N85-28849

FINAL REPORT

SUMMER HIGH SCHOOL APPRENTICESHIP
RESEARCH PROGRAM (SHARP)
OF THE
NATIONAL AERONAUTICS
AND
SPACE ADMINISTRATION

CONTRACT NASW-3838/3-83-1-6010

Prepared by:

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September 28, 1984

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September 28, 1984

Dr. Curtis Graves
Deputy Director for Academic Services
Division of Public Affairs
National Aeronautics and Space
Administration
Room 6049
400 Maryland Avenue, SW
Washington, D.C. 20546

Dear Curtis:

We are pleased to submit this Final Report for the 1984 Summer High School Apprenticeship Research Program (SHARP). As the Final Report demonstrates, this year's SHARP Program was very successful.

Overall, the Program was strengthened and expanded. Detailed guidelines were developed, six more students participated than last year, a newsletter was established, uniform short and long term evaluation instruments were introduced, and recommendations were made for improving the Program. The Program continued to select top notch students and offer them challenging opportunities to learn, earn, and contribute to NASA's research agenda in science and engineering. As a result, the SHARP Program is primed and ready for another year.

We enjoyed working with you and all the other talented and dedicated people involved with SHARP.

Sincerely yours,

Alfred E. Bryan
Managing Director

Leslie A. Jackson
Program Manager

Enclosure

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EXECUTIVE SUMMARY

A total of 125 talented high school students had the opportunity to gain first hand experience about science and engineering careers by working directly with a NASA scientist or engineer during the summer. This marked the fifth year of operation for NASA's Summer High School Apprenticeship Research Program (SHARP). Ferguson Bryan served as the SHARP contractor and worked closely with NASA staff at Headquarters and the eight participating sites to plan, implement, and evaluate the Program.

The main objectives for the program year were to strengthen SHARP and expand the number of students in the Program. These eight sites participated in the Program: Ames Research Center North, Ames' Dryden Flight Research Facility, Goddard Space Flight Center, Goddard's Wallops Flight Facility, Kennedy Space Center, Langley Research Center, Lewis Research Center, and Marshall Space Flight Center.

Design. One of the principal tasks undertaken to satisfy the objectives just mentioned was the development of a set of detailed guidelines for those responsible for managing the Program at the national and center levels (i.e., the management team). The SHARP Guidelines covered program plans, delivery, administration, evaluation, and reports. Although the guidelines have proven to be very useful, they will need to be revised at least once a year.

Delivery. The annual SHARP Planning Conference, which was held February 23-25, 1984, in Washington, D.C., was attended by 17 management team members. Most of the Conference was devoted to presentations and discussions on last year's Program and a critique of this year's Guidelines. A Planning Conference Report was prepared.

Each center developed its own Center Plan for the Program and recruited and selected high school students with an interest in and aptitude for science and engineering careers. The students took part in a challenging eight to ten week paid research apprenticeship. After an orientation period, the students spent 80% or more of their time in the laboratories working on their research projects with their mentors. The rest of the time was spent on reports, counseling, field trips, and other enrichment activities.

The composition of the group was as follows:

Females	58%
Males	42%
Minorities	70%
First Time SHARP Students	86%

From 1983 to 1984, the number of students increased from 119 to 125 -- an increase of six students or 5%.

Other tasks undertaken included the development of a Press Kit and a General Information Kit for use by the management team. Also, about 80 colleges and universities identified by this year's students received information about SHARP and the students. The goal of this pilot task was to expose selected colleges and universities to SHARP and get them to send information to the students about their undergraduate science and engineering programs.

Administration. Ferguson Bryan provided administrative support that facilitated the planning, implementation, and evaluation of SHARP. Key administrative policies and procedures were detailed in the SHARP Guidelines.

To improve communications within the Program, the SHARP Newsletter was inaugurated. Two issues (June and August) were written, printed, and distributed to students, mentors, and management team members. Monthly progress reports were submitted and quarterly progress meetings were held in Washington, D.C.

Evaluation. The End-of-the-Program Evaluations showed that each group involved in SHARP -- students, NASA program staff, NASA mentors, faculty coordinators, and others -- felt very positive about the Program and wanted to see it continue and expand.

The Follow-Up Survey on SHARP students from 1980 to 1983 revealed that 88% of the students who were in college were majoring in science or engineering; and three of the four students who have just graduated (75%), have earned degrees in science or engineering. For all SHARP classes, high percentages of students are continuing to work and study in the areas of science and engineering.

Recommendations on Transferring SHARP Experience beyond NASA Centers. The question has been raised about what NASA should do for high school students who do not live within commuting distance of a NASA center. Two options for transferring the SHARP experience to them are discussed below.

1. A Work-Study Exchange Program. This program would be tied into the existing high school student exchange program and the existing SHARP Program. Students who do not live within commuting distance of a NASA center would live with host families at the centers of their choice. These students would pay their own long distance travel expenses, receive a wage or stipend for their work in the NASA laboratories, and take credit work at a local high school.

2. A Residential Program. This program would be operated at one or more NASA centers with appropriate housing accommodations. Students would not pay for long distance travel, room, or board; and they would not receive any pay for time spent in the laboratories. The existing SHARP Program would continue in its present form.

It is recommended that the NASA SHARP management team discuss the feasibility of these and other options for transferring the SHARP experience beyond NASA centers at the next SHARP Planning Conference.

Recommendations for SHARP '85. The only recommendation is that the annual planning conference be held in October or November so as to allow each center to start its planning for SHARP as early as November or December.

In conclusion, we are pleased to say that the objectives of strengthening and expanding SHARP have been satisfied. Everyone associated with SHARP -- especially the students, mentors, and management team -- should feel proud and should be congratulated for maintaining the high standards of excellence for which SHARP has become noted.

I. INTRODUCTION

The 1984 Summer High School Apprenticeship Research Program (SHARP) began October 14, 1983, and ended September 28, 1984. This marked the SHARP Program's fifth year of providing talented high school students with an opportunity to gain first-hand experience about science and engineering careers by working directly with a NASA scientist or engineer during the summer. Eight NASA sites participated in SHARP:

1. Ames Research Center North
2. Ames' Dryden Flight Research Facility
3. Goddard Space Flight Center
4. Goddard's Wallops Flight Facility
5. Kennedy Space Center
6. Langley Research Center
7. Lewis Research Center
8. Marshall Space Flight Center

A total of 125 students participated in paid research apprenticeships at these sites. Ferguson Bryan served as the contractor for the Program. Contract staff worked closely with NASA staff at Headquarters and the eight participating sites to plan, implement, and evaluate the Program.

At the outset, the primary objective for the program year was to strengthen SHARP and expand the number of students in SHARP, building on the accomplishments of the last four years. NASA's Division of Public Affairs identified the following priorities for SHARP:

1. Improved program planning.
2. More capabilities for disseminating program information.
3. A comprehensive, uniform evaluation of program costs and benefits.

The 1984 program year was to be a year of fine tuning an established and successful program.

