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JOHN H. BOECKEL and Dr. Nicholas M. Short of Goddard's Applications Directorate recently returned from a trip to Southeast Asia where they discussed the practical uses of the Earth Resources Technology Satellite with scientific and government leaders of several countries. Here Dr. Short (left) and Mr. Boeckel chat with Dr. Sanga Sabhasri (right), Secretary General of Thailand's National Research Council during a Regional Seminar on ERTS and Southeast Asia. For the story, see Page 4.

ERTS Second Anniversary

NASA's Earth Resources Technology Satellite (ERTS-1) passed its second birthday on July 23 and continues to return data that is proving increasingly valuable to the United States and some 50 other nations, especially underdeveloped countries. Launched in 1972 from the Western Test Range, ERTS-1 is gathering new and, in many cases, substantial cost-saving information about the Earth in the fields of agriculture, forestry, geology, oceanography, water resources, pollution, mapping, hydrology and land use.

This information is used by numerous state and federal government agencies as well as private industry and universities. In some cases, data from ERTS are being used on a daily or operational basis. For example, the Department of Interior's Geological Survey office in Miami, working with NASA's Goddard Space Flight Center, is using information daily from ERTS to provide federal and state agencies with data to make decisions on water needs for the Everglades, agricultural and urban areas. Goddard manages the ERTS project.

The U.S. Army Corps of Engineers has used ERTS to make a national dam inventory of all impoundments of 50 acre feet or more. The same type of information is being used by the Department of Interior's Bureau of Sports Fisheries and Wildlife to accurately assess the number of migratory waterfowl over vast areas of the U.S. and Canada. This information is important for establishing waterfowl regulations. Satellite estimating techniques appear to hold considerable promise for accurate assessment of waterfowl.

Data from the spacecraft has been used to develop a cartographically accurate map of the entire United States and base maps that meet the requirements of land use planning are being prepared from similar data.

(See Page 2)

Helios Survives Lead-melting Temperatures

Helios-A, the U.S.-German solar probe, recently passed a milestone in preparations for launch this fall when it withstood six days of high-temperature testing at California's Jet Propulsion Lab (JPL). Project managers Gilbert W. Ousley, Chief of Goddard's International Project Office, and Ants Kutzer of the West German Association for Space Exploration stated that the JPL facility is the only one capable of running the necessary tests.

During the tests in a 25-foot space simulator, scientists produced temperatures hot enough to melt lead. Parts of a prototype Helios reached a blistering 370 degrees Centigrade (700 degrees Fahrenheit) during six days of testing. The Helios was then declared ready for the extreme temperatures it will encounter in an unprecedented journey to within 28 million miles of the Sun. The first spacecraft, Helios-A, will be launched from Kennedy Space Center by the United States and West Germany next October. Helios-B, a second craft, is scheduled to be launched in late 1975.

The simulated solar radiation which Helios survived in the JPL vacuum was 11 times the solar intensity at the outer edge of the Earth's atmosphere. Space scientists refer to it as 11 suns. This 11-sun capability was achieved through an optical arrangement in which a 15-foot reflecting mirror was placed just above the half-way mark in the chamber. The mirror intensified heat on the spacecraft and intercepted light beams from a bank of 37 xenon-gas arc lamps which trained up to 800 kilowatts on the revolving spool-shaped spacecraft.

(See Page 2)

Pioneer Venus Mission

Five Goddard scientists have been chosen to work on teams which will provide experiments for two Pioneer spacecraft destined for Venus in 1978.

The teams, including one scientist each from France and Germany, were selected by NASA from 162 scientists who submitted proposals in response to a NASA invitation last year.

The Goddard scientists working on the missions are: Harry Taylor, Ion Mass Spectrometer experimenter for both the probe and orbiter missions; Siegfried Bauer, Participating Theorist for the probe mission; Hasso Niemann, Neutral Mass Spectrometer experimenter for the orbiter mission; Larry Brace, Langmuir Probe experimenter for the orbiter mission; and James Hansen, Cloud Photopolarimeter experimenter for the orbiter mission.

The primary objective of the twin missions is to study Venus and its environment. A detailed investigation of Venus' atmosphere and clouds will be conducted, which could obtain information leading to a better understanding of our own atmosphere. The Pioneer Venus project is managed by NASA's Ames Research Center, Mountain View, California.

The scientists will participate in experiments dealing with the composition and structure of the Venus atmosphere down to the surface, the nature and composition of the clouds, the circulation pattern of the atmosphere, and the radiation field in the lower atmosphere. The upper atmosphere and the magnetic and radiation environment of the planet will also be studied.

(See Page 2)

ERTS ANNIVERSARY . . . From Page 1

The satellite's imagery has proven especially useful in analyzing the Mississippi River watershed as well as the impact of floods from above St. Louis to New Orleans. Similar major river studies are underway or have been completed in other parts of the United States.

In the energy field alone, the effectiveness of ERTS in helping identify potential sources of energy by mapping geologic structures, revealing for the first time faults and lineaments not previously identified, is very promising.

By correlating these structures with known oil-bearing structures elsewhere, it is believed that geologists will be able to determine where new petroleum deposits may be located. The same principle is equally effective for other mineral deposits—iron ore, copper, etc.

