

**NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION**

**FISCAL YEAR 1997 ANNUAL PERFORMANCE REPORT TO
THE WHITE HOUSE INITIATIVE OFFICE ON
HISTORICALLY BLACK COLLEGES AND UNIVERSITIES**

**Office of Equal Opportunity Programs
April 1998**

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

**FISCAL YEAR 1997 ANNUAL PERFORMANCE REPORT
TO THE WHITE HOUSE INITIATIVE OFFICE ON
HISTORICALLY BLACK COLLEGES AND UNIVERSITIES (HBCU)**

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EXECUTIVE SUMMARY

Historically Black Colleges and Universities (HBCU) continue to be a vital part of NASA's commitment to excellence in research and development and education. The NASA Administrator has reasserted the Agency's resolve for equal opportunity and diversity by noting, "The quality of our workforce has always been the Agency's greatest asset. This quality can be further enhanced by creating a NASA that is fully reflective of our Nation's multicultural and talented population."

NASA established four measurable objectives to be accomplished during Fiscal Year (FY) 1997 and FY 1998. These objectives included establishing additional partnerships, increasing selections based on peer evaluation and merit review, increasing the number of HBCU students conducting research, and doubling the number of competitively selected Precollege Awards for Excellence in Mathematics, Science, Engineering and Technology to HBCU's. In FY 1997, we have accomplished the first two objectives and are making substantial progress towards achieving the next two objectives.

NASA's investment in HBCU's grew from our planned investment of \$52 million in FY 1997, to an actual investment of \$61 million. The \$61 million represents an increase of 17 percent over the Agency's expected FY 1997 investment. The significant increase resulted principally from NASA's honoring all of its commitments to late FY 1996 commitments that were not obligated until FY 1997. This investment enabled the Agency to continue to expand its efforts to focus new research and education opportunities for HBCU's toward competitive solicitations and selections based on peer review. Some of the results from these competitive peer reviews and merit selections include: 1) a continuation of 11 HBCU Research Centers; 2) the expansion of the Institutional Research Awards for Network Resource Training Sites to include five HBCU's; 3) the continuation of the second phase of the two Model Institutions of Excellence (MIE) in collaboration with the National Science Foundation (NSF); 4) the initiation of institutional-based graduate researchers awards; and 5) the award of new teacher preparation and precollege mathematics and science grants.

The Agency's successful progress in exceeding its FY 1997 HBCU Plan can be directly attributable to the involvement and commitment of NASA managers agencywide. NASA managers contributed to the development of Announcements of Opportunity (AO) and helped to launch other funding initiatives. Additionally, once the awards were made, they conducted technical assistance visits to HBCU campuses.

We are looking forward to building on these partnerships to achieve measurable results in support of Executive Order 12876, "Historically Black Colleges and Universities" and to contributing to the technological leadership and competitiveness of HBCU's, NASA, and the Nation.

PART I-A: SUMMARY OF AGENCY AWARDS TO HBCU'S BY CATEGORY: FY 1997

1. Agency: National Aeronautics and Space Administration
2. Agency Representative: George E. Reese _____
Associate Administrator for Equal Opportunity Programs (Signature)
3. Total Universe of Funds for Institutions of Higher Education (IHE) \$811,551,487

DISCRETIONARY AWARDS (dollars in thousands)

CATEGORY	AWARDS TO IHE's+	AWARDS TO HBCU's*	AWARDS TO HBCU's AS % of TOTAL AWARDS TO IHE's
1. Research & Development	\$718,922	\$38,149	5.3%
2. Program Evaluation			
3. Training	\$41,296	\$16,738	40.6%
4. Facilities and Equipment	\$719		
5. Fellowships, Internships, Traineeships, Recruitment, & Arrangements under IPA's	\$10,765	\$2,073	19.3%
6. Student Tuition Assistance, Scholarships, and Other Aid	\$3,915	\$1,903	48.6%
7. Direct Institutional Subsidies			
8. Third-Party Awards		\$1,053	
9. Private-Sector Involvement		\$876	
10. Administrative Infrastructure			
11. Other	\$35,682	\$606	1.7%
TOTAL	\$811,552	\$61,399	7.6%

Daniel S. Goldin
Administrator

(Signature)

+ IHE=Institutions of Higher Education
* HBCU's=Historically Black Colleges and Universities

**PART I-B: TOTAL FY 1997 AWARDS TO HISTORICALLY BLACK COLLEGES
AND UNIVERSITIES**

	Institutions of Higher Education	Historically Black Colleges And Universities
DISCRETIONARY AWARDS:	\$811,551,487	\$61,398,687
LEGISLATED AWARDS:	\$0	\$0
TOTAL AWARD:	\$811,551,487	\$61,398,687

PART 1-C FY 1997 SUMMARY OF AGENCY AWARDS TO HBCUS BY INSTITUTION

	R & D	PE	TRAINING	F & E	FELLOWS	SFA	DIS	TPA	PSI	AI	OTHER	TOTALS
HAMPTON UNIVERSITY	\$4,017,331		\$1,065,590		\$20,265	\$690,100						\$5,793,286
NORFOLK STATE UNIVERSITY	\$323,909		\$532,259		\$22,000	\$19,650						\$897,818
SAINT PAUL'S COLLEGE												
VIRGINIA STATE UNIVERSITY												
VIRGINIA UNION UNIVERSITY												
WEST VIRGINIA												
BLUEFIELD STATE COLLEGE												
WEST VIRGINIA STATE UNIVERSITY					\$5,000							\$5,000
U.S. VIRGIN ISLANDS												
UNIVERSITY OF THE VIRGIN ISLANDS												
OTHER HBCU AWARDS											\$606,067	\$606,067
ALLIED TECHNOLOGY GROUP, INC.									\$876,267			\$876,267
ASEE								\$50,000				
GEM								\$300,000				\$300,000
NAFEO								\$703,291				\$703,291
GRAND TOTAL	\$38,149,388		\$16,737,486		\$2,073,115	\$1,903,073		\$1,053,291	\$876,267		\$606,067	\$61,398,687

PART 1-C: FY 1997 SUMMARY OF AWARDS TO HBCU'S BY NASA HEADQUARTERS PROGRAM OFFICE, CENTERS, AND JET PROPULSION LABORATORY

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	R&D	PE	TRAINING	F&E	FELLOWS	SFA	DIS	TPA	PSI	AI	OTHER	TOTALS
AERONAUTICS AND SPACE TRANSPORTATION TECHNOLOGY	\$2,908,575		\$1,100,470									\$4,009,045
Ames Research Center	\$2,226,744				\$323,500						\$41,259	\$2,591,503
Dryden Flight Research Center	\$647,907										\$2,095	\$650,002
Langley Research Center	\$3,127,068					\$690,100						\$3,817,168
Lewis Research Center	\$4,561,218				\$27,000							\$4,588,218
EQUAL OPPORTUNITY PROGRAMS	\$7,563,324		\$12,769,038					\$1,053,291	\$876,267			\$22,261,920
HUMAN RESOURCES AND EDUCATION					\$1,271,881	\$1,006,663						\$2,278,544
LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS	\$650,000											\$650,000
EARTH SCIENCE	\$2,700,000		\$438,944									\$3,138,944
SAFETY AND MISSION ASSURANCE	\$400,000											\$400,000
Goddard Space Flight Center	\$1,691,494				\$450,734	\$206,310					\$53,737	\$2,402,275
SPACE FLIGHT	\$520,000		\$2,329,034								\$450,000	\$3,299,034
Johnson Space Center	\$2,060,598										\$26,475	\$2,087,073
Kennedy Space Center	\$1,544,166										\$7,687	\$1,551,853
Marshall Space Flight Center	\$2,485,515										\$6,212	\$2,491,727
Stennis Space Center	\$1,438,380											\$1,438,380
SPACE SCIENCE	\$2,899,194		\$100,000									\$2,999,194
Jet Propulsion Laboratory	\$725,205										\$18,602	\$743,807
TOTAL	\$38,149,388		\$16,737,486		\$2,073,115	\$1,903,073		\$1,053,291	\$876,267		\$606,067	\$61,398,687

PART II - AWARDS AND NARRATIVE INFORMATION

Acronyms

Headquarters (HQ)

Office of Equal Opportunity Programs (OEOP)
Office of Aeronautics and Space Transportation Technology (OASTT)
Office of Human Resources and Education (OHRE)
Office of Life and Microgravity Sciences and Applications (OLMSA)
Office of Space Science (OSS)
Office of Earth Science (OES)
Office of Safety and Mission Assurance (OSMA)

Ames Research Center (ARC) - Moffett Field, CA

Dryden Flight Research Center (DFRC) - Edwards, CA

Goddard Space Flight Center (GSFC) - Greenbelt, MD

Jet Propulsion Laboratory (JPL) - Pasadena, CA

Johnson Space Center (JSC) - Houston, TX

Kennedy Space Center (KSC) - Kennedy Space Center, FL

Langley Research Center (LaRC) - Hampton, VA

Lewis Research Center (LeRC) - Cleveland, OH

Marshall Space Flight Center (MSFC) - Marshall Space Flight Center, AL

Stennis Space Center (SSC) - Stennis Space Center, MS

American Society for Engineering Education (ASEE)

Faculty Awards for Research (FAR)

Graduate Degrees for Minorities in Engineering and Science (GEM)

Institutional Research Awards (IRA)

Mathematics, Science, and Technology Awards for Teacher and Curriculum
Enhancement Program (MASTAP)

Minority University Research And Education Programs (MUREP)

National Association for Equal Opportunity in Higher Education (NAFEO)

Precollege Awards for Excellence (PACE)

Technical Review Committee (TRC)

University Research Centers (URC)

PART II - AWARDS AND NARRATIVE INFORMATION

Research and Development

<u>HBCU/ACTIVITY</u>	<u>CENTER</u>	<u>AWARD</u>
ALABAMA		
<u>Alabama A&M University</u> Iron-Ion Induced Low Dose Mutagenesis	ARC	\$119,961
Adaptation of Leaf Spectroreflectometry & Neural Network Image Analysis Approaches	ARC	\$129,976
Signal Processing Algorithm Sensor	DFRC	\$29,932
Sensing Integrated Optics in Thin Films of Polymers and Organic Materials	HQ	\$1,322,050
Integrated Optics in Thin Films of Polymers & Organic Materials	LeRC	\$33,600
Optical Sensors Based on Single Arm Thin Film Wave Guide Interferometer	LeRC	\$76,000
Development of Stable Elevated Temperature Silicon Carbide Sensors	LeRC	\$125,000
Optical Sensors	MSFC	\$153,224
R/S "An Unconventional Three-Dimensional Computation of Transitional Aerodynamics For RLV"	MSFC	\$178,374
R/S "Curriculum Adjustments in Mathematics for Science & Engineering Programs"	MSFC	\$189,432
Effect of Dopants on the Growth & Properties of Mixed Organic Crystals for Nonlinear Optical Applications	MSFC	\$99,822

R/S “An Innovative Approach for Vortex Tube Analysis and Application in Film Cooling	MSFC	\$100,000
R/S “Bulk and Thin Film Organic Non-linear Optical Crystals for Devices and Microgravity Processing”	MSFC	\$100,000
Center for Hydrology, Soil Climatology, and and Remote Sensing	HQ/OES HQ/OEOP	\$1,400,000 \$125,000
<u>Tuskegee University</u>		
Team Training and Retention of Skills Acquired in Above Real Time on a Flight Simulator	DFRC	\$37,246
Center for Food and Environmental Systems for the Human Exploration of Space	HQ/OLMSA HQ/OEOP	\$350,000 \$650,000
Biotransformation Model Mixture Hydrogen Fuels	KSC	\$103,647
Fracture Morphology of Selective Polymer Systems Under Monotonic & Fatigue Loading	KSC	\$96,164
Sweetpotato Stem Cutting Database	KSC	\$157,346
Identification of Surface and Near Surface Defects	LaRC	\$94,309
Characterization of Flow Behind the Fan of a Turbo Fan Engine	LeRC	\$82,624
Sputtering Erosion in the Ion Thruster	LeRC	\$29,984
Development of Computer Model of the TVC Electro-Mechanical Actuator System	MSFC	\$98,957
R/S Atomization in Impinging Jet Injectors Of Liquid Propellant Rocket Engines	MSFC	\$80,220

A Study of Fluid Mechanics of Reaching Flows in Selected Aerospace Propulsion Devices	SSC	\$253,022
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DISTRICT OF COLUMBIA

Howard University

The Development of a New Generation Trapped Radiation Database	GSFC	\$213,000
Research in Software Reuse and Cost Modeling	GSFC	\$11,235
The Development of a New Generation Trapped Radiation Database	GSFC	\$95,299
Center for the Study of Terrestrial and Extraterrestrial Atmospheres (CSTEA)	HQ/OES HQ/OSS	\$500,000 \$499,194
A Change Management Intervention in the MU-SPIN Program	GSFC	\$55,000
CSTEA HBCU Academic Research Consortium (CHARC)	GSFC	\$1,100,000
Laboratory Studies of the Photochemistry of Titan's Atmosphere	GSFC	\$45,000
Julian Oscillation within an Aquaplanet	GSFC	\$22,000
Model Characterization Research & Development Grant	HQ	\$11,000
Caffeine Metabolism: The Pharmacokinetics of Space Flight	JSC	\$195,330
Experimental Evaluation of Motor Drive Technologies for Future Aerospace Applications	LeRC	\$159,549
Growth & Realization of Devices in Large Area Cubic SiC	LeRC	\$101,854