In this final report, you will see that, overall, these objectives and priorities were achieved. The remainder of the report is divided into these sections:

II. Design

III. Delivery

IV. Administration

V. Evaluation

VI. Recommendations on Transferring SHARP Experience Beyond NASA Centers

VII. Recommendations for SHARP '85 and Conclusions

VIII. Appendix

This report includes material from the Centers' Final Reports submitted at the end of the program year. The next section of the report, Design, describes the SHARP Guidelines.

II. DESIGN

Ferguson Bryan decided that one of the most effective ways to respond to the SHARP objectives and priorities just discussed would be to develop a set of detailed program guidelines for those responsible for managing the Program at the national and center levels (the management team). After consulting in person with key management team members at Headquarters and in the field, Ferguson Bryan prepared a set of draft guidelines, entitled, Guidelines for the National Aeronautics and Space Administration's Summer High School Apprenticeship Research Program.

The Guidelines opened with a statement of the SHARP concept, a description of how to use the guidelines, and a glossary of terms. Specific guidance and examples were provided for these areas:

1. Program Plans;
2. Program Delivery and Administration;
3. Program Evaluation and Reports.

A representative page from the Program Plans section of the Guidelines is shown in Exhibit 1 at the end of this section. The Guidelines concluded with an appendix that contained samples, blank forms, and address lists.

Considerable time and effort were devoted to the development of the Guidelines. The initial draft was critiqued by the management team during the SHARP Planning Conference in February, 1984. After that, the Guidelines were revised, approved, and distributed to each management team member for use during the rest of the program year. The Guidelines will need to be revised at least once a year. Revisions should be made as necessary to reflect changes in policies, procedures, forms, examples, names, addresses, and telephone numbers, for example.

EXHIBIT 1: REPRESENTATIVE PAGE FROM SHARP GUIDELINES

2.1 Objectives, Components, and Organization Chart

NATIONWIDE OBJECTIVES

DESCRIPTION

The nationwide objectives of SHARP for this fiscal year are to:

1. Introduce and expose 125 talented, under-represented minorities and women at the high school level to scientific and engineering careers at NASA through a structured work experience with a NASA scientist or engineer.

2. Strengthen the Program through improved planning, dissemination of information, and evaluation of costs and benefits.

3. Expand SHARP to include more students.

As a result of this career exploration program, these students will be better able to make decisions about science and engineering careers on the basis of first-hand information and experience.

TASKS (T) AND DELIVERABLES (D)		LEAD PERSON*	SCHEDULE
T-1	Review existing nationwide objectives, with input from headquarters and centers	Contractor Program Manager	Oct
T-2	Recommend and finalize nationwide objectives for new FY	Contractor Program Manager	Nov-Jan
D-1	Nationwide objectives (as part of Guidelines)	Contractor Program Manager	Nov 30 (Draft) Jan 31 (Final)

ADDITIONAL INFORMATION

Each center or facility will have its own set of objectives, as will be explained later.

* Recommended lead or primary responsibility

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III. DELIVERY

This section of the final report covers three areas: A. Planning Conference, B. Summer Program, and C. Public Information.

A. Planning Conference. The annual SHARP Planning Conference was held earlier than usual to provide a longer planning and start-up period at the center level. This year, the Conference was held in Washington, D.C., at NASA Headquarters, from February 23 - 25, 1984.

A Planning Conference Information Guide was prepared and sent to management team members before the Conference. The Guide included registration, travel, hotel, and agenda information. A total of 17 people attended, representing NASA Headquarters, Ames Research Center, Ames' Dryden Flight Research Facility, Kennedy Space Center, Langley Rsearch Center, Lewis Research Center, Marshall Space Flight Center, and Ferguson Bryan. During the Conference, attendees reported on last year's program, shared experiences, and critiqued the draft SHARP Guidelines. A Planning Conference Report was prepared and submitted after the Conference.

B. Summer Program. Each Center developed its own Center Plan for its summer program, in accordance with the SHARP Guidelines. The Centers recruited and selected students who demonstrated an interest in and aptitude for science and engineering careers. A profile of the students who participated in SHARP '84 is presented in Exhibit 2 at the end of this section.

After an orientation period, the students spent 80% or more of their time in the laboratories, working on their research projects with their mentors. The rest of the time was sent on reports, counseling, field trips, and other enrichment activities. A center by center list of students, projects, career interests, mentors, and management team members is shown in Exhibit 3 at the end of this section. You'll find a one page summary of each Center's summer program in the Appendix.

C. Public Information. Two information kits were developed and included in the SHARP Guidelines for use by all management team members. The first kit was a Press Kit and the second a General Information Kit. The kits could be used as they were or could be modified or supplemented to meet a particular need. Several Centers decided to issue news releases and did receive coverage in the local media. Ferguson Bryan distributed the General Information Kit to individuals and organizations interested in learning more about SHARP.

Ferguson Bryan initiated a pilot activity to let a number of colleges and universities know about SHARP and all of the 1984 students, so the students could get additional information about educational opportunities in their fields of interest. A letter and information sheets were sent to the undergraduate deans of science and engineering at 80 colleges and universities identified by this year's students. The deans were asked to send information on their educational programs to the students. A copy of the two letters sent is included in the Appendix.

EXHIBIT 2: PROFILE OF SHARP '84 STUDENTS

CENTER	NUMBER OF STUDENTS 1984	NUMBER OF STUDENTS 1983	INCREASE NUMBER	INCREASE PERCENT
AMES NORTH	20	20	0	0
AMES' DRYDEN	10	10	0	0
GODDARD	25	25	0	0
GODDARD'S WALLOPS	5	5	0	0
KENNEDY	10	10	0	0
LANGLEY	15	14	1	7.1
LEWIS	20	20	0	0
MARSHALL	20	15	5	33.3
TOTAL	125	119	6	5.0

SEX	NO.	PERCENT
Female	72	57.6
Male	53	42.4
TOTAL	125	100.0
ETHNICITY		
Hispanic Origin	6	4.8
Not of Hispanic Origin	119	95.2
TOTAL	125	100.0

RACE	NO.	PERCENT
American Indians or Alaskan Natives	2	1.6
Asians or Pacific Islanders	19	15.2
Blacks	60	48.0
Whites	38	30.4
Others	6	4.8
TOTAL	125	100.0
PROGRAM STATUS		
New or First Time	108	86.4
Returning	17	13.6
TOTAL	125	100.0

EXHIBIT 3: SHARP '84 STUDENTS, MENTORS, AND MANAGEMENT TEAM

A total of 125 students at eight sites worked on their summer projects under the careful supervision of their mentors and management team members, as noted below.