ERTS imagery of Alaska has resulted in the discovery of six copper molybdenum prophyries (potential copper-bearing formations) in the Tanacross area near the Canadian border and two of them are being drilled, according to Dr. John Miller of the Geophysical Institute at the University of Alaska.

The lineaments are also being used in Alaska to identify potential sites for sizeable earthquakes. Knowing this is of great importance to future locations of dams, roads, port facilities, even the Alaska Pipeline new under construction.

In addition, the National Oceanic Atmospheric Administration's National Marine Fisheries Service has clearly demonstrated the feasibility of using ERTS data to predict fish distribution in the Gulf of Mexico. If perfected, the method will prove of great value to commercial fishermen in pinpointing areas of high probability for successful fishing as well as resources assessment.

In land use planning it has been demonstrated that ERTS can provide the necessary information to classify whole states, economically, quickly and repetitively for a fraction of the cost by conventional methods. For example, a color coded legend can show land use by urban, residential, woodland, commercial-industrial, high population density, low population density, agricultural, etc. in a matter of weeks and at very little cost compared to conventional methods. An area that took a year and $90,000 to classify in 1968, took one month and $3,000 in 1973 by using ERTS.

Agricultural uses of the spacecraft indicate that ERTS technology will make the existing crop sampling methods more efficient and provide better estimates of commodity production on the national and state levels.

Seventeen different agricultural classes were delineated in about 30 minutes by ERTS over the central valley of California which was far more detailed and timely than crop reporting methods now used by the Statistical Reporting Service of the Department of Agriculture. In Kansas, estimates of wheat acreage made from satellite imagery were 90% accurate.

New possibilities continue to be identified from the flow of data from ERTS even though the spacecraft no longer returns world-wide coverage, some five million square kilometers (two million square miles), daily because its two tape recorders are no longer functioning after two years in orbit. However, the imagery from its Multispectral Scanner, MSS, is still as good as the day it was launched and continues to transmit directly to ground stations in Canada, the United States and Brazil. Italy is also building a ground station to receive ERTS photos.

In addition, transmissions from Data Collection Platforms, DCPs, continue to provide important information on a regular basis on such things as water levels, air and water temperature, humidity, rainfall—even volcanic tremors from DCPs located on potentially erupting volcanoes in Central America and dormant ones in the United States.

General Electric Co., Valley Forge, Pa. built the spacecraft and Hughes Aircraft Co., Culver City, Calif. built the MSS.

The launch of a second Earth Resources Technology Satellite (ERTS-B) has been delayed until early 1975 because of the success of ERTS-1.

HELIOS TEST . . . From Page 1

The Helios prototype was spun on a JPL-designed turntable spindle at 60 revolutions per minute, simulating the spacecraft's strategy to keep from burning up as it nears the Sun.

The high temperature tests were conducted from April 28 through May 2. Other Helios tests in the simulator emulated less severe conditions near the Earth and en route to the Sun. The full testing period ran through May 10.

Previous high intensity simulated in the chamber was 6½ suns, achieved in testing Mariner 10 before its successful trip to Mercury earlier this year. Helios will travel at least ten million miles closer to the Sun than Mariner 10.

The JPL facility simulates the conditions of deep space, including the vacuum and extreme cold of space in addition to solar radiation. After a spacecraft is sealed in the chamber, pumps suck out the air to create a vacuum. Liquid nitrogen is pumped into the chamber walls to lower their temperature to a space equivalent to about minus 300 degrees Fahrenheit.

About 30 JPL technicians and engineers, and as many German Helios project employees, were involved in the tests.

PIONEER . . . From Page 1

Nine members of the team will serve as Participating Theorists, coordinating the various experiments and participating in the analysis of the returned information.

NASA will utilize two Pioneer-class spacecraft for the mission. One of the spacecraft will launch four scientific probes toward the surface of Venus and then enter the atmosphere itself, transmitting additional data to Earth until the spacecraft burns up.

The sister ship will have been placed in orbit around the cloud-shrouded planet about a week earlier to study the planetary conditions before entry of the probes.

The probe portion of the mission will utilize a bus, a large probe, and three small probes. The spacecraft will be spin-stabilized, use solar power, and will weigh, including probes, about 832 kilograms (1,850 pounds) at launch. The trip from Earth to Venus will take 125 days, and will include two or three mid-course maneuvers.

The large probe will take a little more than one hour to descend through the atmosphere. The small probes will fall freely to the surface. Their mission is designed to end when they reach the surface, almost 60 minutes after entry.

The bus will be targeted to enter the Venus atmosphere at a shallow entry angle and transmit data to Earth until it is destroyed by the heat of atmospheric friction.

Like its sister craft, the Venus orbiter will be spin-stabilized, use solar cells for power, and weigh about 517 kilograms (1,150 pounds) at launch. The trip from Earth will take about 190 days and will include two or three maneuvers.

At Venus, the orbit insertion motor will be fired to place the spacecraft in orbit. The orbiter will come as close as 200 kilometers (125 miles) to the planet's surface.

The spacecraft for the atmosphere probe is scheduled to be launched in May 1978, about three months prior to the launch of the orbiter. Both will arrive in the vicinity of Venus within a few weeks of each other in December, 1978.

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ATS-6 Experiments Begin

The sixth Applications Technology Satellite (ATS-6), launched on May 30, is now in full operations. With checkouts complete, a wide-range of complex communications and technology experiments have been turned on.