Experimental Implementation of High Performance AC Drives	LeRC	\$70,000
Aerospace Power System Automation	LeRC	\$100,000
Advanced Intelligent System Application to Load Forecasting and Control for Hybrid Electric Bus	LeRC	\$94,500
Determination of Thermal State of Change in Solar Heat Receivers	LeRC	\$100,000
Free Radical Spectroscopy and Kinetics in Microgravity Combustion	LeRC	\$80,158
<u>University of the District of Columbia</u> Partnership Award with Minority Universities and Colleges	GSFC	\$200,000
FLORIDA		
<u>Bethune-Cookman College</u>		
Operation of the Center for Space Education	KSC	\$328,175
<u>Florida A&M University</u>		
Turbulent Measures in Supersonic Flow	ARC	\$80,000
Integrated Design Systems Technology	ARC	\$299,502
Development of a Transdermal Delivery Device For M Elatonin in VIVO	ARC	\$97,994
A Cooperative Research Program in Aeronautical Information Science Technologies	ARC	\$238,811
Multilayer Thin Film Capacitors for High Performance Applications	JPL	\$105,184
Control and Calibration of ARID	KSC	\$71,490
Shock Wave Dynamics in Weakly Ionized Plasmas	LaRC	\$30,000

Center for Nonlinear and Nonequilibrium Aerosciences (CeNNAs)	HQ/OASTT	\$541,000 \$299,000
Analysis of Direct Cast Titanium and Texture	LaRC	\$98,494
Flight Effects on Forward Radiated HSCT Fan Noise	LeRC	\$79,906
Distance Learning in the Sciences	LeRC	\$60,000
Remote Sensing Land-Use Classification and Enhancement of Agricultural Production in South Africa	SSC	\$149,545
Labile and Stable Soil Organic Carbon Pools Revealed by C-14 and C-13 Signatures	SSC	\$96,566

GEORGIA

Clark Atlanta University

Chemically Derived Dense Alumina-Zirconia Composites for Improved Mechanical and Wear Erosion Properties	DFRC	\$75,000
Accuracy of Earth Observing System of Middle Atmosphere Dynamics	GSFC	\$100,000
Cross Sections for Electron Impact Excitation of Planetary Atmospheres	GSFC	\$60,000
Real-time Prototyping Project	JPL	\$222,500
Bioconversion of Waste to Nutritional Protein	KSC	\$98,349
Computational Materials Research	LaRC	\$13,591
Blended-Wing-Body Structural Technology Study	LaRC	\$15,000
Construction of Finite Difference Schemes Having Special Properties	LaRC	\$73,312

Study of Long-Term Durability of Polymer Matrix Composites	LeRC	\$60,000
Research Facility to Study Flows through Annular Diffusers	LeRC	\$57,000
The Construction of Finite Difference Schemes Having Special Properties	LeRC	\$110,138
NRA-95-1-LeRC Modeling and Testing Of Hybrid Titanium Composites for High Temperature Applications	LeRC	\$54,796
High Performance Polymers and Composites	HQ/OASTT	\$850,000
Study of Long-Term Durability of Polymer Matrix Composites for High Temperature Applications	LeRC	\$59,999
Turbulent Premixed Methane Air Combustion: Emissions, characteristics and Modeling	LeRC	\$75,000
Research Entitled: “Experimental and Numerical Studies of Combustion Instabilities”	MSFC	\$99,931
<u>Morehouse College</u> Simulated Microgravity	JSC	\$100,000
<u>Morehouse School of Medicine</u> The Neurolab Education Program in the Decade of the Brain	ARC	\$498,740
Gravity Induced Changes on the Steroidogenesis by Lateral Cells of the Pregnant Rat	JSC	\$99,966
Effects of Microgravity on the Disposition and Biotransformation of the Therapeutic Agents	JSC	\$200,000
Assessing the Putative Mechanisms of Gravity Induced Cellular Changes	JSC	\$70,912

<u>Spelman College</u>		
Development of Synchronously Scanned OPO Cars as New Probe for Hostile Environment	LeRC	\$49,558
Integrated Approach to the Prediction of Hyper-polarization of Organic Crystals	MSFC	\$144,833
Potential Use of Halogenated Tetraphenylporphyrins in Nonlinear Optical Materials	MSFC	\$98,979
LOUISIANA		
<u>Grambling State University</u>		
Polymerizable Monomer Reactants-modified Polymides	LeRC	\$100,000
R/S "NLO Polymers that have Enhanced Thermal Stability and Low Alignment Decay	MSFC	\$99,960
<u>Southern University - A&M College</u>		
QFT Design Framework for Rotocraft Control	ARC	\$99,988
Learning & Generalization Using Neural Networks with Applications to On-Line F-16 Reference Model	ARC	\$24,999
Air Traffic Control Using Neural Networks	ARC	\$102,000
A Proposal to Develop Interactive Classification Technology	ARC	\$75,973
The Advanced Thin Ionization Calorimeter Arctic Balloon Experiment	GSFC	\$135,000
Effects of Aerosol and Clouds Interactions on UV, PAR, & Crop Yields	GSFC	\$99,977
Research & Education Experiences for Minority Undergraduates in Composite Material	KSC	\$200,000

Fractographic Studies and Analyses in Data Base Documentation and Development	KSC	\$75,000
Development and Utilization of a Multipurpose Atmospheric Corrosion Sensor	KSC	\$96,995
Knowledge Preservation for Design of Rocket Systems	LeRC	\$100,000
Inlet Distribution and Surge/Stall Instability in Axial Compression Systems	LeRC	\$27,081
Development of Integrated Methodology for Engine Component Design and Optimization”	LeRC	\$120,000
Research “Composite Truss Design Optimization”	MSFC	\$167,633
<u>Southern University – New Orleans</u> NASA/UNO Partnership for Excellence in Math and Science Education	SSC	\$194,105
MARYLAND		
<u>Bowie State University</u> Model Based VQ for Multispectral Earth Image Data Compression	GSFC	\$50,000
Automation of Scheduling of Orbit Determination Programs	GSFC	\$41,997
Bowie State’s Satellite Operation and Control Center	GSFC	\$200,000
<u>Morgan State University</u> Forging a Partnership: A 21 st Century Approach To the Investigation of Scientific & Technological Phenomena	GSFC	\$850,274
Modeling and Charge Point Detection	GSFC	\$30,000
Morgan Network Resource Training Site	GSFC	\$600,000

Laboratory Study of the Behavior of Saturated Sedimentary Material	GSFC	\$181,372
The Magnetic, Transport and Structural Properties of Pulsed Laser Deposited Magnetic Oxide Films	GSFC	\$109,588

MISSISSIPPI

<u>Jackson State University</u> Boundary Layer Processes Affecting Tropical Cyclone Intensity Changes	GSFC	\$100,000
A Prototype Object-Oriented GIS	JPL	\$94,500
System Definition and Object-Oriented Programming for a Rocket Engine Numerical Simulation	LeRC	\$104,279
JSU-NASA Partnership for Research and Educational Programs	SSC	\$180,000
<u>Mississippi Valley State University</u> Incorporating Information Technology to Enterprise Zones and Empowerment Communities	SSC	\$189,664

NORTH CAROLINA

<u>Johnson C. Smith University</u> Conservation/Solution Method (STE) For Linear Potential Flow Problems	LeRC	\$99,936
<u>North Carolina A&T State University</u> Motion Planning in a Society of Intelligent Mobile Agents	ARC	\$132,268
Performance Modeling of a Pilot in a Free-Flight Mode	ARC	\$77,000

Artificial Potential Field Based Motion Planning/Navigation in a 2 & 3 Dimensional Dynamic Environment	DFRC	\$176,908
Hybrid Motion Planning with Multiple Destinations	DFRC	\$91,002
Multidisciplinary Modeling & Simulation Of Aerospace Vehicle Systems	DFRC	\$87,860
On the Previewed Control Action for Aircraft Flying Qualities	DFRC	\$50,000
Formal Foundations of Agents	GSFC	\$99,688
Center for Aerospace Research	HQ/OASTT	\$518,575
High Tc Bolometer Development	JPL	\$81,450
Fault-Tolerant and Self-Checking Logic System	JPL	\$106,271
Intelligent Agent Based Scheduling	JSC	\$70,035
Cleaning of Contaminated Substrates	KSC	\$186,400
Three-Dimensional Geometric Nonlinear Contact Stress Analysis of a Two-Rivet Lap Joint	LaRC	\$43,000
Experimental, Developmental and Basic and Applied Research	LaRC	\$401,500
Approaches to Design and Evaluation of Sandwich Composites	LaRC	\$40,000
The Center for Aerospace Research	HQ/OASTT	\$700,000
Polyimides Resin Infiltration Composites	LaRC	\$100,000
Aerothermo Structural Analysis of Low Cost Composite Nozzel/Inlet Components	LeRC	\$238,883

Computational Assessment of Fan By-Pass System Design in Advanced Duct Propulsors	LeRC	\$56,709
New Mechanistic Constitutive Model for High Temperature CMCS Under Monotonic Cyclic Loading	LeRC	\$60,000
Feasibility Investigation on the Development of a Structural Damage Diagnostic & Monitoring	LeRC	\$25,000
Robust, Brillouin Active Embedded Fiber-is-the Sensor System in Smart Composite	LeRC	\$23,744
R/S “Solution Polymerization of Thermosets in 1-G and Microgravity Environment”	MSFC	\$97,698
Development and Testing of a Vibrometry Technique for Health Monitoring	MSFC	\$98,039
<u>Winston-Salem State University</u> Parallel Object-Oriented Programming in Network Environment	LeRC	\$46,572

OHIO

<u>Central State University</u> Development of Searchable Database on General Aviation Propulsion	LeRC	\$149,957
<u>Wilberforce University</u> Wilberforce Power Technology in Education Program	LeRC	\$100,000

PENNSYLVANIA

<u>Lincoln University</u> Exploring the Challenge of Integrating Technology and Education	SSC	\$117,994
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SOUTH CAROLINA

<u>South Carolina State University</u> Center for Network Resources and Training at South Carolina State University	GSFC	\$650,000
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<u>Voorhees College</u> Graphic Information Center	LaRC	\$180,000
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TENNESSEE

<u>Fisk University</u> X-Ray/Gamma-Ray Remote Sensing	GSFC	\$10,000
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Consortium for Advancing Renewable Energy Technology (CARET)	LeRC	\$503,822
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Interfacial Physics of Metal/SiC	LeRC	\$175,000
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Telemedicine and Rapid Identification of Microorganism	MSFC	\$189,079
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Novel Method of Evaluation of Uniformity And Structural Homogeneity of Ternary Wide Gap Semiconductors	MSFC	\$200,000
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Center for Photonic Materials and Devices	HQ/OSS HQ/OLMSA	\$700,000 \$300,000
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<u>Meharry Medical College</u> Summer Research Program	JSC	\$83,453
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<u>Tennessee State University</u> The Associate Principal Astronomer for AI Management of Automatic Telescopes	ARC	\$120,000
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Center for Automated Space Science	HQ/OSS	\$1,500,000
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NASA/TSU Network Resource & Training Site	GSFC	\$600,000
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New Automated Web-Based Tracking System	KSC	\$130,600
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Melting of Solid Particles in a Fluid Under Microgravity	LeRC	\$149,960
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Research Project to Increase Pool of Minority Engineers	LeRC	\$68,659
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TEXAS

Prairie View A&M University

Study of Radiation Effects on Infrared Detectors & Materials for Space-Based Astronomy Applications	ARC	\$129,532
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Study of Radiation Effects on Electronics at High Atmospheric Altitudes	DFRC	\$25,000
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Study of Radiation Effects on Electrical Devices at High Atmosphere Altitudes	GSFC	\$33,941
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The Plasma Configuration Of Neptune's Magnetosphere	GSFC	\$100,000
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Network Resources Training Site	GSFC	\$1,200,000
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Center for Applied Radiation Research	HQ/OSF	\$520,000
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Studies on the Neptunian and Uranian Magnetospheres	JPL	\$115,300
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Orbital Debris Research	JSC	\$170,000
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Flow Boiling Enhancement for Thermal Management System	JSC	\$25,000
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Software Engineering Initiative	JSC	\$223,984
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Bone Conduction Headset Development	JSC	\$96,918
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Radiation Effects on DC-DC Convertors	LeRC	\$193,888
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Research to Significantly Enhance Composites Survivability at 550 Degrees in Oxidative Environment	LeRC	\$100,000
Low Cost Wide Bandwidth and High Gain Microstrip Antenna Array for Satellite and Personal Communications	LeRC	\$21,000
R/S #RF97-00112 “Combustion CFD Technology Study for Advanced Airbreathing Propulsion Systems”	MSFC	\$100,000
Establishment of Solar Observatory	MSFC	\$89,334
Image Analysis	SSC	\$119,524
<u>Texas Southern University</u>		
Environmental Science	JSC	\$150,000
Enhance Capability of Environmental Sensing Research	JSC	\$150,000
Soluble Silicon	JSC	\$50,000
High Energy Cells Research	JSC	\$200,000
Microgravity and Sickle Cell Anemia	JSC	\$175,000
VIRGINIA		
<u>Hampton University</u>		
Development of an Ultrasonic and Fabry-Perot Interferometer System for Nondestructive Inspection of Aging Aircraft Studies	DFRC	\$74,959
Advanced Undergraduate Research Using Optical Radiation in the Atmosphere (AURUORA)	GSFC	\$74,988
Investigations of Tropical Atmosphere Radiative Energy Balance Using CERS and TRMM Data	LaRC	\$90,000