Ames Research Center North (Mountain View, CA)

Apprentice	Project	Career Interest	Mentor
1. Aguilar, James	Telecommunications Research	Electrical Engineering	Robert Gibson
2. Aochi, Julie	Life Science Flight Experiments	Undecided	Henry Leon
3. Bakas, George	Theoretical Studies	Astrophysics	Bruce Smith
4. Brazill, Derrick	Biomedical Research	Chemical Engineering	Howard Nelson
5. Caffee, Sean	Simulator Development	Electronic Engineering	Robert Reutte
6. Dalrymple, Melinda	Theoretical Studies	Undecided	Bruce Smith
7. Elsea, Louise	Life Science Flight Experiments	Electrical Engineering	Henry Leon
8. Felix, Seth	Telecommunications Research	Engineering	Robert Gibson
9. Hall, Yvette	Biomedical Research	Engineering	Patricia Cowi
10. Hathorn, Sadie	Telecommunications Research	Engineering	Robert Gibson
11. Hwang, Cynthia	Theoretical Studies	Astronomy	Bruce Smith
12. Kao, Gloria	Chemical Research	Electrical Engineering	Robert Rosser
13. Ko, Kenneth	Extraterrestrial Research	Electrical Engineering	Robert Wharton
14. Majumdar, Mousumi	Extraterrestrial Research	Biological Research	Robert Wharton
15. Ornealas, Daniel	Aircraft Systems	Aerospace Engineering	Victor Ross
16. Shem, Bruce	Space Operations	Aeronautical Engineering	David Tristra
17. Short, Kendra	Systems Development	Undecided	Bruce Benjamin
18. Taira, Brent	Aircraft Guidance and Navigation	Engineering	William Nedell
19. Tucker, Eleanor	Extraterrestrial Research	Engineering	John Billingham
20. Wong, Alton	Aerospace Human Factors Research	Astronaut Program	Mike McGreevy

Management Team : John Leveen, Employee Development Office; Garth Hull, Educational Services Officer; B. Michael Donahue, Educational Services Officer; Patricia Powell, Faculty Coordinator

Ames' Dryden Flight Research Facility (Edwards, CA)

Apprentice	Project	Career Interest	Mentor
1. Grabhorn, Sandra	Structure Analysis	Engineering/Math	Dr. Kajah Gupta
2. Hutzler, Trina	Flight Operations	Biochemistry/Ecology	William Albrecht
3. Inouye, Stephanie	Calibrations for Tranducers	Systems Analysis	Darla Duke
4. Lansgaard, Daniel	Oblique Wing Calibration	Engineering	Robert Curry
5. Schreier, Cindy	Computer Program Conversion	Astrophysics	Neil Matheny
6. VanNorman, Micheal	Artificial Intelligence	Electrical Engineering	Dale Mackall
7. Williams, Angela	X-29 Simulator Work	Business	Trindel Maine
8. Wisehart, Daniel	Battery Analysis	Engineering/ Astronomy	Alphonzo Stewart
9. Yates, Johnnie	Controlled Impact Demonstration	Medicine	Terry Montgomery
10. Yeganeh, John	Thermal Analysis of Shuttle Wing	Science	Dr. William Ko

Management Team : Harold Washington, Assistant Chief, Flight Support; Robert Garza, Faculty Coordinator

Goddard Space Flight Center (Greenbelt, MD)

Apprentice	Project	Career Interest	Mentor
1. Barnum, Stacey	Earth Resources	Engineering	Emmett Chappelle
2. Bugg, Michael	Planetary Aeronomy	Astronaut Program	Larry Wharton
3. Burnett, Leon	Systems Development and Analysis	General Science	Frank McGarry Betsy Edwards
4. Byrd, Carlton	Severe Storms	Engineering	Ida Hakkarinen Joseph Steranka
5. Chestnut, Shirlita	Atmospheric Chemistry	Electrical Engineering	Dr. Jack Kaye
6. Craigen, Rhea	Information management	Biomedical Engineering/Medicine	Henry Linder Carey Noll
7. Darby, Iris	Experiment Engineering	Engineering	Dean Smith Jay Smith
8. Exum, Cecil III	Operations Scheduling Support	Biomedical Engineering	John Semyan James Ridgby
9. Ficklin, Chon	Space Science Data	Engineering	Dr. Joseph King
10. Fowler, Angela	Laboratory for Planetary Atmos	Astronomy and Chemistry	Harry Taylor
11. Freeman, Kevin	Telecommunications and Data Base	Astronomy and Computer Science	Clarence Ackerson Curtis Emerson
12. Howard, Otis	Spacecraft Component Development and Analysis	Electrical Engineering/ Public Accounting	Stan Oleundorf
13. Jordan, Carl	Extraterrestrial Physics	Biomedical Engineering	Dr. Bertram Donn
14. Kerr, James Jr.	Systems Acquisition	Engineering/ Computer Science	Patrick Hennessy
15. King, Dawan	Materials Control and Review	Pediatrics	Frederick Gross
16. LaGrand, Lisa	Altitude Determination Control	Computer Systems Analysis	Gary Meyers William Struthers
17. Mayes, Robert	Astrochemistry	Physical Science	Dr. Peter Wasilewski
18. Minor, Bryan	Space Science Data	Obstetrics/ Gynecology	Steve Peregoy Dr. Joseph King
19. Phillips, Keith	Advanced Missions Analysis	Aerospace Engineering/ Astronaut Program	Dr. Enrico Mercanti
20. Risher, Michael	Project Operations	Electrical Engineering/ Linguistics	Roger Tetrick
21. Russell, Patricia	Astronomy and Solar Physics	Aerospace or Biomedical Engineering/Patent Law	Dr. Jaylee Mead Dr. Carol Crannell
22. Stone, Claudine	Control Center Systems	Computer Systems Analysis	Paul Ondras
23. Williams, Kathleen	Interplanetary Physics	Chemistry/ Engineering	Dr. Keith Ogilvie Len Burlaga
24. Williams, Michael	User Terminal and Location Systems	Electrical Engineering/Computer Science	Dr. Chopo Ma
25. Woodland, Stephanie	Atmospheric Chemistry	Business	Wm. Jay Massman Dr. Jack Kaye

Management Team : Elva Bailey, Educational Programs officer; Cyn Hadnott, Faculty Coordinator

Student Aide : Mar-jeau Barrett

Goddard's Wallops Flight Facility (Wallops Island, VA)

Apprentice	Project	Career Interest	Mentor
1. Collins, Jacqueline	Wind Tunnel Program	Business Admin.	Jimmy Gladding
2. Cropper, Lisa	Laser System Computer Program	Computer Science	Bob Tittle
3. Mayonado, Susan	Plans for Directional and Identification Signs	Architecture	Harland Scholl
4. Norman, Steven	Analysis of Aircraft Fuel	Pharmacology Medicine	John Murrell
5. Tingle, Natalie	Comparison of Satellite Meteorological and Rocket Data	Computer Science	Frank Schmidlin

Management Team : Joyce Milliner, Public Affairs

Kennedy Space Center (Florida)