In its geosynchronous orbit, 35,680 kilometers above the equator, ATS-6 matches Earth's 24-hour rotational period and thus remains over a fixed point on the globe. It is presently positioned at 94 degrees west longitude on the equator, a point due south of Kansas City, where it commands a view of the entire United States.

The satellite's most critical elements are a nine-meter reflector antenna and a multi-frequency transponder. Through these two systems, ground controllers can relay high power levels to simple land, sea and air antenna receiver systems over a large geographical area.

Experiments turned on for demonstration or actual operation during the month of June include the TV Relay Using Small Terminals (TRUST) experiment, the COMSAT Propagation experiment, the Very High Resolution Radiometer, the Advanced Thermal Control Flight experiment, the Spacecraft Attitude Precision Pointing and Slewing Adaptive Control experiment, and the Radio Beacon experiment.

The first educational courses ever taught via space satellite television began on July 2 with the transmission of color video materials through ATS-6. More than 2000 graduate-level elementary school teachers located in eight Appalachian states are taking part in this experiment. Those successfully completing the courses will receive full credit from the University of Kentucky.

Then on July 10, the Veterans Administration began using ATS-6 to transmit weekly broadcasts of consultations, clinical and educational materials to ten VA hospitals in the Appalachian states, relatively isolated because of the mountainous terrain. In this project, programs originating in Denver, Colorado, are beamed to the satellite which serves as a "relay-broadcast station," sending the programs to the ten VA hospitals. Audio signals and slow-scan video images can be transmitted from the participating VA hospitals to the Denver studio, making possible active participation and consultation from all sites involved.

Other experiments activated in July include the Millimeter Wave Propagation experiment, the Radio Frequency Interference experiment, and the Indian Health Service program.

In September, the Federation of Rocky Mountain States will begin a series of TV programs via ATS-6 to remote areas of the country.

Later in the Fall, the Tracking and Data Relay Experiment will get underway following the planned launch of Nimbus-F.

JOHN M. THOLE (right), ATS Project Manager, chats with Dr. Kenneth R. Lokey, Associate Project Director of the Federation of Rocky Mountain States' "Satellite Technology Demonstration" experiment that will use ATS-6. Thole visited the Federation for a briefing on its efforts during his visit to Denver to participate in a press demonstration of the inauguration of the Veterans Administration's experiment on ATS-6.

CONSERVATION NOTES

Solar Protection

By David G. Lewoc
Assistant Chief
Plant Operations and
Maintenance Division

Solar protection is achieved by fastening a reflective Mylar film to the inside of windows with an adhesive. This film reflects 80 percent of the solar heat, which substantially reduces the amount of air conditioning required to cool the building.

Solar protection can be viewed on the windows of Buildings 1, 2, 6, 7, 12, and 16. When viewed from the outside, the windows resemble mirrors. From the inside, looking out, the film blocks approximately 50 percent of the light, which requires a little adjustment on the part of the office occupants.

The question is often raised that if solar protection blocks out 80 percent of the solar heat, surely more fuel must be used in the winter to heat the offices and that the solar heat would be an asset in heating offices during the winter, thereby decreasing the fuel usage. This reasoning, however, while appearing logical, is faulty in several aspects.

What occurs in reality *without* solar protection in the winter is as follows:

1. Hot water is circulated through the convector units in the building to provide heating.
2. The sun shines on the solar sides of the building.
3. The outside temperature reaches 32°F.
4. The heating to the solar sides of the building must be secured in order to keep the rooms from becoming too hot.
5. If the outside temperature reaches 44°F and the air conditioning is not activated, the occupants would become uncomfortably warm.
6. Therefore, at 44°F the main chillers at the Central Power Plant are activated and bring cool air to off-set the heat caused by the sun, the electrical lighting, and the heat which is generated by the area occupants. In addition, experience has shown that the chillers must go into operation when the outside temperature reaches 44°F or it is difficult after that point to cool the building down.

The important idea, here, is that with solar protection, not only is a little extra time bought should the sun come out unexpectedly, but the amount of cool air which is required to cool the building down is less with the solar protection than without it since there is no "catch-up" required. Ironically, then, the savings during the winter are achieved by reduction in air conditioning.

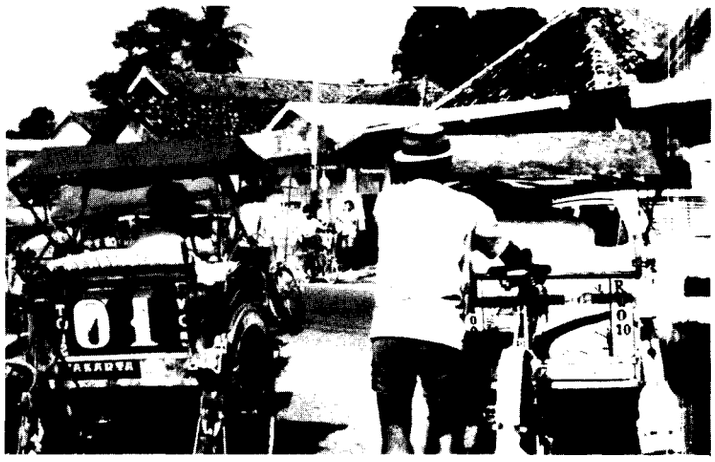
The west side of Building 7 can be used as an example as to how much savings are realized by using solar protection. There are 26 windows consisting of 27 square feet each in area for a total of 702 square feet. The solar load consists of 75 to 150 BTU/hour/square foot. Using an average of 100 BTU/hour/square foot, or 100 BTU/hour/square foot x 702 square feet = 70,200 BTU/hour, or approximately six tons per hour.