Hampton University Aerospace Science Center	LaRC	\$400,000
Research in Fluid Mechanics	LaRC	\$100,000
Electrorheological Fluids – Aerospace Applications NLPN 95-104	LaRC	\$49,999
Stratospheric Aerosol and Gas Experimenting (SAGE III) Program	LaRC	\$45,000
Research Center for Optical Physics	HQ/OES HQ/OSS	\$800,000 \$200,000
Research in Airway Science, Architecture and Physics	LaRC	\$363,519
Development of Laser Materials for Lidar Systems	LaRC	\$165,001
Radiation Transport and Shielding for Space Exploration and High-Speed Flight Transportation	LaRC	\$80,000
Advanced Electromagnetic Interference and Radiation Research	LaRC	\$104,087
Interpretation of Lidar and Satellite Data Sets Using a Global Photochemical Model	LaRC	\$79,363
Aerospace Applications	LaRC	\$74,998
Mixing Noise and Thrust Benefits Using Corrugated Designs	LaRC	\$180,000
Concepts for Atmospheric Science Education (CASE)	LaRC	\$180,395
Metal Polymer Composite Surfaces and Inter-Phases	LaRC	\$100,000
Lidar Instrument for Tropospheric Ozone	LaRC	\$180,000

Distributed Bragg Region Sensors with Aerospace Applications	LeRC	\$75,000
Parallelization of Rocket Engine Simulator Software	LeRC	\$97,870
Optical Strain Gauges for Plume Impingement Studies	LeRC	\$199,191
New Hardware for Laser & Surface Light Scattering Supplemental Fiber Optic Devices	LeRC	\$25,000
High Temperature Fiber Optic Sensor System for Plume Impingement Studies	LeRC	\$40,001
Fiber Optic Sensor Component and SYS for Smart Materials & Structures	MSFC	\$100,000
Information Content Improvement By Hyper Spectral Imager	SSC	\$137,960
<u>Norfolk State University</u>		
Research Experience in Earth Systems Science	GSFC	\$78,409
Development of Laboratory Experiments For Engineering Materials, Science, & Technology	LaRC	\$41,000
Characterization of Materials	LaRC	\$204,500
Research and Development Total		\$38,149,388

NARRATIVE

NASA contributes to the creation of new scientific knowledge by exploring the solar system and the universe beyond and by studying the space environment and its effects on biological and physical processes. It is our aim to better understand who we are, how we got here, and where we are going. Through research and development, we maintain scientific leadership, excite and inspire our society, strengthen education and scientific literacy, develop and transfer technologies to promote U.S. competitiveness, foster international cooperation to enhance programs and share

their benefits, and set the stage for future space ventures. The Agency's Strategic Plan has organized its programs into the following four Strategic Enterprises: Earth Science; Space Science; Human Exploration and Development of Space; and Aeronautics and Space Transportation Technology. Approximately 30 HBCU's support the achievement of the objectives of these Enterprises through research that is conducted by these universities on their campuses throughout the Nation. Participating universities usually conduct research in basic areas applicable to the long-term goals of the various NASA Program Offices.

An important NASA objective is to involve HBCU's in the performance of research projects in collaboration with NASA Headquarters, Field Installations, and JPL. NASA has established many relationships with HBCU's and will continue the following programs:

HBCU RESEARCH CENTERS

The HBCU Research Centers continue to foster new science and technology concepts, expand the Nation's aerospace research and development, develop mechanisms for increased participation by faculty and students in mainstream research, and have developed infrastructures to help increase the production of disadvantaged students with advanced degrees in NASA-related fields. The original seven University Research Centers (URC), which were established in 1991, began the first year of their second 5 years of funding during FY 1996. The decision to extend them for a second 5 years was made after extensive reviews by specially assembled teams of experts, both internal and external to NASA. The four HBCU Research Centers first selected in FY 1995 were continued in FY 1997 for their third year of funding.

Together, the 11 HBCU Research Centers achieved the following outcomes in Academic Year (AY) 1996-97 and Summer 1997 (with changes from the previous year given in parenthesis):

- 205 faculty members, research associates, and post-doctoral researchers conducted NASA- related research at URC's.
- 357 socially and economically disadvantaged (hereafter referred to as disadvantaged) and/or disabled students participated in URC research (2 percent increase).
- 118 degrees were awarded to disadvantaged students, including 67 Bachelor's Degrees, 49 Master's Degrees, and 2 Doctoral Degrees (36 percent increase).
- 296 refereed papers and/or book chapters were published or accepted for publication, including 111 students as authors or co-authors (1 percent increase in publications; 13 percent increase in student authorship).
- 390 technical presentations were given, including 89 by students (4 percent increase in presentations; 19 percent decline in student presentations).

- \$19.0 million was leveraged in new research funds from sources outside the NASA minority university research and education program (does not compare directly to previous data).
- 9 patents were disclosed, applied for, or awarded (80 percent increase).
- 8 commercial products were under development or marketed (14 percent increase).

HBCU RESEARCH CENTER FY 1997 HIGHLIGHTS

Alabama A&M University

Center for Hydrology, Soil Climatology and Remote-Sensing (HSCaRS)

The initial research thrust of HSCaRS is to develop a comprehensive research program investigating hydrologic processes, with emphasis on remote-sensing measurements and modeling of soil moisture. The objectives are threefold: (1) to develop a measurement/modeling strategy from low-resolution microwave data to derive soil moisture profile information and to determine its variability on a range of spatial scales; (2) to develop a precise, inexpensive, in situ technique for measuring soil moisture to facilitate the ground truthing of remotely sensed data and the validation of global and regional climate change models; and (3) to take knowledge from hydrologic modeling, coupled with evolutionary computing techniques, to model and visualize soil moisture, soil erosion, and contaminant transport through soils and within water bodies.

Morehouse School of Medicine

Space Medicine and Life Sciences Research Center (SMLSRC)

NASA's SMLSRC at the Morehouse School of Medicine has two primary goals. The first is to make significant findings in life sciences and biomedical research that are of relevance to the mission of NASA. The second is to increase the number of students and postdoctoral fellows trained in space medicine and life sciences who are embarking on careers in that area.

The SMLSRC is divided into three research teams composed of 11 faculty members: Cardiovascular, Musculoskeletal, and Cell Biology. The teams work on one to three research projects with a central research theme related to NASA interests. The Cardiovascular team examines hemodynamic responses of salt-sensitive rats and humans to simulated microgravity, using hind limb-suspended rats and the head-down bed-rest model for humans. The Musculoskeletal team is determining whether the drug clenbuterol may be used as a countermeasure for the muscle wasting and bone loss that is observed in rats under simulated microgravity conditions. The Cell Biology team examines differentiation, development, and function of vascular, skeletal, and neuronal cells and tissue in a NASA bioreactor, which simulates aspects of a microgravity environment.

Prairie View A&M University

Center for Applied Radiation Research (CARR)

CARR was established in 1995 to address missions and critical technologies of NASA. CARR conducts research in three technical areas: space environmental simulation, radiation effects on electronic and photonic systems, and radiation effects on bio-systems. The Center is unique in that it addresses issues from the microscopic level, truly “systems-level” materials, complex integrated circuit systems, physiological studies at the cellular level, and the human reproductive and immune systems.

Tennessee State University (TSU)

Center for Automated Space Science (CASS)

The objective of CASS is to achieve a broad-based aerospace research capability. The purposes are to foster new science and technology concepts for autonomous space systems, expand the Nation’s research base for aerospace research, increase participation by faculty and students at TSU and its partners at Western Kentucky University and South Carolina State University, and increase the production of disadvantaged students who are U.S. citizens with advanced degrees in NASA-related fields.

Clark Atlanta University

High Performance Polymers and Ceramics Research Center (HIPAC)

HIPAC utilizes a team approach in which interdisciplinary teams of chemists, material scientists, and engineers work together to conduct research in areas spanning the range of synthesis, processing, and characterization of new materials to meet aerospace needs.

During FY 1997, HIPAC has documented accomplishments in the following areas: 1) synthesis, characterization, properties, and processing of polyimides; 2) preparation and characterization of nonlinear optical and photorefractive polymers; 3) Smart Material Systems; and 4) fabrication and mechanical characterization of polymer-based composites.

Florida A&M University

Center for Nonlinear and Nonequilibrium Aeroscience (CeNNA)

Research at CeNNA is focused on plasma drag reduction, jet noise, turbulent-free shear layers, and materials characterizations. The goals of this research are: (1) to develop new physical insights and new methodologies having an impact on current and future aeronautics and space transportation technologies; (2) to provide a broad-based, important, and useful aerospace research capability at Florida A&M; (3) to develop cooperative initiatives between academic and industrial partners in order to support the Center’s NASA-related research focus; and (4) to contribute to the overall quality of NASA research activities through

mutually beneficial interactions with NASA Field Installations and through the identification and training of potential NASA scientists and engineers.

Hampton University

Research Center for Optical Physics (RCOP)

RCOP promotes world-class leadership in selected areas of optical sciences and technologies, and develops under-utilized human resources to meet the Nation's science and engineering manpower needs in the 21st century. The vision of RCOP is to establish Hampton University as a premier institution for optical scientific advancement and education in the Mid-Atlantic United States. There are three areas of research that form the core of RCOP's strategic focus:

- Atmospheric Sciences and Optical Remote-Sensing Technology
- Optical Materials (including laser, nonlinear optical, and smart materials development)
- Non-Intrusive Diagnostics

During the past year, RCOP researchers have developed a variety of new technologies, patented methods of calibration, and have made a number of significant scientific discoveries. The Center has also established numerous research and educational collaborations with private industry, NASA and other Government agencies, and universities and has completed the development of six state-of-the-art research laboratories.

Fisk University

Center for Photonic Materials and Devices

The Center for Photonic Materials and Devices aims at performing research and developing technologies relevant to NASA's mission, focusing on the field of photonics. Research in photonics has made possible the development of new technologies that have produced revolutionary changes in communications, computing, robotics, medicine, environmental control, and many industrial processes. In addition, the potential reputation of the Center will attract an increased number of disadvantaged students and will motivate them to pursue careers relevant to the NASA mission.

North Carolina A&T State University

Center for Aerospace Research (CAR)

CAR conducts interdisciplinary research for the purpose of building engineering design tools that will lead to the effective development of the next generation of subsonic, supersonic, and hypersonic aircraft and spacecraft. Five research groups (Aerospace Structures, Human-Machine Systems Engineering, Computational Fluid Dynamics, Propulsion, and Controls and

Guidance) focus on innovative research in their quest for new technologies with applications in spacecraft and high-speed aircraft design.

CAR is committed to educating and training disadvantaged students and to enhancing opportunities for disadvantaged faculty in the field of aerospace engineering technologies. North Carolina A&T State University is very supportive of CAR's objectives, and the school has provided research facilities in its recently renovated Interdisciplinary Research Building.

Howard University

Center for the Study of Terrestrial and Extraterrestrial Atmospheres (CSTE A)

The strategic focus of CSTE A is to establish at Howard University a self-supporting, world-class facility for the study of terrestrial and extraterrestrial atmospheres. Special emphasis is placed on the training of disadvantaged students in aerospace-based sciences and engineering.

Tuskegee University

Center for Food Production, Processing, and Waste Management for Controlled Ecological Life Support Systems

This Center's research focuses on the development and refinement of information, technology, and systems for the production, processing, and use of sweetpotato and peanut biomass that meet the design plans of NASA's Advanced Life Support program and the NASA Human Exploration and Development of Space Enterprise. The roots, nuts, and leaves of these two crops can be processed into a variety of foods and their nonedible resources recycled as part of an integrated food and environmental system for human life support in space.

FACULTY AWARDS FOR RESEARCH (FAR)

NASA's FAR program seeks to provide the Agency with the resources necessary for mission completion while developing a diverse NASA-sponsored research community consisting of institutions with significant underrepresented minority enrollments. The FAR program supports faculty-driven research at HBCU's and Other Minority Universities (OMU) that is relevant to the NASA Strategic Enterprises as described in the NASA Strategic Plan. Participation in FAR is currently open to tenure-track faculty of HBCU's and OMU's that offer degrees in engineering, mathematics, or science disciplines.