Apprentice	Project	Career Interest	Mentor
1. Baker, Julie	Program for Basic 09	Engineering	Glen Seaton
2. Boucher, Darnell	Water Absorption on Titanium Tiles	Math/Physics	Ray Gompf
3. Cronin, Nancy	Front End Processor Software	Electrical Engineering	Tom Fleming
4. Devereaux, Ann	Fiber Optics Computer Program	Physics	Mike Padgett
5. Goodwin, Nancy	Blood Calcium Ions	Biology/Math	Mary Frye
6. Holt, Eric	Computer Software	Computer Math	Mike Seay
7. Lee, Linda	Land Spreading of Waste Water Effluent	Chemistry	Ross Hinkle
8. Long, Eva	Land Spreading of Treated Chemical Waste	Mathematics	Ross Hinkle
9. Semmel, Glen	Building a Computer for Telemetry	Computer Math	Al Ordonez
10. Sheth, Bela	Hydrazine Detection in Water using Chromatography	Material Chemistry	Lee Underhill

Management Team : Raymond Corey, Education Program Officer; June Buchanan, Student Programs; Barbara Grant, Faculty Coordinator

Langley Research Center (Hampton, VA)

Apprentice	Project	Career Interest	Mentor
1. Anderson, Denise	Advanced Transport Operating System (ATOPS)	Engineering	Gil Haynes
2. Collins, William	Polymeric Films	Mechanincal/ Aeronautical Engineering	Dr. Edward Long
3. Damsky, Leslie	Management Info. Sys. Programs	Systems Analysis	Jeff Cleveland
4. Danforth, Pamela	Earth Radiation Budget Experiment	Space Science	Michelle Taylor
5. Gray, Stephanie	Electronirradiated Ultem Polyethermide Film	Engineering	Sheila Long
6. Gutierrez, Andrew	Computerized Gas Chromatograph (GC)	Engineering	David Schryer
7. Hudgins, Joy	Temperature Tunnel Computer Program	Mechanical Engineering	John Karns
8. Minder, Melissa	Gallium Arsenide Superlattice Structures	Aerospace Engineering	Dr. Charles Byvik
9. Parkany, Ann	Polar Stereographic Map Computer Program	Engineering	Marvin Clemmons
10. Poyner, Karin	Model Deformation Measurement	Chemical Engineering	John Franke
11. Reagan, Sandra	Fiber Optics Technology	Mathematics	Herbert Hendricks
12. Sermons, Horace	Testing Pressure Sensor Modules	Engineering	Michael Mitchell
13. Smith, Jaime	Biogenic Production of Atmospheric Oxides of Nitrogen	Aeronautical Engineering	Dr. Joel Levine
14. Tran, Bao-Nga	Transonic Cryogenic Tunnel Computer Program	Engineering	David Dress
15. Veal, James	ASD Color Graphics System	Engineering	Mark Shipham

Management Team : Gary Price, Public Affairs; Roger Hathaway, Education Specialist; Walter Darden, Jr., Faculty Coordinator

Lewis Research Center (Cleveland, OH)

Apprentice	Project	Career Interest	Mentor
1. Alvarado, Daisy	Combustion Research	Computer Engineering	I. Lopez
2. Austin, Loretta	Icing Research	Computer Engineering	H. Neumann
3. Blair, Janet	Micro Processing	Aeronautical Engineering	S. Levine
4. Buckner, Sherry	Chemical Research	Chemical Engineering	D. Briehl
5. Chang, Martin	Architectural Design	Architectural Engineering	D. Lauderdale
6. Don, Anna	Computer Programming	Engineering	Q. Lee
7. Garrett, Michael	Turbo Engine Research	Computer Engineering	T. Spalvins
8. Hill, Isaac	Inlet Research	Chemical Engineering	A. Bishop
9. Johnson, Tonya	Aircraft Research	Electrical Engineering	C. Zola
10. Kirby, Kammie	Electron Research	Computer Engineering	C. Chamis
11. Long, Andre	Centaur Mission	Aeronautical Engineering	T. Wickenheiser
12. Mahar, Kelly	Tribology Research	Aeronautical Engineering	D. Brewe
13. Molson, Terence	Composites Research	Computer Engineering	C. Chamis
14. Morgan, Sharyn	Engine Research	Computer Engineering	B. Steinetz
15. Nudelman, Eric	Computer Programmer	Computer Engineering	L. King
16. Oliver, Denise	Rotor Dynamics Research	Chemical Engineering	J. Cawley
17. Radford, Jameel	Solar Cell Research	Electrical Engineering	V. Weizer
18. Rosario, Virgilio	Energy Cells Research	Computer Engineering	R. Leon
19. Sanchez, Antoinette	Materials Research	Electrical Engineering	R. Jech
20. Winters, Rodney	Photo Lithography	Electrical Engineering	W. Williams

Management Team : Lynn Bondurant, Educational Services Officer; Judy Budd, Educational Services Office; Glendell Nailing, Faculty Coordinator

Marshall Space Flight Center (Huntsville, AL)

Apprentice	Project	Career Interest	Mentor
1. Bailey, Trevor	Man/Systems Integration	Medicine	Fred Sanders
2. Bone, Theodora	Operations Planning and Analysis	Engineering/ Computer Science	Gloria Hullett-Smith
3. Butler, Melanie	Optical Systems	Engineering/Medicine	James Bilbro
4. Cross, David	Metallurgical and Failure Analysis	Engineering/Medicine	James Burka
5. Doyle, Tracey	Solid State Devices	Engineering	Frank Szofran
6. Ellison, Darrin	Materials Selection Control	Engineering/ Accounting	Joseph Scollard
7. Hancock, Michelle	Experiments and Components Test	Aeronautical or Chemical Engineering	Herman Kesler
8. Hatchett, Ollie	Flight System Analysis	Mechanical Engineering	William Maynard
9. Hawkins, Felicia	Instrumentation	Undecided	Edward Wells
10. Helba, Michael	High Energy Physics	Physics	Charles Meegan
11. Howard, Scott	Solar Sciences	Electrical Engineering	Ernest Hildner
12. Johnson, Pamela	High Energy Physics	Research and Engineering	Martin Weisskopf
13. Kakani, Lakshmi	Magnetospheric Physics	Biomedical Engineering	Paul Craven
14. Killough, Graham	Aerodynamic Analysis	Mechanical Engineering/ Computer Science	Paul Ramsey
15. Massey, Gregory	Electronic Packaging	Electrical Engineering	James Kaufmann
16. Myers, Virginia	Lab Support	Engineering	Roy Taylor
17. O'Neal, Dawne	Optical Systems	Biomedical and Electrical Engineering	Donald Griner
18. Parker, Charla	Systems and Payloads Tests	Computer Science/ Engineering	Robert Klinger
19. Thomas, David	Solidification Process	Chemical Engineering	D. Frazier
20. Williams, Sonja	Electrical Power	Engineering/ Medicine	J. Lanier

Management Team : C. Donald Bean, Director of Personnel; Clyde Foster, Director, Equal Opportunity Office; George Newby, Personnel Office; Jimmy Pruitt, Education Specialist; Evalyn Humphrey, Faculty Coordinator

IV. ADMINISTRATION

In this section of the final report, the following areas are presented: A. Work Schedule, B. Administrative Support, C. Monthly Progress Reports, and D. Quarterly Progress Meetings.