Boeckel, Short Discuss ERTS in Far East

John H. Boeckel, Assistant Director for Operations, and Dr. Nicholas M. Short, of the Earth Resources Branch, traveled to the Far East late this Spring to discuss the practical uses of the Earth Resources Technology Satellite (ERTS) with scientific and government leaders of several countries. The trip, sponsored by the U.S. Information Service, took them to Bangkok, Thailand, where they helped conduct a Regional Seminar on ERTS and Southeast Asia; Kuala Lumpur, Malaysia; Jakarta, Indonesia, for a busy schedule that included a Seminar on ERTS at the National Petroleum Ministry; and Singapore.

In addition, Dr. Short visited New Zealand and Australia where he discussed ERTS applications in geology, agriculture, forestry, and land use mapping.

Throughout their trip, Mr. Boeckel and Dr. Short found a high level of interest in the ERTS program. Both Thailand and Indonesia are currently using the data in important national programs. Every country expressed concern over the continued availability of satellite remote sensed data, and many are looking forward to the possibility of a continuing operational system.



PEDI-CABS such as these made touring Jakarta a pleasure.

DR. NICHOLAS SHORT (right) and John Boeckel became tourists for a day when they visited the Royal Palace in Bangkok.

SMALL RICE FIELDS such as these are common throughout the area toured by John Boeckel and Nicholas Short and illustrate one of the problems encountered in using ERTS for studying agriculture in Southeast Asia. The small field size (below the resolution capability of ERTS) and mixed states of maturity of the crops make classification and measurement by remote sensing impossible.

Standard Tape Recorder Contracts

NASA has selected Odetics Corporation, Anaheim, California, and RCA Corporation, Camden, New Jersey, for negotiation of contracts for design, development and fabrication of Standard Tape Recorders (STR's). The Odetics contract will cover STR's in the 10^9 (one billion) data bit storage range at an estimated cost of $4,000,000. The RCA contract will be for 10^8 (one hundred million) capacity STR's for an estimated cost of $600,000.

The two contracts are the first selections to implement a recently established NASA policy of promoting maximum commonality in hardware design. The object of this policy is to minimize cost and increase reliability. The recorders developed under these contracts will become "standard"—flight units of the same type will be used whenever possible for all future spacecraft requiring these sizes.

The Odetics award includes the supply of six 10^9 STR's for the Nimbus G spacecraft. It also covers fabrication of 24 of a 3.8 billion bit version for the Space Shuttle Orbiter. The 10^8 STR's in the RCA proposal are for future spacecraft.

The Goddard Space Flight Center, as the Lead Center for 10^9 and 10^8 recorders, will manage these contracts. The recorder development is part of the Standard Space Systems Program, directed by the Low Cost Systems Office (LCSO) at NASA Headquarters.

New ERTS Investigators Selected

Space satellite pictures will be used in a broad range of new studies of Earth's natural resources and man's use of them, NASA announced on July 12.

Investigations in the United States and 48 other countries will be conducted by 93 research teams in Federal, state, and foreign governments, international organizations, universities, and private companies.

The investigators will analyze remotely sensed data in the form of imagery or on magnetic tape from NASA's first Earth Resources Technology Satellite (ERTS-1), launched two years ago last month on July 23, 1972, and from ERTS-B, carrying the same sensors, which is expected to be launched early next year.

The studies, selected from 669 proposals, include work in eight disciplines or categories: Agriculture, forestry and range land; environment; interpretive techniques; land use; marine resources; Meteorology's mineral resources, oil, civil works, and hazards; and water resources.

More than half the domestic and three-fourths of the foreign investigations will demonstrate potential applications for operational use of Earth resources monitoring from space.

Data products will be furnished to the investigators through the Federal Data Centers operated by the Departments of Interior, Agriculture, and Commerce.

NASA will fund the domestic investigations at a cost of approximately $5.9 million. Foreign investigators will be supported by their own countries.

The new studies, called ERTS Follow-on Investigations, replace or extend approximately 200 domestic and 100 foreign investigations conducted with data from ERTS-1.

SUMMER PROGRAMS PART II

This is the second of a three-part series of articles featuring Goddard's 1974 summer programs. This issue features American University's program for outstanding high school students, Civil Service summer employees, and the Summer Aide Program. Coming up in September will be the Junior Fellowship Program, the National Aerospace Fellowship Program, and the Teachers' Workshops.

As summer approaches, most students daydream about Ocean City weekends, cross-country hitchhiking adventures, and sleeping until noon. Many students, however, choose instead to spend their summers working to gain valuable job experience, and often, to make money, too. At Goddard this summer, close to 200 high school students, college students, and faculty members have chosen the option to work.