As a result of participating in this program, Principal Investigators contribute directly to NASA research and support the development of disadvantaged and/or disabled student researchers. Opportunities for participation in the Agency's mainstream research expand as recipients' research capabilities are enhanced through interaction with NASA researchers and facilities. In addition, the pool of disadvantaged and/or disabled students with research

OMU's. The data that follow were obtained from 30 of the 34 projects that had been funded for at least 1 year.

This report summarizes the activities of these FAR projects during the AY 1996–97 and Summer 1997 reporting period. During this period, 47 professional-level investigators were involved in the 30 research projects--33 faculty members, 12 research associates, and two postdoctoral fellows. A total of 169 students--111 undergraduates and 58 graduates participated in these research activities. The research accomplishments were documented in 25 refereed papers or book chapters that were published during this period. Significantly, 19 students were authors or co-authors of these publications. An additional 15 papers or book chapters, involving 14 student authors or co-authors, were accepted for publication during this period. The broader research community was informed of this work through 87 technical presentations given, including 21 presentations given by students.

During AY 1996–97, the 30 reporting FAR projects were able to leverage their NASA Minority University Research and Education Programs (MUREP) expenditures (\$1.2 million, not including \$.07 million of student support) to an additional \$2.7 million in new research support, \$0.5 million from other NASA programs, and \$2.2 million from other agencies.

An additional objective of the FAR program is to increase the number of disadvantaged and/or disabled students receiving mathematics, science, engineering, and technology research experience and entering careers in NASA-related fields. Of the 169 students, 111 (66 percent) participated at the bachelors-degree level, 51 (30 percent) participated at the masters-degree level, and seven (4 percent) participated at the doctoral-degree level. Of the participating students, 88 percent were members of an underrepresented ethnic minority group.

Forty-nine student participants obtained degrees during the reporting year: 34 bachelors degrees, 13 masters degrees, and two doctoral degrees. Seventeen of the graduates were employed in NASA-related fields: nine bachelors-degree graduates, five masters-degree graduates, and three doctoral-degree graduates. Fifteen of the 34 bachelors-degree graduates planned to pursue graduate degrees, while five of the 13 masters-degree recipients planned to pursue doctoral degrees. In total, 76 percent of the students receiving degrees remained in the pipeline by continuing for the next degree or by accepting employment in a NASA-related field.

Brief reports from the projects funded during the Summer 1996 and AY 1996–97 reporting period, along with abstracts of the newly funded projects, follow.

Development of an Ultrasonic and Fabry-Perot Interferometer (FPI) for Nondestructive Inspection of Aging Aircraft

Principal Investigator: Dr. Alphonso C. Smith
Department of Electrical Engineering
Hampton University
Hampton, Virginia 23668
Date of Original Award: 1994

RESEARCH ACCOMPLISHMENTS

During the past year, the FPI sensor detection system was continued, and refined modifications were made in the data acquisition and evaluation process. The ultrasonic and FPI detection system was improved from one- to multiple-sensor detectors, and physical models were developed to understand the physical phenomenon of this work. Multilayered flawed samples were fabricated for inspection by a prototype ultrasonic and FPI detector, and experimental data were verified with simulated results. Finally, a prototype instrument package was laboratory-tested on actual airframe structures for documentation purposes.

The present period will be the end of the 3-year FAR grant award. The people involved in the project would like to continue this effort to build a prototype instrument using the technology developed but lacked sufficient funding to do so. The project is currently seeking funds to continue this important research effort.

RELEVANCE TO NASA STRATEGIC ENTERPRISES/BENEFITS TO SOCIETY

The objective of this project was to help NASA maintain its leadership in space, Earth science, and aeronautical research. The project is helping in these areas by training students in laboratory research programs directed toward solving state-of-the-art measurement problems. In so doing, the project will not only help NASA meet its mission, but at the same time provide research training to disadvantaged students and increase the pool of well-trained scientists and engineers. Students graduating from Hampton University will then be in a better position to help meet the Nation's critical labor needs for engineers and scientists.

STUDENT ACHIEVEMENTS

Students are being trained in the areas of fiber-optic sensor techniques, ultrasonics, and instrumentation measurement science. This research program has provided an opportunity for students to interact with researchers at NASA's Langley Research Center. As a result, these students' research skills and marketability have been greatly improved. One student who worked on the project is intending to continue his studies in graduate school.

Multilayer Thin Film Capacitors for High Performance Power Applications

Principal Investigator: Dr. Peter J. Gielisse
College of Engineering
Florida A&M University–Florida State University
Tallahassee, Florida 32310
Date of Original Award: 1996

INTRODUCTION

The goal of this research is to develop multilayer thin-film capacitor structures for applications in high-power and high-heat-generating electronic devices, power transmission and distribution, automotive energy systems, energy storage, electronic packaging, power supplies for laser systems, high-field pulsed magnets, and rail-gun power systems. Multilayer thin-film capacitor structures with the right dielectric properties, which can be manufactured at low cost, should make a major impact in these areas.

RESEARCH ACCOMPLISHMENTS

The magnetron sputtering system, which is used for dielectric and electrode film synthesis, can now be switched between a DC and an RF source, allowing conducting or nonconducting materials as targets. A ramp cycle is available to build up the power level gradually and helps prevent possible target destruction. The carrier gas system has been completely rebuilt, and the sputtering gun has been replaced with a more efficient gun of newer design.

The thick-film facility has been installed and made operational. A special test screen, allowing for the production of small rectangular area films to check out film recipes for use in multilayer capacitor structures, has become available. Thick-film pastes based on nanosized particles are currently under development.

A dielectric film test and measurement facility has been designed and put into operation. This project has the capability to test with contacting rigid metal electrodes and with noncontacting electrodes of different sizes.

Thin films were deposited in a typical DC and RF plasma-assisted reactive physical vapor deposition setup onto aluminum-coated aluminum-nitrogen substrates. Optimal conditions have not yet been obtained. The silicon-aluminum-oxygen-nitrogen thin-film structures deposited in 100-percent argon were quite different from those generated in 100-percent nitrogen—the latter types indicating a resistivity 1 to 2 orders of magnitude higher. It was also noted that the resistivity and breakdown strength increased significantly as a function of time. Breakdown occurred at 60 volts for 100-percent argon environments and at 70 volts for 100-percent nitrogen, indicating the presence of defects, inhomogeneity, or insufficient film quality. Present efforts are studying the root causes. Aluminum-nitrogen films, both metal

rich and stoichiometric, have been deposited on silicon, aluminum oxide, and nickel substrates. Dielectric characterization is in progress.

A software tool for the evaluation of multilayer structures has been developed in parallel with activities in support of the experimental thin-film capacitor research task. The current software program is useful in narrowing material property and geometry choices for any type of multilayer (capacitor) design and for determining the probability of adhesion or crack failure.

STUDENT ACHIEVEMENTS

During this year, five undergraduate students have worked on the program; one M.S. candidate and one Ph.D. candidate are finishing their respective thesis and dissertation. A paper was presented at the International Spring Seminar on Electronic Technology in June 1997, and it has been published in the proceedings.

Phenylethynyl Containing Polyarylene Ethers/Polyimides Resin Infiltration of Composites

Principal Investigator: Dr. DeRome O. Dunn
Center for Composite Materials Research
Mechanical Engineering Department
North Carolina A&T State University
Greensboro, North Carolina 27411
Date of Original Award: 1996

INTRODUCTION

The objective of this research is to make composites by the Resin Transfer Molding (RTM) method. The resin of interest is newly developed at NASA's Langley Research Center by Dr. Brian Jensen. This resin is specially formulated to be used at temperatures of about 300 C while having a relatively low and stable melt viscosity before cure-enabling RTM processing.

RESEARCH ACCOMPLISHMENTS

The following work on composites was conducted during the first year: resin synthesis; measurement of resin viscosity and other properties; resin-wetting studies; CAD drawing, development, and design of mold; carver press insulation; compression molding; compression testing; fiber volume testing; and microscopic sample preparation.

RELEVANCE TO NASA STRATEGIC ENTERPRISES

High-temperature material applications are of importance to NASA's ongoing support of technological developments in the aerospace industry. An example is the High Speed Civil Transport (HSCT), which requires structural materials capable of withstanding temperatures of 300°C. High-temperature materials will allow aircraft to be more efficient and faster while carrying bigger payloads. The RTM process for making composites is inexpensive compared to other methods because: (1) a complex shape can be made as one part; (2) the RTM process is capable of producing near-net-shape composites, which reduce and/or eliminate machining; and (3) composite aerospace structures permit weight savings. These advantages for high-temperature composites could be employed if structural composites are made by the RTM process with this resin.

BENEFITS TO SOCIETY

The use of high-temperature composites in aerospace applications will allow for the maintenance and/or improvement of current air transportation advances while avoiding a significant increase in cost to the consumer. By using these composites, aircraft can be made faster (such as the HSCT), comparably lighter (allowing higher fuel efficiency and a larger payload), and more durable (enabling less maintenance)—all of which will help moderate costs. The use of RTM processing for aerospace structural composites will help hold down the cost of aircraft construction by enabling a reduction in the number of structural parts and the amount of machining and labor involved.

STUDENT ACHIEVEMENTS

Two graduate students and three undergraduate students were involved in research activities during the reporting period. One student was a chemical engineering major, and four were mechanical engineering majors. They each traveled to NASA's Langley Research Center to visit with the technical monitor, Dr. Brian Jensen. Ms. Valerie McLaughlin, a graduate student in chemical engineering, participated in a summer co-op at Langley supported by grant funding. Ms. Saunya Amos, an undergraduate student in mechanical engineering, presented a poster titled, "Acid Digestion: Fiber Volume Fraction Determination" at the First Annual NCAMP Undergraduate Research Conference at North Carolina A&T State University in Greensboro, North Carolina, on April 11, 1997. The students participated in initial research development during this first year of grant funding.

Optimal Rate Concept Acquisition for Classification of Remotely Sensed Spatial Data and Propulsion Test Data

Principal Investigator: Dr. Willie G. Brown
Department of Computer Science
Jackson State University
Jackson, Mississippi 39217
Date of Original Award: 1994

INTRODUCTION

Image processing is the manipulation and interpretation of digital images using a computer. One image-processing task involves classification, which is the process of assigning the pixels of an image (the most elemental component of the image, sometimes called a raster) to one of several land-cover classes or thematic categories. This technique provides a quantitative method for automating the identification of features in a scene. The main objective of this research is to investigate and demonstrate the use of artificial intelligence expert system technology for the classification task. The overall research effort includes surveys and evaluations of expert system shells, surveys and evaluations of knowledge discovery techniques for uncovering relationships in raw data, and the implementation of prototype classification systems.

RESEARCH ACCOMPLISHMENTS

A machine-learning technique, which combines the version space method for concept acquisition and the genetic algorithm technique for optimization, has been implemented. This technique, called optimal rate concept acquisition, not only produces descriptions of classes, but also suggests the best examples of raw data to use for training the classification system. Testing has shown the accuracy rate for the version space classifier to be comparable to other classification systems (such as neural network systems). However, the version space systems can be trained using far less data than other classifiers and produce descriptions of the data that can be easily understood by humans.

RELEVANCE TO NASA STRATEGIC ENTERPRISES

NASA has, and will continue to collect, vast amounts of remotely sensed spatial data. However, much of this digital data are unidentified and therefore unusable in their present form. This project addresses a technical problem that is vital to NASA's Earth Science Enterprise-- analyzing, classifying, and extracting useful and usable information from the vast amounts of data that will be generated by the Earth Observing System (EOS).

INSTITUTIONAL RESEARCH AWARDS (IRA)

The IRA program is composed of two components: IRA Research and IRA Network Resource and Training Site (NRTS). One purpose of the IRA program is to strengthen the capacity of minority institutions to provide a quality learning and research environment for students traditionally underrepresented in science and engineering fields. Another purpose is to increase these students' opportunities to participate in and benefit from NASA and federal research and education programs. Through IRA funding, minority institutions and researchers are given the opportunity to enhance their research and educational capabilities in NASA-related fields, providing the additional benefit of increasing their ability to enter the mainstream competitive research process.

Now in its fourth year, the IRA program funds are enhancing research and education capabilities at five Hispanic-Serving Institutions (HSI). This report summarizes the activities of these IRA institutions during the AY 1996–1997 and Summer 1997 reporting period. During this period, 79 professional-level investigators were involved in research projects at the IRA institutions, including 49 faculty members, 18 research associates, and 12 postdoctoral fellows. A total of 145 students--87 undergraduates and 58 graduates--participated in these research activities. The research accomplishments were documented in 75 refereed papers or book chapters published during this time period. Significantly, 35 students were authors or co-authors of these publications. An additional 33 papers or book chapters, including 17 student authors or co-authors, were accepted for publication during this period. The broader research community was informed of this work through 88 technical presentations, including 24 presentations given by students.

During the reporting period, the five developing IRA's were able to leverage their NASA MUREP expenditures (\$3.3 million, not including \$.09 million of student support) to an additional \$8.8 million in new research support, \$2.2 million from other NASA programs, and \$6.6 million from other agencies.