A. Work Schedule. The twelve-month Work Schedule has been completed, with the exception of the final Financial Management Report (Form 533M), which will be completed and submitted before October 15. See Exhibit 4 at the end of this section.

B. Administrative Support. Ferguson Bryan provided administrative support that facilitated the planning, implementation, and evaluation of the SHARP Program. Key administrative policies and procedures were detailed in the SHARP Guidelines.

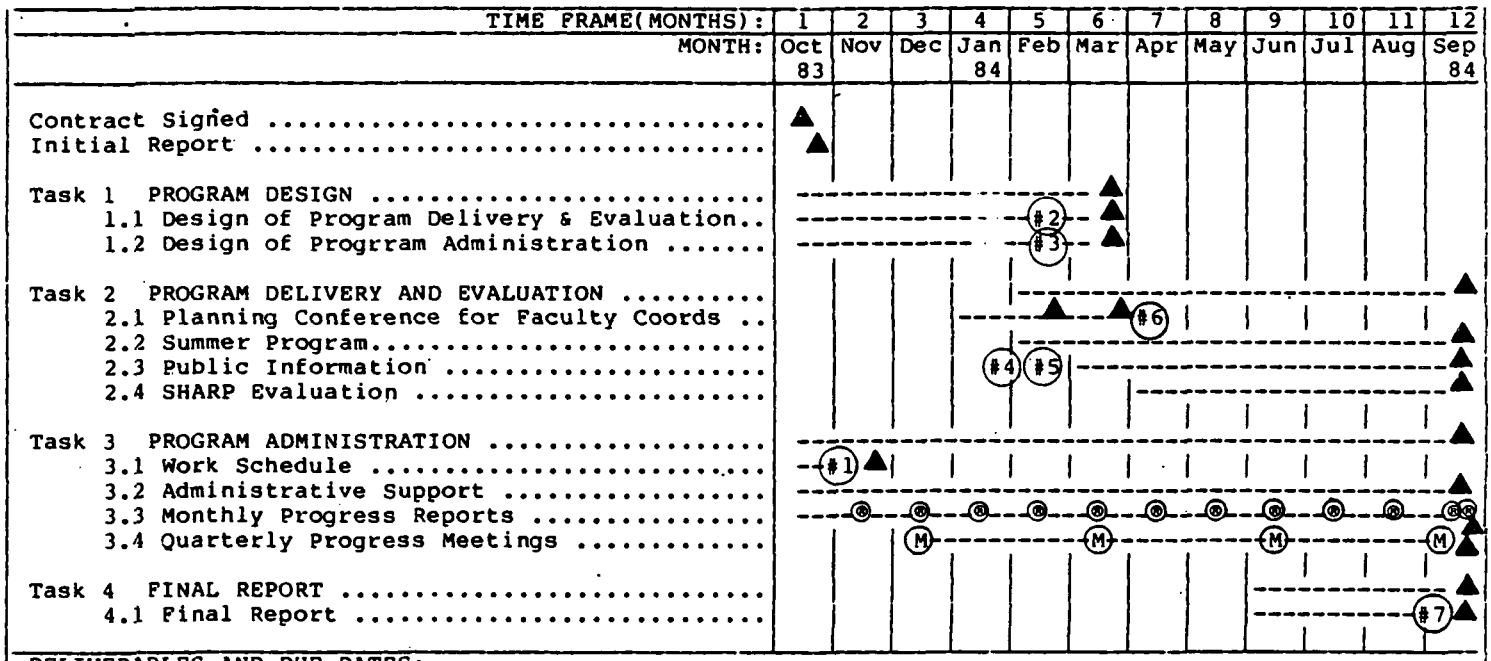
The SHARP Newsletter was inaugurated this summer; two issues (June and August) were written, printed, and distributed. The Newsletter is intended to be primarily an internal communications vehicle to allow the various people involved in SHARP at different sites to keep in touch with each other.

C. Monthly Progress Reports. Ferguson Bryan prepared monthly progress reports that summarized programmatic and adminstrative actities, accomplishments, and problems, along with budget information on SHARP.

D. Quarterly Progress Meetings. NASA and Ferguson Bryan representatives met quarterly in Washington, D.C., to discuss work completed and planned, as well as specific opportunities and problems related to SHARP that needed to be addressed.

EXHIBIT 4: SHARP '84 WORK SCHEDULE

SHARP 1984 WORK SCHEDULE
(Revised 2/27/84)



DELIVERABLES AND DUE DATES:

- #1 Work Schedule (Subtask 3.1): November 11, 1983
- #2 Program Delivery & Evaluation Designs (Subtask 1.1): February 21, 1984
- #3 Program Administration Designs (Subtask 1.2): February 21, 1984
- #4 Press Kit (Subtask 2.3): February 21, 1984
- #5 General Information Kit (Subtask 2.3): February 21, 1984
- #6 Planning Conference Report (Subtask 2.1): April 6, 1984
- #7 Final Report (Subtask 4.1): September 28, 1984
- ⊗ Monthly Progress Reports and Monthly Fin. Mgmt Reports (Form 533M): 15th of Month
- M Progress Meetings with NASA Technical Officer at NASA Headquarters: Quarterly

V. EVALUATION

Two types of evaluation of the SHARP Program were conducted during the year. The first was an End-of-the-Program Evaluation completed by those involved with the 1984 Program. The second was a Follow-Up Survey on SHARP students from 1980 to 1983. These evaluations are discussed below.

A. End-of-the-Program Evaluation for 1984. The benefits and costs of this year's SHARP Program and specific ratings and comments are summarized in Exhibit 5 at the end of this section. The composite evaluation picture that emerged was that not only were the objectives of strengthening and expanding the Program achieved, but also the research apprenticeships were quite beneficial and successful. One measure of the success of the Program was the two most frequently made comments by students, staff, and mentors alike: First, the number of weeks in the Program should be expanded; and second, the number of students should be expanded. By and large, those involved in SHARP felt very positive about the Program and wanted it to continue and expand.

B. Follow-Up Survey. The accomplishments and career paths of students who participated in the Program from 1980 to 1983 are summarized in Exhibit 6, at the end of this section. Of the 345 students surveyed, 217 or 63% responded. Of the 138 students who indicated they were in college, 121 or 88% were pursuing science or engineering college degrees. And finally, another encouraging early indicator of the Program's success is that three out of the four students who indicated that they have graduated from college have received a degree in science or engineering.

EXHIBIT 5: END-OF-THE-PROGRAM EVALUATION SUMMARY FOR 1984

Benefits

- 125 talented high school students were exposed to science and engineering careers at NASA; 87 of the 125 (69.6%) were minorities; and 72 of the 125 (57.6%) were women.

- The Progam was strengthened through improved planning, dissemination of information, and evaluation of costs and benefits (Planning Conference, Guidelines, Center Plans, Newsletter, Information Kits, frequent oral and written communications, and uniform evaluations).

- The number of SHARP students was slightly expanded from 119 students in 1983 to 125 this year -- an increase of 6 students or 5%.