HIGH SCHOOL STUDENTS WORK IN TECHNICAL JOBS

Atmospheric physics, the Small Scientific Satellite (S^3), and videometry of peculiar galaxies are just three of the projects that students are working on as a part of American University's 15th Summer Research Program for High Ability High School Students. This year's 11 participating students were placed in the Sciences, Engineering, and Applications Directorates.

Students applied for the program through their schools. Each applicant was required to submit two essays, one explaining why the student wanted to be in the program, and the other describing how the student had prepared himself for the future. Qualified students were then placed in various Washington, D.C., area agencies, such as Goddard, Gammaflux, the National Institutes of Health, and several others. Preference was given to high ability eleventh grade students.

The students work for experience only, receiving a 42-dollar stipend for transportation and costs. Two of the students, Michael Zedd and Robert Albin, received a larger grant from the National Space Club because they are in the program for the second time.

Missile and Satellite Systems (MASS) occupy Michael Zedd's time. Michael says he is trying to improve a new type of integration which is as effective as the old method, but takes less computer time. Elizabeth Likowsky is working with ERTS imagery. First, she explains, she maps stream basins from charts. Then, she maps the same basins from the ERTS imagery, comparing the two sets of results. Deborah Hamill and Bernard Penney work with computer programs, and Robert Albin is building a motor control for a tape recorder.

The students were introduced to Goddard on June 21 with a tour. A planetarium show is planned for August 15. On August 16, the students will return to American University where they and students who worked at other agencies will attend a seminar. Also on that day, the students from Goddard will meet and briefly tell each other about the projects they have been working on this summer. All of the students in the American University program are required to hand in a written report on their projects.

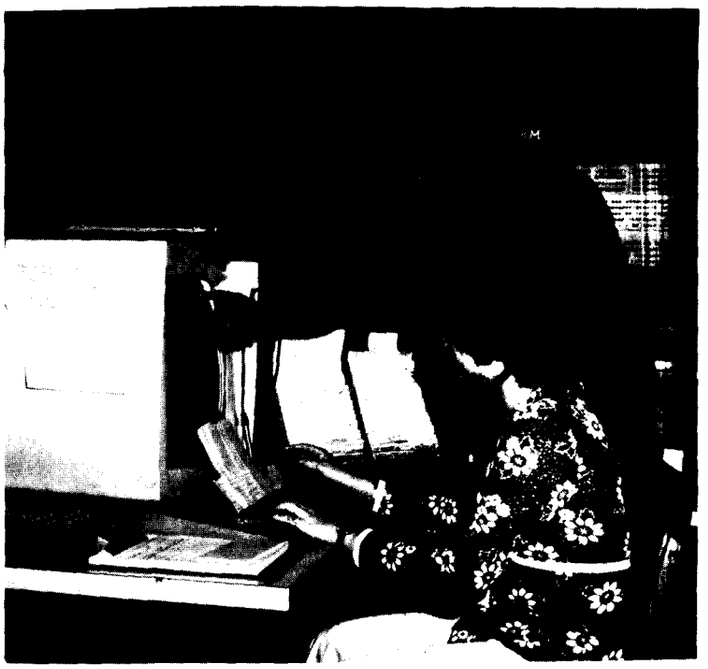
The program is made possible by a grant from the National Science Foundation and contributions from the Washington Academy of Sciences, the Washington Junior Academy of Sciences, the National Space Club, and the Chemical Society of Washington.

AMERICAN UNIVERSITY STUDENTS

Student	Supervisor
Robert Albin	Jack Hayes
Deborah Hamill	Dr. David Fischel
Philipp Hulcher	Dr. Bertram Donn
Mark Kruell	Dr. Robert Hoffman
Harry Layman	Mark Nolan
Elizabeth Likowsky	Albert Rango
Suzanne Page	Harry Taylor
Bernard Penney	Robert Chapman
Kevin Schmadel	Robert Hobbs
Young K. Sohn	Nathan Miller
Michael Zedd	James Barrowman

HIGH ABILITY HIGH SCHOOL STUDENTS are spending the summer at Goddard doing research as a part of a program sponsored by American University. Shown right are: (front row, from left) Elizabeth Likowsky, Bernard Penney, Deborah Hamill, Suzanne Page, Kevin Schmadel, Harry Layman, (second row) Robert Albin, Michael Zedd, Young K. Sohn, (third row) Philipp Hulcher, Mark Kruell, and Coordinator Delores Reeves of the Manpower Utilization Division.

SUMMER AIDE



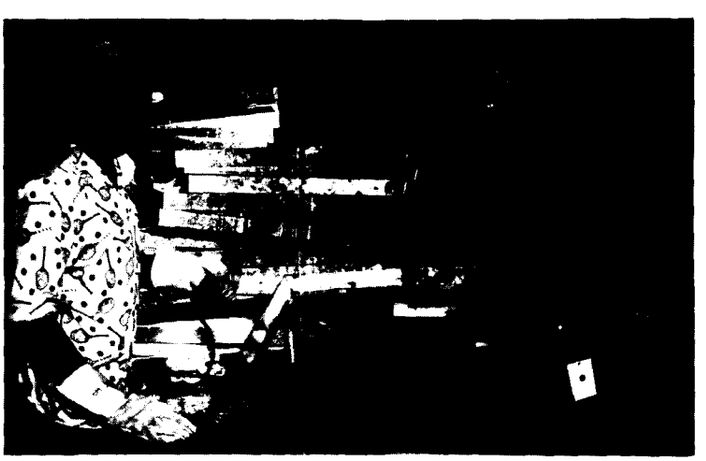
Experience is the keynote for 91 youth who are working at Goddard this year as summer aides. They develop good working habits and attitudes, broaden their career horizons, and earn money so they can continue their education or training. All of the aides are certified by the State Employment Office and most are paid the minimum hourly wage for ten weeks of work in the summer.