A major goal of the IRA program is to increase the number of disadvantaged and/or disabled students receiving advanced degrees and entering careers in NASA-related fields. Of the 145 students, 87 (60 percent) participated at the bachelors-degree level, 29 (20 percent) participated at the masters-degree level, and 29 (20 percent) participated at the doctoral-degree level. Of the participating students, 76 percent were members of an underrepresented ethnic minority group.

During the reporting period, 36 of the student participants obtained degrees: 17 bachelors degrees, 16 masters degrees, and three doctoral degrees. Of these graduates, 78 percent were members of an underrepresented ethnic minority group. Seven of the graduates were employed in NASA-related fields: two bachelors-degree graduates; three masters-degree graduates, and two doctoral-degree graduates. Six of the 17 bachelors-degree graduates planned to pursue graduate degrees, while nine of the 16 masters-degree recipients planned to

pursue doctoral degrees. In total, 61 percent of the students receiving degrees remained in the pipeline by pursuing the next degree or by accepting employment in a NASA-related field.

The objectives of the IRA NRTS are to improve the in-house capability of Minority Institutions to electronically access science data and computational resources; develop mechanisms to support, sustain and evolve the network infrastructure of Minority Institutions (MI); and increase the effectiveness of MI's in the competitive process for NASA and federally-funded programs in science, engineering, and technology.

A report on two of the NRTS recipients follows:

Elizabeth City State University (ECSU)
Regional Network Resources and Training Site (NRTS)

The objective of this site is to establish a Regional NRTS at ECSU to serve the Northeastern North Carolina Region and the Eastern Virginia Region. The NRTS at ECSU will provide network training and facilitate HBCU/MI network opportunities in research and education for MSET faculty and students and for the teachers of predominantly minority-attended elementary and secondary schools in ECSU's region.

Lester Hall, which houses the Mathematics and Computer Science Department, has undergone a complete infrastructure enhancement with Internet connectivity in every classroom, anchored by a new research and training lab with 15 high-end workstations. While cabling to other Science, Math and Engineering Technology (SMET) departments is being completed, high-speed mod lines provide Internet access to these departments. Asynchronous Transfer Mode (ATM) infrastructure has been requisitioned and 45 percent of the installation is completed. This should be available by the beginning of the Fall 1998 semester to support the growing bandwidth demands for training large groups on multimedia and publishing applications.

The new lab provided the capability for hosting 13 Internet/multimedia workshops. The total attendance for these workshops has surpassed the 500 mark, with participation from all the consortium members and other NRTS Principal Investigators.

All ECSU SMET connectivity should be completed and leveraged on for education and research. Fully functional ATM infrastructure should be available. There will be a major investment in all partner infrastructure, including upgrading of Internet bandwidth, campus wiring, and computing resources.

Because of the overwhelming number of participants during Year 1, the collaboration and education initiatives for Year 2 is expected to be enormous. A major 4-week precollege summer program has been scheduled, with participation from NASA's Goddard Space Flight Center and Langley Research Center and all the consortium precollege members, along with

new participants from the planned expansion of partners. Three new programs will leverage the precollege investments: Affordable Technology to Link America's Schools (ATLAS); Global Learning and Observations to Benefit the Environment (GLOBE); and Skymath provided by University Corporation for Atmospheric Research.

Morgan State University

Regional Network Resources and Training Site

Morgan State University established an urban consortium of members involved in a variety of major programs supported by both the Board of Education for Baltimore City and the National Science Foundation. This consortium is leveraging funds, coupled with Internet connectivity, that will stimulate a major change in the way science and math is disseminated to this underrepresented community. Network services, such as electronic mail, the World Wide Web, and Telnet, will be deployed at the participating sites. This will provide access to faculty, staff, and students in the local area in support of ongoing science and education programs in collaboration with the National Science Foundation, the National Technical Association, the Baltimore Urban System Initiative, and other organizations.

Technological Accomplishments for Year 1

Most of the NRTS members received, for the first time, dedicated 24-hours, 7-day-a-week high-speed computer network access in the Internet. Initially, 75 percent of the consortium institutions had none and/or very low-speed access to the Internet.

Programmatic Impacts for Year 1

Collectively among the consortium members, at least eight new science computer labs were created, and at least five science computer labs were enhanced.

Technological Plans for Year 2

This NRTS anticipates doubling network connectivity for at least 50 percent of the consortium members to handle expected increases in information exchanges with collaborators throughout the Internet. In addition, another two to four new institutions will be added to the consortium and for the first time receive dedicated connectivity to the Internet and network training.

Expected Programmatic Impacts for Year 2

Scientific modeling and data analysis teams centering around the Cray J916 at Morgan State University will be established as a computational engine for MI's within the consortium and throughout the Internet because of the increased wide area network connection at Morgan State. There will be substantial development of Internet multimedia applications, such as the World Wide Web and videoconferencing, at the local institutions supportive of research and education initiatives identified in the annual report.

Field Installations, MURED staff need to gain more knowledge about the organizational and management context in which MUREP's are operated at each of the Installations and JPL. By increasing their knowledge of the context in which MUREP's are managed at the Installations, MURED staff will be better prepared to provide technical assistance more tailored to an Installation's specific requirements.

5. Participation in URC annual on-site technical review committee meeting. MURED has been present at every TRC meeting during the last 3 years. If travel funds permit, senior level involvement is recommended this year; if not, senior level participation should be prioritized and the Allied Technology Group, Inc. support will fill in the gaps.

In FY 1997, MURED programs achieved the following: program results exceeded the national averages in retention, graduation rates, grade point averages and percentage of undergraduates to gain entrance into masters and doctoral programs; MURED program costs per student are well-below the national average cost at both the undergraduate and graduate levels; more than two-thirds of MURED-trained primary/secondary science and mathematics teachers are placed in schools with minority student populations in excess of 50 percent.

Research and Development

Metrics for NASA HBCU programs are being continually improved. Evaluations of individual projects within competitive programs and for unsolicited projects continue to be performed as succinct outcome metrics that are aggregable across projects and programs being developed.

In FY 1995 and FY 1996, a program to collect key data on the URC and IRA Program outcomes was piloted. In addition, uniform outcomes data of all FAR award recipients was collected as part of each grant's annual report. Based on the experience gained with these instruments, a Uniform Outcomes Data Collection Process was developed in late FY 1996 to collect program data from Summer 1995 and AY 1995-96. In FY 1997, this Uniform Outcomes Data Collection Process was revised and then used for the second time. As before, the objectives were to establish uniform metrics for all NASA MURED programs and to provide compact instruments for uniform collection of outcomes data keyed to those metrics. These metrics reduce the collection of data to the minimal amounts possible, emphasize outcomes over processes, and are applicable to any project. They are aggregable both horizontally and longitudinally, and they allow adjustable benchmarking standards to be applied. The data was collected electronically over the World Wide Web. This single annual collection of data is used to provide the information necessary for annual MURED reports, required White House Reports, budget submissions and justifications, and comparative assessments of programs and projects.

Two instruments have been devised, one for basic research projects and the other for education projects. For research projects, including URC's, IRA's, and 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, are also collected. This allows formation of reports using benchmarking divisors (e.g., numbers of degrees awarded per dollar spent on students, or number of publications per faculty investigator). For education projects, the Uniform Outcomes Data shifts the emphasis from numbers and demographics of students supported to improvements in student performance. Short-term metrics track increases in test scores and increases in enrollment in mathematics and science preparatory courses for students in NASA programs. Long-term metrics track the rates at which K-12 students in NASA programs enter college and obtain advanced degrees. In addition, data on the numbers of students and institutions supported continue to be collected and reported. Outcomes data collected with these instruments is reported in the narrative for each specific HBCU program.

PARTNERSHIP AWARDS

Partnerships between the NASA Installations and minority universities have great potential to further the ongoing mission of NASA and to assist in developing a diverse community of research institutions with a significant percentage of disadvantaged students. The Partnership Award is designed to create and strengthen such partnerships. Projects supported are unique and innovative, and they fall outside of NASA's usual competitive programs. These projects show evidence of having high potential for long-term support from other sources. Special efforts are made to include outreach to individuals with disabilities and to public schools with enrollments of predominately disadvantaged students.

Partnership Awards are funded for no more than 2 years, at a maximum of \$200,000 per year for each participating MI. Second-year funds are contingent on the successful completion of the first year's activities. The NASA Installations and MI partners are expected to leverage the impact of the award with other funding.

Awards are made in three categories: education, research, and a combination of education and research. Education awards are made in support of such endeavors as precollege projects, bridge projects, course and curriculum development projects, and/or projects that expand the understanding and use of education technology. Research awards are made to cover a wide spectrum of research that is of interest to NASA. Combination awards are made to projects that skillfully combine activities in both the research and education areas. During FY 1997, 39 institutions received a total of 65 awards; 15 education awards, 18 research awards, and 32 combination awards were made. A total of 27 HBCU's received 44 awards. The listed below:

Alabama A&M State University
Bethune-Cookman College
Bowie State University
Clark Atlanta University
Edward Waters College
Fisk University
Fayetteville State University
Florida A&M University
Hampton University
Howard University
Jackson State University
Medgar Evers College
Mississippi Valley State University
Morehouse School of Medicine
Morgan State University
Norfolk State University
North Carolina A&T State University

Prairie View A&M University
Southern University
Southern University at New Orleans
Southern University and A&M College
Spelman College
Tuskegee University
Voorhees College
University of the District of Columbia
Wilberforce University
Xavier University of Louisiana

MURED Electronic Management System (EMS)

The development of the MURED EMS was initiated in FY 1996 as an Internet-based evaluative management tool to support all the ongoing operational programs and new initiatives under the NASA Peer Review Support Contract. The EMS is designed with standard graphical user interface components such as menus, icons, hyperlinked documents and electronic forms containing selection lists, icons, check boxes and radio buttons. The EMS forms are designed for specific program objectives and focus on activities such as surveys, proposal submissions, proposal evaluations, data analysis, grants management and generation of ad hoc or customized reports. These electronic forms are the primary user interface for data manipulation and for running customized applications based on specific program requirements. The MURED EMS is platform independent and currently supports PC, MAC and UNIX environments. Access to the EMS is currently limited by IP address/URL to MURED staff, NASA Field Installation personnel, support contractor, and system development personnel.

The EMS design features, which are being incorporated for the MURED programs, will facilitate generation of annual plans, reports highlighting program performance metrics, and will support strategic planning/budget forecasting. Multiple customized reports and ad hoc report capability are in place for meeting the specific program award objectives. The electronic surveys for the generation of the FY 1997 Education and Training and Research & Technology Reports were successfully completed. The reports are under finalization based on the data analysis and results provided by the EMS. On-line submissions of evaluations for research proposals submitted under the FAR program are currently underway by the reviewers from NASA Installations.

Program Evaluation Total (Evaluation is conducted under the peer review contract with Allied Technology Group, Incorporated. The total value of the contract which includes evaluations is reflected under the Private-Sector Involvement category)

PART II - AWARDS AND NARRATIVE INFORMATION

Training

ALABAMA

<u>Alabama A&M University</u> A Collaborative Program for Enhancing Students with Disabilities	MSFC	\$160,938
<u>Miles College</u> JOVE Program	MSFC	\$38,000
<u>Stillman College</u> Precollege Awards for Excellence in Mathematics, Science, and Technology	HQ/OEOP	\$98,766
Stillman College Precollege Awards for Excellence in Math, Science, Engineering, and Technology	HQ/OEOP	\$74,049
<u>Trenholm State Technology College</u> High School Student Science Enrichment Program	HQ/OEOP	\$185,105
<u>Tuskegee University</u> NASA/Tuskegee Internship Program	JSC	\$25,000

DISTRICT OF COLUMBIA

<u>University of the District of Columbia</u> Scientific Renewal	HQ/OEOP	\$124,799
Saturday Academy Program	HQ/OEOP	\$588,790

FLORIDA

<u>Bethune-Cookman College</u> Science, Engineering, and Mathematics Saturday Academic Readiness Program (SEMSAP)	HQ/OEOP	\$203,250
<u>Edward Waters College</u> Classroom for the Future Center (COTF) Master Science Teacher Certification (MTCF)	KSC	\$200,000
<u>Florida A&M University</u> Training Grant – Project Image	HQ/OEOP	\$1,227,403
Discover – SBI/NASA Internships	KSC	\$200,000
Space Life Sciences Training Program (SLSTP)	HQ/OEOP	\$434,728
Engineering Concept Institute	HQ/OEOP	\$59,781
<u>Florida Memorial College</u> Minority Aviation Career Awareness Program	KSC	\$179,995

GEORGIA

<u>Albany State University</u> Project High School/High Tech	KSC	\$105,750
<u>Morehouse College</u> Project Space Strategic Preparedness Advancing Career	HQ/OEOP	\$753,449
Inspiring Careers in English/Math/Science	MSFC	\$25,000
Inspiring Careers in English/Math/Science	JSC	\$100,000
R/S “A NASA/University Joint Venture in Space Science”	MSFC	\$57,000