- Many NASA projects received valuable research assistance, once again.

- This year's SHARP Program has helped reach the long term goal of increasing the pool of potential applicants for future NASA employment in the fields of science and engineering.

Costs

- The average NASA payroll cost (direct labor and fringe benefits), for student employmees was $139.40 per week per student; students worked from 8 to 10 weeks during the summer, depending on the the site.

- The average cost per student for contract support was $1,999.39 per student for the program year.

EXHIBIT 5: (continued)

Ratings and Comments

Rating Range: E = Excellent, VG = Very Good, A = Average, B.A. = Below Average, P = Poor

QUESTIONS:	STUDENTS	NASA PROGRAM STAFF	NASA MENTORS	FACULTY COORDI-NATORS	OTHERS
• What overall rating would you give the Program?	E	E	E	E	E
• How would you rate the overall effectiveness of the Faculty Coordinator?	E	E	E	E	E
• How would you rate the overall effectiveness of the Mentors?	E	E	VG	E	E
• What was the level of interest and enthusiasm shown by the SHARP students for the Program?	E	E	VG	E	E

Selected Comments

- SHARP is a great program.
- The Program is too short. Students should be able to work one or two more weeks or continue in the fall.
- More students should be added to the Program.
- Reduce the paperwork (evaluations, for example).
- Do a better job of matching students and mentors.
- Make sure mentors have a plan for student projects.
- Arrange for alternate mentors, if mentors are away on vacation or field trips.
- Revise and shorten the evaluations forms.

EXHIBIT 6: FOLLOW-UP SURVEY SUMMARY FOR SHARP '80 to '83

	SHARP CLASS YEAR			
	80	81	82	83
1. RESPONDENTS				
a. Number of apprentices in survey	73	109	74	89
b. Number of survey respondents	39	64	47	67
c. Number of survey non-respondents	34	45	27	22
d. Percentage responding (1b/1a)	53	59	64	75
2. EDUCATION				
a. Number of high school graduates	38	64	47	67
b. Number currently in college	35	59	43	1
c. Number currently in college with science or engineering majors	31	54	35	1
d. Percentage with science or engineering majors (2c/2b)	89	92	81	100
e. Number of college graduates	3	1	N/A	N/A
f. Number of college graduates with science or engineering majors	2	1	N/A	N/A
g. Percentage graduates with science or engineering majors (2f/2e)	67	100	N/A	N/A
3. EMPLOYMENT				
a. Number employed last 12 months (excluding SHARP)	34	59	45	57
b. Number employed in science or engineering	16	38	20	33
c. Percentage employed in science or engineering (3b/3a)	47	64	44	58
4. AWARDS AND OTHER ACCOMPLISHMENTS				
a. Number who won one or more awards, honors, etc.	26	44	23	65
5. CAREER PATH				
a. Number who have made a career decision	33	57	43	60
b. Number decided on science or engineering career	26	50	37	54
c. Percentage in science or engineering (5b/5a)	79	88	86	90
6. OVERALL VALUE OF SHARP				
a. Number that checked "Somewhat helpful"	2	2	0	1
b. Number that checked "Helpful"	10	19	6	8
c. Number that checked "Very Helpful"	16	23	23	26
d. Number that checked "Extremely Helpful"	5	12	12	25

Selected Comments

- This program is absolutely and undeniably valuable as well as enjoyable. The contacts made are invaluable and add to the overall experience. Thank you for providing the program and doing the excellent job required to maintain it.

- My experiences and interests in the engineering field came about because of SHARP. If it was not for SHARP, I probably would still be undecided in my major.

- Even though I have chosen to major in a non-technical field, the work experience gained from my summer at NASA was invaluable. I feel a strength of character and a desire to learn and much of this is directly attributable to the encouragement gotten from the program.

VI. RECOMMENDATIONS ON TRANSFERRING SHARP EXPERIENCE BEYOND NASA CENTERS

SHARP has been a successful program so far, as just shown in the Evaluation section. However, the question has been raised about talented high school students who do not live within commuting distance of a NASA center for facility. What should NASA do for them? This section offers some ideas on transferring the SHARP experience beyond NASA centers.

A. Background and Assumptions. NASA is an agency that needs the best and brightest minds to tackle the challenges of advanced aeronautics and space exploration. Currently, NASA has about 24,280 permanent and temporary workers. As NASA Administrator James Beggs has said, "We need to search more aggressively for women, minorities, and handicapped individuals who are intelligent, skillful, innovative, and inquisitive. For these are the kinds of people we need to meet the challenges of tomorrow."

In reality, the challenge of tomorrow is going to be met today, in large part. The NASA work force is maturing; last year, the average age incresed to 44.5 years. Approximately 9% of NASA's scientists and engineers and 19% of its managers are eligible to retire today. Who will take the place of these people? Today's scientists, engineers, and managers who have

some experience. And who will eventually take their place? Today's hires. Today's hires will be among the scientists and engineers who attempt to equal or exceed the outstanding accomplishments of the agency's first 25 years. But they will be successful only if they are ready for the challenge. SHARP is a feeder program that is helping high school students get ready for this challenge.

In its first five years, SHARP has exposed over 500 students to science and engineering careers. Let's assume 75% of these 500 go on to earn a degree in science or engineering. That leaves a pool of 375 potential NASA employees. And let's assume that 10 to 20 percent of that pool will go to work for NASA over a five-year period, starting in 1985. That means about 8 to 15 participants from the SHARP Program will be added to the NASA work force each year. Of those new additions to the NASA work force, many will be women and minorities. This will represent a small but significant contribution to NASA's mission and personnel needs both today and in the future. Naturally, these are educated guesses and we really don't know yet what the results of the SHARP Program will be. The longitudinal survey (follow-up survey) will permit us to estimate and track the results.

We can also speculate about what would happen if the SHARP experience were to be transferred to high school students

living outside of a center's commuting radius. It would be safe to say that the broad benefits to be reaped from such an initiative would be as follows:

1. Make a research apprenticeship experience in science or engineering more accessible to all eligible U.S. citizens, wherever they may live.

2. Stimulate interest in and enthusiasm for NASA's mission on a wider and deeper scale.

3. Enrich and enlarge the pool of potential employees in the long term.

These benefits would be to the mutual advantage of the nation's young people and NASA.

B. Options. Two options for transferring the SHARP experience beyond NASA centers are described below.

1. Work-Study Exchange Program.

This program would be tied into the existing high school student exchange program and the existing SHARP Program. High school students would apply to the NASA center of their choice. Those who were accepted and lived outside the commuting area would be placed with a host family. In addition to working in a research laboratory, the student would take credit course work, (e.g., math) at a local high school. Since the student's high school at home is tied into the program, the student could particpate during the school year or summer and receive credit also. The student would pay his or her travel to the NASA center and receive a wage or stipend for work performed at the center.