"The philosophy of the program is to give youth, aged 16 to 21, an opportunity to work in government agencies, to have meaningfull job experiences, plus an opportunity to make some money," comments Paul L. Jones, the summer aides' counselor. He emphasizes, "The major thrust of the program this year is to get as much on-the-job experience as possible." Another counselor is Marie A. Bowe, a graduate student at the University of Maryland who will enter the teaching profession this fall. Pernell Caple of the Personnel Services Branch is the coordinator of the Summer Aides Program, Homer Newton of the Science and Applications Computing Center acts as a special assistant, and Yulette Harley is secretary for the counselors.

Seventeen of the aides have returned from last year, 42 aides are newcomers to Goddard, and thirty-two were transferred from the Stay-In-School Program. Under the Stay-In-School Program, students work 16 hours a week while school is in session and are paid on a different salary scale from the rest of the aides.

The aides perform a wide variety of duties—everything from constructing filter holders out of sheet metal to handling the mail. Most of the occupations, however, fall into one of three basic categories: clerical, maintenance, or technical.

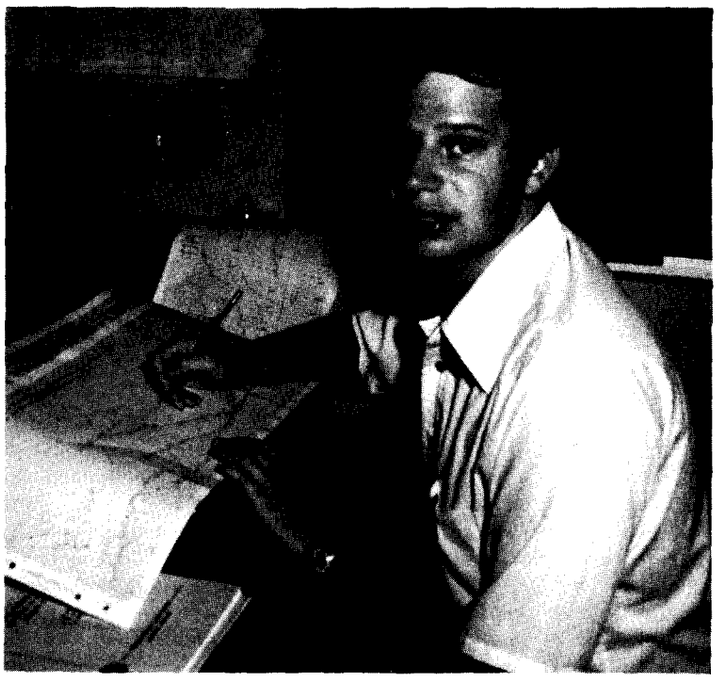
The clerical positions include secretaries, clerk-typists, mail handlers, messengers, library aides, and those who work in procurement and accounting. Maria Daley, a clerk-typist in the health unit, and Sherree Roberts, a clerk-typist for the Chief Counsel, have both returned for their third summer at Goddard.



SUMM

Galen Adams	Horace G
Curtis E. Allen	George E.
Frances J. Allen	Regina Ga
Brenda Austin	Phyllis Ga
Gerald Bacote	Diane Glo
Charles Barksdale	Charles H
Gay Beatty	Judy Harl
Edwin Bergstresser	Robin Har
Rodney Blackwell	Yulette T.
Pauline Blocker	Jennifer H
George Bowens	Caesar Ha
Deborah Bradford	Linda Hay
Marcus Brown	Jean Haye
Michael Burton	Michelle H
Phyllis Byrnes	Grace Hill
Brenda Carter	Clifton Hi
Hilda Carter	Robert Hc
Stephen Carter	Anthony
Patty Clark	Michele In
Daniel Crabill	Albert Jac
Yvette Craig	Debra Jack
Rene Crawford	Ronald A.
Sedrick Cox	Ronald L.
Harry Dakis	Oliver Jam
Esther Daley	Faith A. J
Maria Daley	Donald E.
Ivan Deloatch	Tracy Kni
Carl Doney	Lawrence
Linda Duvall	Bernet Le
Della R. Evans	Leslie Lob
Charles Fletcher	

GAIN EXPERIENCE



Thirteen summer aides are working in the Plant Operations and Maintenance Division. Greg Taylor and George Gantt are spending their summer making filters and sidings from sheet metals. Other maintenance jobs held by the aides include junior building engineers, carpenter's helpers, plumber's helpers, painter's helpers, and elevator repair helpers.