<u>Morehouse School of Medicine</u> Symposium on Career Opportunities in the Biomedical and Public Health Sciences	JSC	\$50,000
Middle/High School Summer Program	JSC	\$49,335
<u>Spelman College</u> Model Institutions for Excellence (MIE)	HQ/OEOP	\$800,000
Model Institutions for Excellence	HQ/OEOP	\$1,736,225
Wise Scholars Program	HQ/OEOP	\$1,353,440
LOUISIANA		
<u>Xavier University</u> Soar 2 Summer Bridge Program	HQ/OEOP	\$135,508
MASTAP Award Project Teach	HQ/OEOP	\$356,000
Partners-Education	SSC	\$187,980
MARYLAND		
<u>Bowie State University</u> Model Institutions for Excellence Program	HQ/OEOP	\$1,007,569
Summer Institute in Engineering and Computer Applications (SICA) Program	GSFC	\$178,134
Model Institutions for Excellence Program	HQ/OEOP	\$1,000,000
<u>Coppin State College</u> JOVE Program	MSFC	\$37,196
<u>Morgan State University</u> Engineering Enrichment Program	GSFC	\$118,955
<u>University of Maryland-Eastern Shore</u> Engineering Program	GSFC	\$51,855

MISSISSIPPI

<u>Jackson State University</u> Young Scientists Program	HQ/OEOP	\$95,948
PACE/MSET Award	HQ/OEOP	\$99,985
Pre-Engineering (9 th Grade) Minority Training Summer Program	HQ/OEOP	\$47,949
JOVE Research	MSFC	\$44,000

NORTH CAROLINA

<u>Bennett College</u> Precollege Awards for Excellence in Mathematics, Science and Technology	HQ/OEOP	\$95,100
Mathematics, Science and Technology Awards for Teacher Enhancement Program	HQ/OEOP	\$288,152
Scholars for Excellence in Mathematics, Science, Engineering and Technology	HQ/OEOP	\$95,100
<u>Elizabeth City State University</u> Dr. C. D. Turnage PACE/MSET Program	HQ/OEOP	\$100,000
Regional Network Resources and Training Site at ECSU	HQ/OEOP	\$550,000
<u>Fayetteville State University</u> NASA Technology Institute	HQ/OEOP	\$86,853
PACE/MSET Award	HQ/OEOP	\$100,000
Preservice/Inservice/Model for Teaching Integrated Math/Science with Technology	LaRC	\$360,000
JOVE Program	MSFC	\$12,500

<u>North Carolina A&T State University</u> Minority University Systems Engineering and Satellite Program	JPL	\$100,000
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<u>Saint Augustine's College</u> PACE/MSET Award	HQ/OEOP	\$100,000
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Saint Augustine's College Summer Science Camp	HQ/OEOP	\$100,000
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<u>Shaw University</u> Shaw University Mathematics, Science and Technology Awards for Teacher and Curriculum Enhancement	HQ/OEOP	\$200,000
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PENNSYLVANIA

<u>Lincoln University</u> To Help Students Ease the Transition from High School	GSFC	\$90,000
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PACE Award – Precollege Awards for Excellence in Mathematics, Engineering, and Technology Program	HQ/OEOP	\$100,000
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SOUTH CAROLINA

<u>South Carolina State University</u> Share with a Pair of Peers Project (SWAPOP)	HQ/OEOP	\$371,089
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TENNESSEE

<u>Fisk University</u> Training Underrepresented Students in Biological Research at Fisk University	ARC	\$98,961
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TEXAS

Jarvis Christian College

PACE Award – Precollege Awards for Excellence In Mathematics, Engineering, and Technology	HQ/OEOP	\$100,000
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VIRGINIA

Hampton University

PACE/MSET Program	HQ/OEOP	\$100,000
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The American Indian Education Opportunities Program	LaRC	\$109,250
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Educational Outreach for NASA Sciences and Applications	MSFC	\$856,340
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Norfolk State University

The Science and Math For Everyone Project	LaRC	\$180,000
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Pre-Service Teacher Conference	LaRC	\$172,259
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Rural Outreach Program	LaRC	\$180,000
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Training Total		\$16,737,486
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NARRATIVE

During FY 1997, NASA continued to support training programs that develop resource pools of talented disadvantaged students, who are U.S. citizens, in NASA-related science, mathematics, engineering, and technology. Training is essential for NASA to meet its current and future human resources goals. Examples of some NASA training initiatives in FY 1997 include the following:

Mathematics, Science and Technology Awards for Teacher and Curriculum Enhancement Program (MASTAP)

Teacher training awards, the majority of which are MASTAP, increase the number and strengthen the technical skills and knowledge of disadvantaged and/or disabled mathematics, science, and technology teachers. As a result of this award, selected preservice and inservice teachers will have knowledge of national and state teaching standards. Participants become state-certified and experienced in teaching at middle and high schools that have substantial enrollments of disadvantaged students.

Teacher training awards are funded annually and range between \$30,000 and \$225,000. The average award is \$140,000. MASTAP awards, although refunded annually, are 3-year awards not to exceed \$200,000 annually.

Currently, there are MASTAP grants at the following HBCU's: Bennett College, North Carolina; the City University of New York-Medgar Evers College, New York; Shaw University, North Carolina; Xavier University, Louisiana; and South Carolina State University, South Carolina (as listed below).

South Carolina State University

University Share With a Pair of Peers Project (SWAPOP)

SWAPOP is a collaborative effort of preservice/in-service minority science, mathematics and industrial technology education teachers with middle and high school students. The project is designed to span 3 academic years, beginning in the fall semester of 1995-96, continuing through the spring and summer semesters, and ending the summer of 1998. During these years, preparatory and experiential activities developed to accomplish the project's goals will take place. Examples of these will be as follows: (1) the organization of a science, mathematics, and technology education club at the University to serve as a center for recruiting, training, retaining and increasing the number of State-certified minority teachers in the above-named areas; (2) to develop an academic comradeship between preservice and inservice teachers in the middle and high schools through specifically designed collaborative activities; and (3) to provide summer program instruction and experiences that will develop and enhance the knowledge and skills of preservice, inservice teachers, and middle and high school students.

Precollege Awards for Excellence Program in Mathematics, Science, Engineering, and Technology Awards (PACE/MSET)

The primary purpose of PACE is to support research-based educational outreach projects that increase the number and strengthen the skills, knowledge and interest of disadvantaged and disabled students in college preparatory mathematics, science and technology courses in public middle and high schools with substantial enrollments of minorities.

range.
Thirty-seven of the participants were males, and 56 participants were females. The students were recruited from middle and high schools from Guilford County schools through school counselors, teachers, and parents.

The program experienced the following improvements:

- Teachers who work in the Guilford County School System served as teachers of biology, English, computer science, and mathematics in the MSET Program. This proved to be a major advantage in that the instructors were familiar with academic issues that needed to be addressed. In addition, these instructors were familiar with the curriculum patterns and competencies that must be achieved by the students within the public school system. Most of the participants attend schools within the Guilford County School System.
- There was the addition of the Physics curriculum.
- There were separate teachers for middle and high school mathematics and English classes.

Fayetteville State University

Fayetteville State University's Mathematics/Science Education Center (MSEC) implemented its year-round Mathematics/Science Education Network (MSEN) Precollege Program for students in grades 6 through 12. The MSEN Precollege Program is an academic enrichment program offering instruction for those groups of students underrepresented in mathematics, science, and technology. The NASA PACE/MSET grant provided MSEC the opportunity to continue its summer scholars and Saturday Academy programs as well as provide teacher inservicing and parent training workshops.

The objectives of the MSEN Precollege Program include ensuring that: (1) all 9th grade students are enrolled in algebra I; (2) 9th through 12th grade students enroll in academic- or honors-level mathematics and science courses; (3) seniors graduate with at least 4 years of math and science even though only 3 years are required for college entrance; and (4) the pool of students entering and successfully completing math, science, and technology fields of study is greatly increased. Tutorial outreach programs in mathematics and science are provided via MSEC for students of grades 4–12 throughout the academic school year.

The MSEN Precollege Program successfully implemented a 20-Saturday session Saturday Academy throughout the school year and a 4-week summer program for all students enrolled. Teachers who work with the program participate in extensive training and planning sessions to ensure that all students are receiving quality enrichment activities that are hands-on and not textbook-oriented.

Statistics on course enrollment for students of grades 6 through 12 participating in the MSEN Precollege Program indicate that more than 50 percent of 7th grade students are enrolled in pre-algebra, more than 60 percent of 8th graders are in algebra I, 50 percent of 9th–11th grade students are enrolled in academic- or honors-level math and science courses in high school, and 70 percent of 12th grade students are enrolled in pre-calculus, calculus, physics, or top-level math, science, and technology courses, with 40 percent of these academic or honors courses. Based on information provided upon graduation (12th grade) and tracking of these students, 65 percent pursue math, science, and technology fields of study. This past year's graduating class reinforces that trend and reflects the high grade point average received in high school and retained through college.

The challenge for the MSEN Precollege Program at Fayetteville State is parent awareness and involvement, ensuring that parents of students enrolled in the program are actively involved in their child's education, high school curriculum alignment (course selection), and for their child preparing for and taking the SAT prior to the 12th grade year. The MSEN Precollege Program provides one-on-one tutorial assistance in math, science, and technology, SAT preparation, and scholarship research as a component part of its Saturday Academy.

This year's graduating class reflected impressive demographics. Of the 18 students graduating from the MSEN Precollege Program, all enrolled in a 4-year college or university, except one. This exception student enrolled at a technical community college to pursue a degree in architectural engineering. Of the 17 students who enrolled in a 4-year school, the following data apply:

- Eight students are pursuing medical careers (cardiovascular, obstetrics, neuroscience, or pathology).
- Four students are pursuing engineering careers (electrical, mechanical, or biomedical).
- Three students are pursuing business/accounting careers.
- Two students are pursuing other fields of study (such as transportation).

Two of the students pursuing cardiovascular careers received full 4-year scholarships. Total scholarship/award offers for one of these students was approximately \$250,000, while the other student's was more than \$400,000.

Other student achievements were reflected during the Awards Ceremony, whereby students were recognized for Top Honors (all A's for the academic year), A-Honors (all A's plus one B), B-Honors (A's, B's, plus one C), and Perfect Attendance. More than 125 students were recognized in these categories.

The Alpha Phi Alpha Fraternity partnered with 15 male students of the senior high component during the Saturday Academy and conducted monthly sessions on leadership skills, mentoring, social and development skills, and preparation for college. These fraternity members volunteered their time to this project. Through fundraising activities by the parents' support group, many businesses donated merchandise in support of this program. Major companies and academic professions in the area such as E. I. DuPont, Wellman Industries, and Fayetteville Technical Community College made up the background for the Precollege Advisory Board that provided major support throughout the year.

NASA/University Joint Venture in Space Science (JOVE)

JOVE offers direct participation in space science research to a broad segment of faculty and students in the Nation's colleges and universities. The JOVE Initiative establishes research linkages that encourage institutions of higher learning to use the space program as a basis to involve both graduate and undergraduate students. Colleges and universities are also encouraged to establish outreach programs to precollege students in their regions. NASA makes space science data available to university researchers through an electronic data link, in exchange for the university providing

faculty and students time to conduct research. Educational outreach programs are designed by the university to offer space science courses for high school students and summer space camps for student and teacher enrichment. The following HBCU's participated in the JOVE Initiative in FY 1998:

Bethune-Cookman College
Coppin State University
Fayetteville State University
Jackson State University
Miles College
Morehouse College

Model Institutions for Excellence (MIE)

NASA, in collaboration with the National Science Foundation (NSF), and the Departments of Interior and Agriculture, award collaborative agreements of up to \$2.5 million a year to the six institutions selected for the MIE Program. The chosen MIE's have a track record of awarding Science, Education, and Mathematics (SEM) degrees, a strong commitment to SEM education and undergraduate research, and a potential for launching a major enhancement of their current efforts. The NASA-sponsored MIE's are Bowie State University and Spelman College.

Founded in 1865 as part of the University of Maryland system, Bowie State University (BSU) is an institution that can boast some of the State's most competitive graduates. Among the school's great strengths are its SEM departments, whose excellence is responsible for Bowie State's fifth-in-the-Nation ranking in number of African American graduates with degrees in computer science.

The goal of BSU's SEM education is to ensure that a higher number of students seek and complete advanced, quality education in SEM, with computer technology the key ingredient linking all facets of the program. Computers play a featured role in the SEM program's theme: Achieving excellence in SEM education through the infusion of computer technology in every aspect of teaching, learning, and administration.

Over the past several years, Spelman has demonstrated its ability to prepare and graduate strong SEM students. In 1993, for example, 30 percent of the graduating class received SEM degrees and since 1988, there has been a 57 percent increase in the number of Spelman science majors pursuing doctoral degrees in SEM areas.

Spelman has always been represented by a faculty that wants more for its students and by students who want more for themselves. Spelman's selection as a Model Institution for Excellence exemplifies its dedication to its students and exceptional SEM education. Spelman's MIE program focuses on the following five areas of advancement: Curriculum

Development; Undergraduate Research; Student Enrichment Activities; Laboratory Instrumentation and Equipment; and Faculty and Staff Development.