2. Residential Program

This program would be located at one or more NASA centers with appropriate housing accommodations. High school students would be selected from all over for a summer research apprenticeship program. The students would not have to pay for long distance travel, room, or board; and they would not receive any pay. The existing SHARP Program would continue in its present form.

These descriptions are presented to illustrate possible directions and to stimulate thinking and discussion on the subject.

C. Recommendation. It is recommended that the NASA management team discuss the feasibility of these and other options for transferring the SHARP experience beyond NASA centers at the next SHARP Planning Conference and decide on the appropriate next steps at that time.

VII. RECOMMENDATIONS FOR SHARP '85 AND CONCLUSIONS

Only one recommendation is made for the 1985 program year:

Hold the annual planning conference in October or November.

Because evaluations and impressions of the prior year will still be fresh in everyone's minds at that time of year, the management team should be in the best frame of mind to consider changes to the Guidelines and other important matters. Also, an earlier planning conference would allow each center to start its planning work as early as November or December with clear, definite program information in hand.

For SHARP, the 1984 program year was a year of fine tuning an established and successful program. SHARP has been strengthened and expanded, as planned. Everyone associated with SHARP -- especially the students, mentors, and management team members -- should feel proud and should be congratulated for maintaining the high standards of excellence for which SHARP has become noted.

VIII. APPENDIX

Summaries of the 1984 SHARP Program at Participating Centers

Ames Research Center (Mountain View, California)

Twenty science/mathematics oriented high school students particpated in a ten-week NASA-Ames Research Center sponsored program during the summer of 1984 (June 11 - August 17, 1984).

Five years ago in October 1979, President Carter signed an Executive Order appropriating special funds for SHARP. President Reagan, recognizing the inherent merits of SHARP, gave it his seal of approval for continued success by re-funding SHARP. Pursuant to the President's directive, Ames Research Center (ARC) conducted its fifth SHARP for minority youth.

The objective of SHARP is to recognize high school juniors who have demonstrated unusually high promise for success in mathematics and science. Students who were accepted to participate in this 10-week summer program earn as they learn. Twenty academically talented students who will be seniors in high school in September were chosen to participate in SHARP "84." Mentors were selected to provide students with "first-hand" experiences in a research and development environment in order that each student may "try out" his or her tentative professional career choice. The student trainees in SHARP made important and very significant contributions to the ongoing research here at ARC, as well as providing additional staff where needed. Some special features of SHARP included field trips to private industries doing similar and related research, special lectures on topics of research here at ARC, individual and group counseling sessions, written research papers and oral reports, and primarily the opportunity to be exposed to the present frontiers in space exploration and research.

The space age has seen the frontiers of knowledge and technology extended beyond the wildest dreams of our forefathers. Today's science fiction will seem commonplace in the twenty-first century. The engineer of today and tomorrow will face incredible and fascinating challenges. SHARP has as its purpose the goal of enabling women and minorities to be a vital part of the engineering team that will solve these challenges. The long-range goal of SHARP is to contribute to the future recruitment of needed scientists and engineers.

Ames' Dryden Flight Research Facility (Edwards, California)

Ten science/math oriented high school students participated in an eight week NASA/Dryden Flight Research Facility sponsored program (SHARP Program) during the summer of 1984 (June 13 - August 10, 1984). These students represented schools within commuting distance of Dryden and came highly recommended by their school guidance counselors and teachers. The students were selected on the basis of grades, course work, and teacher and counselor recommendations. Other factors considered were career interests, PSAT scores, and profitability from participation in the program. This was the fourth such program conducted at Dryden.

While at Dryden, each participant worked under the mentorship of an engineer on projects currently under study by NASA. The program objective was to provide them with a working and learning experience in a laboratory environment which would give the student apprentices a deeper and broader appreciation for engineering, science, and technology, leading to a stimulation of their interest in the development of career choices.

In addition to the laboratory work, the apprentices were exposed to enrichment activities that included guest lectures, film reviews, field trips, simulated aviation and computer training, and group/individual counseling sessions.

Culminating their work-study experiences, the apprentices reported the results of their research projects in a formal setting to lab directors, branch chiefs, and mentors, as well as invited guests. Their reports were prepared under the guidance and supervision of their mentors, with assistance from the faculty coordinator. Included in their presentations (oral and written) were numerous, positive illustrations of how participation in this program influenced their career plans and aspirations.

Goddard Space Flight Center (Greenbelt, Maryland)

Twenty-five science and math oriented high school students participated in the eight-week NASA/Goddard Space Flight Center in Greenbelt, Maryland. The program dates were June 25 - August 17, 1984. These students represented school districts in Washington, D.C., Montgomery County, Prince Georges County, Howard County, and Baltimore City. They were assigned mentors in the areas of engineering, related sciences (e.g., atomospheric chemistry, earth resources, and geology), Systems Analysis, Data Center, Telecommunications, and the Computer Sciences branches. This was the fifth year with the SHARP Program here at Goddard.

As an apprentice here at Goddard Space Flight Center (GSFC), the student is exposed to the operation of complex technical professional occupations. The mentor serves as a rôle model, and from the mentor, the student gains valuable information regarding a tentative career choice. They learn about specific skills and training requirements and experience "real" on-the-job demands, such as, proficiency, work scheduling, meeting deadlines, and successful interpersonal relationships.

In addition to the laboratory work, the apprentices were exposed to enrichment activities that included field trips, career day (which included films, speakers, and a panel), small group seminars, and individual counseling sessions.

Climaxing their apprenticeship experiences, the students reported the results of their research projects in a formal setting to GSFC lab directors, branch chiefs, mentors, school administrators, and parents. Their reports were poster presentations (which include their objective for the summer and other pertinent information) that they presented orally at the VIP night on August 14, 1984.

The overall experience expands the students frame of reference and presents new possibilities and significant challenges that will favorably influence the eventual career choice or choices.

Of the twenty-five participants, 17 were new to SHARP and 8 returned from last year. Of the eight returnees, six have completed the SHARP Program and are enrolled at leading universities. These include: University of Maryland at Baltimore, Cornell University, University of Pennsylvania, University of Virginia, George Washington University, and Howard University.

The other two returnees are seniors at their respective high schools. They are eligible to return again next year.

Goddard's Wallops Flight Facility (Wallops Island, Virginia)

Five high school students took part in the 1984 NASA Summer High School Apprenticeship Research Program (SHARP) at Wallops Flight Facility. The students were assigned to a research laboratory and worked under the supervision of a NASA scientist or engineer.

In addition to their laboratory work, the students prepared reports and took field trips. The Program concluded with a SHARP VIP night, featuring student presentations, remarks by Dr. Curtis Graves of NASA's Division of Public Affairs, and the awarding of certificates.

Kennedy Space Center (Florida)

Ten academically talented students in math and science particpated in the fifth annual program at Kennedy Space Center. These students commuted daily from Orange, Seminole, and Brevard Counties with travel distances as great as 62 miles one way.