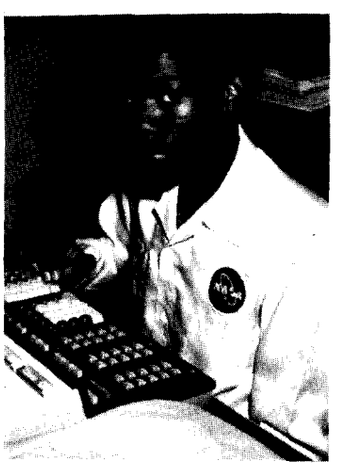
Many of the aides who have technical jobs work with computers, such as Lawrence Law, who works in the Project Engineering Section, and the many aides in the Sciences Directorate. Working with metals in the Engineering Services Division is Don Marion. Don, who will be a senior this fall at Duvall High School, works on the EOS project and is currently making a model of Dr. Goddard's rocket.

Four students who attend the Model Secondary School for the Deaf work in the Science and Applications Computing Center. The Model Secondary School for the Deaf is affiliated with Gallaudet College in Washington, D.C. The students, under the supervision of Gerard "Griff" Griffith, are Galen Adams, Phyllis Byrnes, Joel Ritter, and Tyrone Wooten.

Tony Watson and Charles Barksdale who help run the presses in the Printshop are two of the students working in the Graphic Arts Branch.

Regina Garland, who is here for the second year, has combined clerical and technical work. Two days a week, she takes and develops X-rays in the health unit, and for the rest of the week, she is a secretary.

Incidently, in 1965, President Lyndon B. Johnson set up the Summer Aides Program, which was originally called the Youth Opportunity campaign, to give young people a chance to earn while they learn during the summer.



ER AIDES

ley	Don Marion
lantt	Cathy Marlow
and	Kenneth Matthews
ing	Debra McCullum
er	Greg Monn
icock	Cynthia Mundell
/	Donna Musgrove
ey	Martin Myers
Harley	Gale Parker
rris	Debra Proctor
	Joel Ritter
	Sherree Roberts
	Quincy Robinson
enson	Gail Rotan
er	Eugenia Sackett
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rn	Gregory Taylor
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tson	Chester Turner
son	Lillette Turner
Jackson	William Turner
Jackson	Patricia Vinscavick
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Jordan	Stephen White
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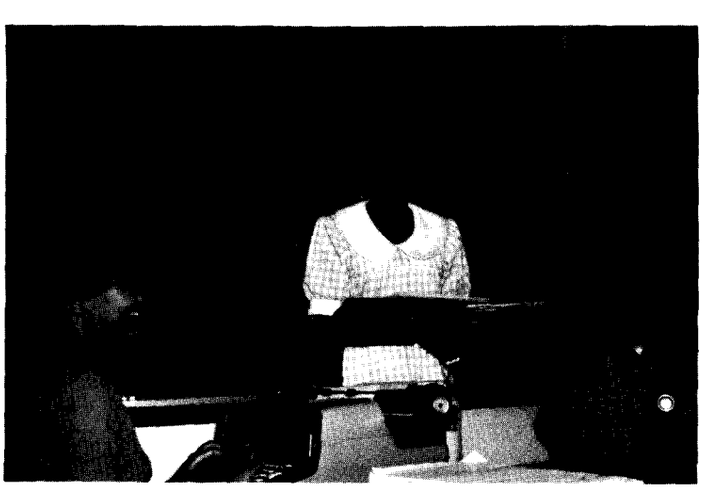
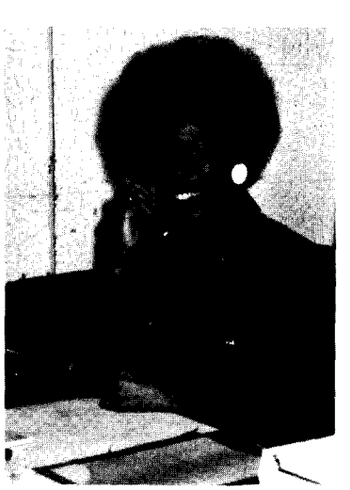
Law	N. Ray Wilson
	Tyrone Wooten
el	Darnell Wright





CIVIL SERVANTS SPEND THE SUMMER AT GODDARD

Employment for high school students and graduates, college students, college graduates, and faculty members is provided by the Summer Civil Service Program. The 94 participants will work for two months this summer in a wide variety of jobs, including legal clerks, clerk-typists, astronomers, engineering technicians, and math, administration, biology, and physical science aides.

These summer jobs are open to anyone aged 16 or over. College graduates may apply directly to the government agency at which they desire employment. All other prospective employees must qualify under the Summer Employment Examination. The purpose of this program is to attract students to the Center after graduation. In return, the students receive an opportunity to earn money, an introduction to Goddard, and a chance to gain occupational experience. Many of the summer Civil Servants are students working their way through college, while some are faculty members who work in counseling and other special research assignments.

For example, recent high school graduate Leslie Rosenthal works in the security office. He helps make security badges, takes indentification pictures, and helps with other security procedures. Leslie will be a freshman this fall at the University of Maryland, and hopes to eventually become a dentist.

Math aide Laura Casswell of the Laboratory for Solar Physics and Astrophysics says she is "helping reduce data from the OSO-7 satellite." Laura will be a junior this fall at Villanova University in Philadelphia, Pennsylvania, where she majors in astronomy.