PART II - AWARDS AND NARRATIVE INFORMATION

Facilities and Equipment

There are no grants awarded specifically for Facilities and Equipment. A small portion of funding is normally permitted under a research or education grant to fund equipment required to support research or education activity. In addition, to the degree that it is available from the NASA Installations, HBCU's may be able to acquire excess or loaned equipment to support research efforts or scientific teaching.

Executive Order 12999, Educational Technology: Ensuring Opportunity for All Children in the Next Century, signed April 17, 1996, by President Clinton, streamlines the transfer of excess and surplus Federal computer equipment to our Nation's classrooms and encourages Federal employees to volunteer their time and expertise to assist teachers and to connect classrooms. In order to ensure that American children have the skills they need to succeed in the information-intensive 21st century, the Federal Government is committed to working with the private sector to promote four major developments in American education: making modern computer technology an integral part of every classroom; providing teachers with the professional development they need to use new technologies effectively; connecting classrooms to the National Information Infrastructure; and encouraging the creation of excellent educational software.

In transferring educationally useful Federal equipment, the Executive Order calls on all agencies to give highest preference to schools and nonprofit organizations, including community-based educational organizations, through a gift or donation. These transfers shall be made at the lowest cost to the schools or nonprofit organizations permitted by law. The availability of the equipment shall be made known to eligible recipients by all practical means, including newspaper, community announcements, and the Internet.

PART II - AWARDS AND NARRATIVE INFORMATION

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

<u>HBCU/ACTIVITY</u>	<u>CENTER</u>	<u>AWARD</u>
<u>ALABAMA</u>		
<u>Alabama A&M University</u> Graduate Student Researchers Program (GSRP)	HQ/OHRE	\$22,000
Space Grant	HQ/OHRE	\$30,000
EPSCoR	HQ/OHRE	\$25,000
<u>Miles College</u> EPSCoR	HQ/OHRE	\$8,560
<u>Oakwood College</u> EPSCoR	HQ/OHRE	\$5,000
<u>Tuskegee University</u> Space Grant	HQ/OHRE	\$41,450
<u>ARKANSAS</u>		
<u>University of Arkansas at Pine Bluff</u> Space Grant	HQ/OHRE	\$22,559
<u>DISTRICT OF COLUMBIA</u>		
<u>Howard University</u> ASEE NASA Summer Faculty Fellowship Program	GSFC	\$450,734
Space Grant	HQ/OHRE	\$32,675

Summer Faculty	HQ/OHRE	\$370,000
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<u>University of the District of Columbia</u> Space Grant	HQ/OHRE	\$40,173
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GEORGIA

<u>Clark Atlanta University</u> Space Grant	HQ/OHRE	\$29,358
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<u>Morehouse College</u> Space Grant	HQ/OHRE	\$1,000
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LOUISIANA

<u>Dillard Univeristy</u> EPSCoR	HQ/OHRE	\$23,500
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<u>Southern University A&M College</u> EPSCoR	HQ/OHRE	\$57,500
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1997 NASA/ASEE Summer Faculty Fellowship Program at Stennis	HQ/OHRE	\$230,000
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Space Grant	HQ/OHRE	\$42,215
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<u>Xavier University</u> EPSCoR	HQ/OHRE	\$17,000
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MARYLAND

<u>Coppin State College</u> JOVE	HQ/OHRE	\$13,698
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MISSISSIPPI

<u>Alcorn State University</u> Space Grant	HQ/OHRE	\$5,954
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<u>Coahoma Community College</u> Space Grant	HQ/OHRE	\$4,966
<u>Jackson State University</u> GSRP	HQ/OHRE	\$22,000
JOVE	HQ/OHRE	\$17,000
Space Grant	HQ/OHRE	\$24,361
<u>Mississippi Valley State University</u> Space Grant	HQ/OHRE	\$3,940

NORTH CAROLINA

<u>Fayetteville State University</u> Generating Electronic Materials (GEM) for Teaching/Learning Mathematics and Science Teacher Training	LeRC	\$27,000
<u>North Carolina A&T State University</u> Graduate Student Researchers Program	HQ/OHRE	\$22,000
Ronald E. McNair Graduate Research	ARC	\$323,500
Space Grant	HQ/OHRE	\$1,075
<u>North Carolina Central University</u> Space Grant	HQ/OHRE	\$1,000
<u>Winston-Salem State University</u> Space Grant	HQ/OHRE	\$1,000

OHIO

<u>Central State University</u> Space Grant	HQ/OHRE	\$1,875
<u>Wilberforce University</u> Space Grant	HQ/OHRE	\$10,200

OKLAHOMA

<u>Langston University</u> Space Grant	HQ/OHRE	\$12,962
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PENNSYLVANIA

<u>Lincoln University</u> Space Grant	HQ/OHRE	\$23,500
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SOUTH CAROLINA

<u>South Carolina State University</u> Space Grant	HQ/OHRE	\$12,895
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TENNESSEE

<u>Fisk Univeristy</u> Space Grant	HQ/OHRE	\$16,000
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<u>Tennessee State University</u> Space Grant	HQ/OHRE	\$32,200
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VIRGINIA

<u>Hampton University</u> Space Grant	HQ/OHRE	\$20,265
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<u>Norfolk State University</u> GSRP	HQ/OHRE	\$22,000
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WEST VIRGINIA

<u>West Virginia State University</u> Space Grant	HQ/OHRE	\$5,000
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**Fellowships, Internships, Traineeships,
Recruitment, & Arrangements under
the IPA's Total**

\$2,073,115

NARRATIVE

JPL Summer Employment Program

JPL's minority employees and minority summer interns are encouraged to apply for fellowships at HBCU's and other minority institutions to obtain graduate and undergraduate degrees in disciplines of particular interest to the Laboratory. Programs include the JPL Minority Fellowship Program, the National Physical Science Consortium (NPSC), and the National Consortium for Graduate Degrees for Minorities in Engineering (GEM). JPL awarded \$149,200 in FY 1997 to participants in the Minority Fellowship Program.

During FY 1997, JPL hired 119 students and faculty for summer employment. Of this number, 65 were underrepresented minorities (55 percent). Of the 65 minority students, 16 were from HBCU's. Students participating in the Summer Intern Program have the opportunity to work closely with JPL scientists and engineers on projects compatible with the students' academic disciplines or scientific and engineering interests. The total expenditure for the program was \$137,972.

PART II - AWARDS AND NARRATIVE INFORMATION

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

<u>HBCU/ACTIVITY</u>	<u>CENTER</u>	<u>AWARD</u>
<u>ALABAMA</u>		
<u>Tuskegee University</u> Undergraduate Student Awards for Research	HQ/OEOP	\$12,000
DISTRICT OF COLUMBIA		
<u>Howard University</u> Funding for Public Service Internship	GSFC	\$80,660
FLORIDA		
<u>Florida A&M University</u> Undergraduate Student Awards For Research	HQ/OEOP	\$17,000
GEORGIA		
<u>Morehouse College</u> Undergraduate Student Awards for Research	HQ/OEOP	\$24,000
<u>Spelman College</u> Undergraduate Student Awards for Research	HQ/OEOP	\$229,800
LOUISIANA		
<u>Southern University A&M</u> Undergraduate Scholar Awards For Research	HQ/OEOP	\$120,000

MARYLAND

<u>Bowie State University</u> Project SPACE	GSFC	\$106,000
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<u>Morgan State University</u> Undergraduate Student Awards for Research	HQ/OEOP	\$12,000
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Undergraduate Student Awards for Research	HQ/OEOP	\$132,000
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NORTH CAROLINA

<u>Fayetteville State University</u> Undergraduate Student Awards for Research	HQ/OEOP	\$84,325
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<u>North Carolina A&T State University</u> Undergraduate Student Awards for Research	HQ/OEOP	\$87,538
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<u>Shaw University</u> Undergraduate Student Awards for Research	HQ/OEOP	\$120,000
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<u>Winston-Salem State University</u> Undergraduate Student Awards for Research	HQ/OEOP	\$48,000
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TENNESSEE

<u>Tennessee State University</u> Undergraduate Student Awards For Research	HQ/OEOP	\$120,000
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VIRGINIA

<u>Hampton University</u> Langley Aerospce Research Summer Scholars Program	LaRC	\$690,100
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Norfolk State University
Summer of Seasons

GSFC

\$19,650

**Student Tuition Assistance, Scholarships,
and Other Aid Total**

\$1,903,073

NARRATIVE

Undergraduate Students Awards for Research (USAR) Program

In FY 1997, NASA supported 47 students at 10 HBCU's in the USAR Program. The USAR awards provided tuition assistance, summer research experiences, and mentorships for students maintaining a GPA of at least 3.0 in an academic field that supports NASA research objectives.

<u>Institution</u>	<u>Students</u>
Fayetteville State University	4
Morehouse College	1
Morgan State University	10
North Carolina A&T State University	5
Shaw University	5
Southern University	5
Spelman College	9
Tennessee State University	5
Tuskegee University	1
Winston-Salem State University	2
Total	47

PART II - AWARDS AND NARRATIVE INFORMATION

Direct Institutional Subsidies

NASA does not have any direct institutional subsidies.

PART II - AWARDS AND NARRATIVE INFORMATION

Third-Party Awards

<u>HBCU/ACTIVITY</u>	<u>CENTER</u>	<u>AWARD</u>
National Association for Equal Opportunity in Higher Education (NAFEO)	HQ/OEOP	\$403,291
National Association for Equal Opportunity in Higher Education (NAFEO) Services, Inc. (Mobile Teacher Resource Center)	HQ/OEOP	\$300,000
American Society for Engineering Education (ASEE)	HQ/OEOP	\$50,000
The National Consortium for Graduate Degrees for Minorities in Engineering and Science (GEM)	HQ/OEOP	\$300,000
Third-Party Awards Total		\$1,053,291

National Association for Equal Opportunity in Higher Education (NAFEO)

In FY 1997, NASA continued the collaboration with NAFEO Services in support of their Consortium of 17 HBCU's. The focus of the Consortium is to provide tuition assistance, summer research experiences, and mentorships for students maintaining a GPA of at least 3.0 in an academic field that supports NASA research objectives. The member institutions are:

Albany State University
Bethune-Cookman College
Bowie State University
Coppin State College
Elizabeth City State University
Jackson State University
Lane College
Lincoln University
Mississippi Valley State University
Morgan State University
Norfolk State University
Shaw University

Southern University
Talladega College
Texas Southern University
University of Maryland - Eastern Shore
University of the Virgin Islands

American Society for Engineering Education (ASEE) Helen T. Carr Fellowship

The ASEE Helen T. Carr Fellowship provides support to African Americans pursuing Ph.D.'s in engineering. Upon completion of the doctoral degree requirements, a fellow is committed to return to teach at an HBCU. The fellowships support students at eight Historically Black Engineering Colleges (HBEC) including Hampton University, Howard University, Morgan State University, North Carolina A&T State University, Prairie View A&M University, Southern University, Tennessee State University, and Tuskegee University. To date, the Helen T. Carr Fellowships have helped a select group of more than 20 African American engineers earn their Ph.D.'s and join the faculty of one of the HBEC's. Since 1990, six NASA-supported Helen T. Carr Fellows have earned their Ph.D.'s and fulfilled their commitment of joining the faculty at an HBEC. During FY 1997, OEOP continued to support five students through this program. Two of the five students completed their Ph.D. requirements in December 1997 and are expected to accept faculty positions.

The National Consortium for Graduate Degrees for Minorities in Engineering and Science, Inc. (GEM)

NASA has established an education grant with GEM to intervene and improve the number of underrepresented minorities selected into the competitive NASA Graduate Student Researchers Program. This 2-year pilot program will select up to 18 students annually for the GEM Masters of Science program. The goals are: 1) select NASA undergraduate scholars for award of a GEM Masters of Science Fellowship; 2) provide students with a NASA summer research experience; 3) assign mentors for students to enhance students' competitiveness for the NASA Graduate Student Researchers Program; 4) select scholars based on academic accomplishments and commitment to achieving a terminal degree in a field that supports NASA; 5) conduct inservice for mentors to prepare them for effective service; and 6) assist students in the identification of a relevant research topic. In FY 1997, the NASA GEM Bridge project selected 17 students. All students were underrepresented minorities. Eleven students (65 percent) were from four HBCU undergraduate schools and one student was from a Hispanic-Serving Institution.

Summer High School Apprenticeship Research Program (SHARP) PLUS

In FY 1995, NASA and the Quality Education for Minorities (QEM) Network selected 300 high school students as participants in the NASA SHARP Program. In FY 1997, NASA

continued to support 5 HBCU's that were among 15 institutions of higher education selected to conduct SHARP PLUS research-based mentorship programs. FY 1997 funding for the program is \$481,000. Each HBCU site had 20 apprentices participating in research experiences in their campus laboratories and with industry partners. QEM administers SHARP PLUS for the elementary and secondary branch of NASA's Education Division of the Office of Human Resources and Education. SHARP PLUS sets high academic standards and seeks to increase minority students' participation and success rates in challenging mathematics and science courses at the precollege level, thereby increasing the pool of well-prepared students for future professional careers in science and engineering-related fields. The HBCU's participating in the SHARP PLUS Program include Florida A&M University, Hampton University, North Carolina A&T State University, Prairie View A&M University, and Southern University A&M College.