The program at Kennedy Space Center began on June 18, 1984. Each student was assigned a mentor in the area of his/her interest. The mentors provided "hands-on" expriences with the assignment of research projects. Students worked with their mentors 4 and 1/2 days a week, resulting in 90% of their time being spent in research and the remaining 10% being spent in enrichment activities. These activities included a trip to Huntsville, Alabama, to visit the Marshall Space Flight Center; a six-week Youth Leadership Program sponsored by the KSC Toastmasters, several film reviews; and seminars given by several NASA personnel.

Kennedy Space Center is in the process of making a video tape on the SHARP Program. The tape will be carried to various schools and shown to the counselors and teachers, who are very important in the pre-selection process of the SHARP students.

The program concluded on August 10, 1984, with the closing ceremony on the fourth floor of Headquarters Building. The program included oral presentations given by the students, presentations of certificates, special awards, and a luncheon. The guests included Science Supervisors, NASA personnel, parents of the SHARP students, and mentors.

The exposure to the "real world" of science and technology received by these students has been an enriching experience that will be valuable to them throughout the remainder of their individual educational programs.

The long range goal of SHARP is to contribute to the future recruitment of needed scientists and engineers. Several students have stated that their work at Kennedy Space Center has made a tremendous impact on their future careers. Many have now decided to pursue the engineering field.

Langley Research Center (Hampton, Virginia)

Fifteen high school students participated in the 1984 NASA Summer High School Apprenticeship Research Program (SHARP) at Langley Research Center, Hampton, Virginia, for eight weeks (June 18 - August 10, 1984). The students represented high

schools in the Greater Hampton Roads area (Hampton, Newport News, Poquoson, Mathews County, Portsmouth, Chesapeake, Williamsburg, and York County).

Each student was assigned to a research laboratory environment and supervised by a mentor in the student's career interest area. In addition to laboratory experiences, the students were exposed to enrichment activities which included guest lectures, on-center tours, simulated aviation, computer demonstrations and training, and group/individual counseling sessions.

The students reported, formally, the results of their research activities to their branch personnel, program staff and participants, and Langley Research Center personnel. Included in each report were data collections and analyses, graphs, illustrations, as well as sample models of their work.

During the final week of the Program, a career orientation and analysis session was presented. The session provided information about college experiences, college curricula, college funding, as well as general information which assisted the participants in furthering their educational and career goals. Participants in the Program included former SHARP participants, NASA cooperative education students, recently hired NASA employees, and the Personnel Office at Langley Research Center.

Lewis Research Center (Cleveland, Ohio)

Twenty science and math oriented high school students participated in a nine-week NASA Lewis Research Center (LeRC) sponsored program during the summer of 1984 (June 18 to August 17, 1984). These young people represented schools in the Cleveland-Cuyahoga County area and participated in a nine-week program as apprentices, each working directly under the supervision of an LeRC engineer or scientist. This was the fifth year that such a program was conducted at LeRC.

The program objective was to provide them with a working and learning experience in a laboratory environment which would give the student apprentices a deeper and broader appreciation for engineering, science, and technology, leading to a stimulation of their interest in the development of career choices.

In addition to the laboratory work, the apprentices were exposed to enrichment activities that included guest lectures from public and private universities, minority engineers and scientists, film reviews, career awareness programs, field trips, and various other types of academic explorations.

Culminating their work-study experiences, the apprentices reported the results of their research projects in a formal setting to lab directors, branch chiefs, and mentors, as well as to school system administrators, counselors, teachers, parents, and other guests. Their reports were prepared under the guidance and supervision of their mentors, with assistane from the Faculty Coordinator. Included in their presentations (oral and written) were numerous positive illustrations of how participation in the program influenced their career plans and aspirations.

All of the student apprentices came highly recommended by their school principals, school counselors and/or school teachers, and all had attained outstanding scholastic records, with high aptitude in science and mathematics.

The SHARP Program at NASA LeRC has been successful in providing high school students with an in-depth exposure in research and development and it has been successful in stimulating and motivating their interest in science and engineering.

Marshall Space Flight Center (Huntsville, Alabama)

Twenty science/math oriented students from schools of the Huntsville-Madison County area have participated in a two-month program as apprentices, each working directly under the supervision of a Marshall Space Flight Center (MSFC) engineer or scientist.

The program objective was to provide them with a working and learning experience in a laboratory environment. Out of this experience, the students would gain a broader appreciation for engineering and science, leading to a stimulation of their interest in the development of career choices.

In addition to the laboratory work, the apprentices were exposed to enrichment activities that included guest lectures, film reviews, field trips, computer training, and counseling group sessions. During their study sessions, the apprentices wrote articles, kept a daily journal, and conducted interviews of their student advisors (mentors). The articles written led to the publication of the students' Newsletter, Abstracts, and Research Papers.

The apprentices also hosted a day-long visit from the Kennedy Space Center (KSC) SHARP apprentices and their faculty coordinator. This activity included an extensive tour with

briefings of the Marshall Center; and, an opportunity to view the films: "Flyers," and "Hail! Columbia," on the Omnimax screen in the SpaceDome at the Alabama Space and Rocket Center Museum. A brief tour of the museum concluded the KSC apprentices' visit.

Culminating their work-study experiences, the apprentices reported the results of their research projects in a formal setting to MSFC lab directors, branch chiefs, the mentors, school system administrators, counselors, and parents. Their reports were prepared under the guidance and supervision of their student advisor with assistance from the faculty coordinator (FC). Included in their presentations (oral and written) were numerous, positive illustrations of how participating in this program influenced their career plans and aspirations.

All of the student participants came highly recommended by their school principals and/or school counselors and all have outstanding scholastic records.

This is the fourth summer the program has been conducted at the George C. Marshall Space Flight Center. The SHARP program has helped to satisfy a need to provide indepth exposure in research and development to today's youth in an effort to stimulate and motivate their interest in science, engineering, mathematics, and related disciplines.

NASA

National Aeronautics and
Space Administration

Washington, D.C.
20546

Reply to Attn of:

LFC

Dean
Undergraduate School of Engineering

Dear Dean:

NASA operates a Summer High School Apprenticeship Research Program (SHARP) for select students who have demonstrated an aptitude for and interest in science and engineering careers. In this program, students get first hand experience in their field of interest by working directly under the supervision of a NASA scientist or engineer. This experience helps them with their career decisions and advancement. We would like for you to send information on your undergraduate programs to the students who participated in the 1984 SHARP Program.

A total of 125 students took part in the eight week SHARP Program in which only students with strong academic and extracurricular backgrounds were selected. Almost all of this year's outstanding students are now high school seniors. SHARP is especially designed to attract under-represented minorities and women into the fields of science and technology.

Enclosed you will find two lists. One has the career interests of each student; and the other has each student's address. Also included is an overview sheet on the 1984 SHARP Program. We feel the information you send the students will be helpful to them in making their career and school decisions.

Sincerely,

Curtis M. Graves

Curtis M. Graves
Deputy Director
for Academic Services

NASA

National Aeronautics and
Space Administration

Washington, D.C.
20546

Reply to Attn of:

LFC

Dean
Undergraduate School of Science

Dear Dean:

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