their capabilities at NASA's Prime Contractor's Roundtable.
- URCs exhibited their technologies at NASA's national conferences.
- Partnership to develop a modeling management concept for HBCU/MI activities.