PART II - AWARDS AND NARRATIVE INFORMATION

Private-Sector Involvement

<u>HBCU/ACTIVITY</u>	<u>CENTER</u>	<u>AWARD</u>
Allied Technology Group, Incorporated	HQ/OEOP	\$ 876,267
Private-Sector Involvement Total		\$ 876,267

NARRATIVE

Allied Technology Group, Incorporated

During FY 1997, NASA's MURED was supported by the Allied Technology Group, Inc. As part of NASA's continued consolidation effort, MURED's peer review contract was merged with two other NASA divisions to form one single contract. This contract was awarded to Allied in February 1996 in the form of a 3-year contract. The contractor's function includes the development of an Internet-based electronic management system to support solicitation development, peer review and selection, post-award evaluation, and grants/cooperative agreements management with HBCU's and OMU's. Additionally, the contractor provides technical assistance to HBCU's and ensures that HBCU's are familiar and capable of accessing the NASA HBCU programs online via the electronic management system to receive announcements of opportunity, submit proposals, evaluations, and post-award management processes. Allied was awarded \$876,267 in FY 1997.

PART II - AWARDS AND NARRATIVE INFORMATION

Administrative Infrastructure

There are no specific funds allocated for support of the administrative infrastructure of HBCU's. NASA assumes that all of the activities, support, and initiatives referred to in other parts of this report will contribute indirectly to this important area. This certainly is anticipated through all of NASA's minority university institutional research and education awards such as Research Centers, Institutional Research Awards, and Mathematics and Science Awards for Teacher and Curriculum Enhancement Programs.

PART II - AWARDS AND NARRATIVE INFORMATION

Other Activities

<u>HBCU/ACTIVITY</u>	<u>CENTER</u>	<u>AWARD</u>
GEORGIA		
<u>Atlanta University Center</u> College Recruiting	JPL	\$15,750
Annual Awards Banquet for Atlanta University Dual-Degree Engineering Program	JPL	\$2,852
<u>Clark Atlanta University</u> NASA Mentor-Protege with United Space Alliance	JSC	\$450,000
MISSISSIPPI		
<u>PineyWoods Country Life School</u> Summer-School Student Intern Program	JSC	\$25,000
Travel, Career Fairs and Technical Assistance to HBCU's	All	\$112,465
Other Activities Total		\$606,067

Preservice Teacher Conference

The Langley Research Center's Office of Education and Norfolk State University have hosted the highly successful Preservice Teacher Education Conference for 3 consecutive years. During the past 2 years, the Conference was attended by a total of 550 preservice teachers representing 24 HBCU's and OMU's throughout the Atlantic Coast. The third annual NASA Langley/Norfolk State University Preservice Teachers Conference was held during FY 1997, at the Hampton Holiday Inn. During the 3-day Conference, the preservice teachers were exposed to a variety of innovative techniques, educational technologies, and NASA

aerospace materials that they will be able to use in the classroom. There were over 200 attendees representing 23 HBCU's and OMU's.

Cooperating Hampton Roads Organizations for Minorities in Engineering (CHROME)

CHROME was awarded the 1997 Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring in a White House ceremony in FY 1997. This award is administered by the White House through the National Science Foundation. It recognizes the long-time commitment to, and provision of, opportunities for greater participation of minorities and females in science, mathematics, and engineering.

For a second time, CHROME received the QEM Student Awards for Excellence in Mathematics and/or Science for K-12 students. This year, three students were honored at an awards ceremony in Washington, DC.

Technical Assistance to HBCU's

During FY 1997, all NASA Installations and JPL provided technical assistance to HBCU's through a variety of supporting arrangements including: 1) travel by NASA personnel to HBCU's; 2) travel of HBCU faculty to NASA Installations and JPL; 3) participation in career fairs; 4) implementation of cooperative education programs; and 5) establishment of internships for students and summer jobs for HBCU faculty. In FY 1997, MURED conducted the following agencywide workshops: 1) Achieving the Vision: Science and Technology Excellence at Morgan State University; 2) Strategic Implementation Planning in Albuquerque, New Mexico; and 3) Program Review and Planning Meeting in Washington, DC. Technical assistance workshops were conducted at NAFEO Conferences in Washington, DC and Hilton Head, South Carolina to improve financial management of MURED grantees. While providing the technical assistance, NASA worked closely with other organizations such as the Congressional Black Caucus, Gulf Coast Alliance for Minorities, National Physical Science Consortium, National Association for the Advancement of Colored People, National Society of Black Engineers, National Sponsored Programs Administrators Alliance of HBCU's, Inc., and the National Technical Association.

Small and Disadvantaged Businesses (SDB) Utilization

In FY 1997, outreach to include HBCU's in all SDB initiatives continued with participation in: (1) The Quarterly High-Tech Forums, which are jointly sponsored with the Office of Aeronautics; (2) The NASA Mentor-Protégé Program; and (3) The Small and Disadvantaged Business Training Program. For NASA, HBCU's are included in the expanded definition of SDB's by Public Law 101-144/507.

During the Quarterly High-Tech Forums, four HBCU's presented their technical capabilities to NASA Installation management and prime contractors. In April 1997, at the Lewis Research Center, Clark Atlanta University (CAU) presented information on their capability in theoretical physics, engineering, advanced materials, high performance polymers and ceramics, molecular biology, and genetics. Also at Lewis, Tennessee State University focused on its research in neural networks, intelligent controls, environmental engineering, design methodologies and energy systems. In July 1997, at the Langley Research Center, staff of Norfolk State University's Center for Materials Research presented a number of its research efforts and Hampton University personnel focused on research capabilities in laser and optical physics, atmospheric science, material science and technology and fiber optic technology.

In FY 1997, CAU became the first HBCU to enter the NASA -Protégé Program as a protégé to United Space Alliance (USA) under the Space Flight Operations contract at JSC. USA provides developmental assistance to CAU in space flight science, software technologies and business management and development to increase their high-tech expertise. This assistance will increase CAU's expertise and position them to participate in Agency contracts and subcontracts. During the first year of the 3-year relationship, USA awarded an initial subcontract to CAU for \$450,000. Anticipated subcontracts may equal or exceed \$820,000.

NASA FIELD INSTALLATION SUMMARIES

Ames Research Center (ARC)

ARC reported a highly successful HBCU program in FY 1997. The highlight of the year was a first-ever Minority Institution Showcase that included representatives from HBCU's. During the 2-day conference, professors and administrators spotlighted the capabilities of their institutions, gained increased knowledge of ARC's capabilities, and met in intimate settings with their ARC counterparts for technical exchanges. The Showcase resulted in new opportunities for collaborations and new grant awards. ARC increased its FY 1997 awards to HBCU's to more than double its FY 1996 awards. The improved performance reflects the renewed commitment and dedication of ARC management.

Dryden Flight Research Center (DFRC)

During FY 1997, numerous cooperative relationships between DFRC and HBCU's were initiated and expanded by the Center. DFRC continued its participation in recruitment activities at various HBCU's--Prairie View A&M University, Tuskegee University, North Carolina A&T State University, Spelman College, and Morehouse College. Two students from Prairie View A&M were selected as Student Trainees-Engineering during FY 1997. DFRC continues to support the NASA Training programs, Spelman College's Women in Science and Engineering (WISE) and Morehouse College's Strategic Preparedness, Advancing Careers in Engineering/Sciences (SPACE) by allocating funding to support six undergraduate students, four Spelman scholarships and two Morehouse scholarships.

Goddard Space Flight Center (GSFC)

One of the goals of GSFC is to encourage scientific interests and informed career choices for undergraduate and beginning graduate students by providing informational, motivational, and participatory research experiences. During FY 1997, GSFC has transferred the mission operations of the Solar, Anomalous and Magnetospheric Particle Explorer (SAMPEX) satellite to Bowie State University (BSU) under the Partnership Awards program. The aim of the effort is to develop and staff with students, a satellite control center on the campus of BSU. Phase I of the effort introduced BSU to satellite operations by constructing a telemetry monitoring facility, and by providing one full-time position, which is responsible for the daily operations of the Center, all coordination with the GSFC Small Explorer (SMEX) Flight Operations Team and the training of the student operations team. This innovative partnership is progressing on schedule, and holds promise for further collaborations of this type.

Jet Propulsion Laboratory (JPL)

In FY 1997, JPL continued implementing programs to achieve the goals of strengthening the capability of HBCU's to provide quality education and to conduct first-rate research. Although JPL supported a total of 10 HBCU's, a major portion of the funding went to support four universities--Clark Atlanta University, Florida A&M University, North Carolina A&T State University, and Prairie View A&M University. More than half of the funding focused on efforts to strengthen research and development programs at five institutions including Jackson State University. Also, through the Minority Fellowship Program, Summer Faculty Fellowship Program, Cooperative Education Program, and minority summer internship program, JPL enhanced the capabilities of minority faculty to contribute to accomplishing NASA's mission.

Johnson Space Center (JSC)

JSC continued to develop a successful and vital link with HBCU's in implementing Executive Order 12677. During FY 1997, two NASA Centers of Excellence were transferred to JSC: (1) NASA Center for Food, Production, Processing, and Waste Management in Closed Environment Life Support System (CFESH) at Tuskegee University; and (2) Space Medicine and Life Sciences Research Center (SMLSRC) at Morehouse School of Medicine. JSC supported nine different HBCU's in FY 1997 and provided support to eight different HBCU's in high level peer-reviewed projects. Many faculty and students continue their training at their respective institutions at JSC-sponsored symposia and conferences, and three JSC civil servants served under the Intergovernmental Personnel Act (IPA), including one Career Plus Program retiree.

Kennedy Space Center (KSC)

KSC continues to reach out to HBCU's to involve academia in its technology transfer and commercialization and outreach processes. During FY 1997, KSC initiated several new HBCU research grants, along with a consortium of four college/university partnerships to provide specific assistance to the Technology Program and Commercialization Office. During FY 1997, the Center again increased the number of students participating in its summer internship program. Many of these students were from HBCU's. Plans are to continue to reach out and include HBCU's in the Graduate Student Researchers Program and Summer Faculty Program as well. KSC continues its efforts to gain greater participation from HBCU's in its programs.

Langley Research Center (LaRC)

LaRC initiatives to assist HBCU's during FY 1997 are in support of NASA's Strategic Enterprises in scientific and engineering programs. The Center hosted the first-ever Minority Institutions of Higher Education Research Strategies and Funding Opportunities

Workshop attended by more than 85 university presidents, deans, professors, program directors, and principal investigators representing 35 HBCU's. The LaRC Office of Education and Norfolk State University hosted the Preservice Teacher Education Conference (over 200 attendees representing 23 HBCU's and OMU's) for the third consecutive year. In addition, the Cooperating Hampton Roads Organizations for Minorities in Engineering (CHROME) was awarded the 1997 Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring in a White House ceremony.

Lewis Research Center (LeRC)

LeRC strives to be recognized as a premier Research and Development (R&D) organization which utilizes and rewards the skills and talents of all people, to the fullest extent possible. LeRC's funding goals for HBCU's in FY 1996 were a minimum of \$3.67 million in research grants and \$0.49 million in fellowships, internships, student tuition, facilities and other aid. LeRC awarded 48 research grants to 19 HBCU's for a total of \$5.32 million for FY 1997. In the area of training, internships, fellowships, student tuition, etc., LeRC awarded a total of \$0.45 million. The continuous success of LeRC's HBCU funding of research grants was due to the commitment of top LeRC management and adoption of a Lewis plan for HBCU's. Excellent cooperation, coordination, and interfacing among LeRC managers and researchers resulted in the outstanding achievement of LeRC's goals and objectives.

Marshall Space Flight Center (MSFC)

During FY 1997, researchers at MSFC established and nurtured partnerships that enhanced peer-reviewed in-house research and concurrently helped develop infrastructure, students, and faculty at participating HBCU institutions. Participating institutions included: Alabama A&M University; Fisk University; Tuskegee University; Spelman College; Southern University; and Tennessee State University. During FY 1997, MSFC also received six partnership awards with three HBCU institutions. Other forms of interactions with HBCU's included employee involvement on student academic committees, student and faculty tours to Center laboratories, and technical exchanges through seminars. Additionally, during FY 1997, 24 students from five HBCU's participated in a 10-week summer intern program where they were teamed with MSFC scientists and engineers working in many of the Center's laboratories.

Stennis Space Center (SSC)

SSC not only reached its goal of maintaining the current level of funding of research grants at HBCU's at 10 percent of the Center's total R&D expenditures, but significantly exceeded that goal. In FY 1997, HBCU's received 22.9 percent of the total SSC R&D funds awarded. Programs for undergraduate students have been maintained with four HBCU's. A new program for student interns was started at Jackson State University. In addition, campus

presentations on SSC R&D activities were made at seven HBCU campuses and visits for outreach activities were made to four HBCU campuses.