Bruce Buswell, who graduated from Montgomery Blair High School in June, 1974, works in the Earth Observations Systems Division with an optical interface. This device, Bruce explains, scans a picture, changing the picture to an analog signal. The signal is then placed into a converter, which changes the picture to a digital signal. The digital signal goes into a computer which processes the image. Bruce, who worked at Goddard last summer with the American University Summer Research Program for High Ability High School Students, comments, "I really enjoy my work here." This fall, Bruce will enter the University of Arizona as an anthropology major and a computer science minor.

On June 5, the summer employees were welcomed to Goddard by Donald P. Hearth, Goddard Deputy Director, in the Building 3 auditorium. Other seminars and activities include the History of Goddard, a tour of the Center, the Effects of Space Research on Society, the ERTS Project, a planetarium tour, Calypso Caper, and the ATS Project.

AN ASTRONOMY MAJOR at Villanova University, Laura Casswell is a math aide in the Laboratory for Solar Physics and Astrophysics.

LESLIE ROSENTHAL works in the security office. Above, he is taking an identification photo.

BRUCE BUSWELL changes a computer tape. Bruce, who worked at Goddard last year under American University's Summer Research Program for High Ability High School Students will be a freshman at the University of Arizona this September.

CLERK-TYPIST MINDY HOROWITZ runs the Xerox machine in the Sounding Rocket Division located in the Glendale Building.

STEVEN HENRY (standing) and Larry Stephan are both working as legal clerks this summer. Steven works for the Patent Counsel, and Larry works for the Chief Counsel.

SUMMER CIVIL SERVICE EMPLOYEES

Robert Ahlberg
Jon E. Ahlquist
Edwin C. Alford
Rita Aukward
Alice K. Babcock
Steven Baron
James H. Beall
Marie A. Bowe
Robert Bundy
Bruce Buswell
John Campbell
Jane E. Cantrell
Theresa A. Card
Laura Casswell
Richard Cauley
Diane L. Chesnutis
Ernest W. Chesnutis
John M. Christian
Barbara E. Coulter
Edward L. Criscuolo
Kelley Dargan
Edna Didwall
Marc Donvito
Marguerite Duck
Harry Dunbar
Dan Dunham
David M. Dyer
John S. Eicke
Larry Einbinder
James W. Elkins
Gerald Epstein
Keith S. Evans
Richard P. Fahey
Alan B. Frankle
Michael Glazer
Michael Hartman
Steven L. Hast
Neil Hazard
Steven Henry
Gary Horowitz
Mindy Horowitz
Warren Hsing
Barry C. Jackson
Paul L. Jones
Robin Katlin
Carmaleta Kelley
Marc R. Kivity
Sandra Kulansky
Herbert Leass
Mary A. Lorey
Deborah Luongo
Richard S. Lytel
Lynette Malkin
Janet McCall
Jacqueline Meany
Anne Morgenstein
Rise Morgenstern
Steven Murrin
Robert O'Laughlin
Gary Oswald
Mary Pasquella
Olga E. Penney
Denise Pierrot
Phyllis Podolsky
Michael Rindler
Leslie Rosenthal
Laura Salzman
Helene Schember
Judith Shapiro
Raymond Snowdon
David Soloman
Larry Stephan
Lawrence Strow
Barbara Trombka
James Tuni
Freida Valentine
Karen Waldstreicher
David N. Wall
Virginia Wallis
Deborah Wei
Laurey Williams
Clinton Winchester
Sheldon Wolk
James Zmijewski

Materials Engineering Services

The Materials Engineering Branch of the Engineering Services Division has a number of unique materials testing and processing facilities which are available to all GSFC units. Mechanical and physical property measurements, vacuum outgassing, optical property determinations, heat treatments, laser welding, chemical analysis, material failure analysis, non-destructive examination, high magnification examination by light and electron microscopy, and bearing processing are just some of the services that can be provided.

This is the first article of a series which will highlight some of these services. The series is being presented to familiarize responsible center personnel with these capabilities so that they can avail themselves of the MEB's expertise. This first article deals with the processing of ball bearings for spacecraft applications. For additional information contact Alfred J. Babecki, Head of the Engineering Metallurgy Section, on extension 4833.

Bearing Processing

Most GSFC spacecraft employ ball bearings in subsystems or in experiments and, over the years, they have been responsible for a number of "short-life" failures. Investigation of many pre-launch bearing failures by the Engineering Metallurgy Section has revealed a host of questionable conditions in the bearings as procured from the bearing manufacturer.

In those days, very few facilities outside of the bearing manufacturers' felt qualified to inspect, examine, clean, or lubricate bearings without risking their reliability. Consequently, most bearings were procured directly from the bearing vendor, or even installed into the device by the bearing vendor, without outside inspection. The failure analyses revealed such rejectable conditions as incorrect or inadequate supply of lubricant, incorrect ball cage materials, improperly installed shields, broken cages, chemically etched ball or race surfaces, excessively rough ball or race finishes, particulate matter, among others.

Such revelations prompted the MEB to gradually assume an increasingly greater role in monitoring bearing processing, and then of actually performing bearing inspection, cleaning, and lubrication in-house. Concomitantly, the MEB performs outgassing and friction and wear tests of solid and liquid lubricants; so it is able to review lubricant needs and make specific recommendations based upon the kind of service, the environment, power availability, proximity to optics, etc.

The MEB's bearing and lubrication experts, Alfred J. Babecki, Charles E. Vest, Carl L. Haehner, and William G. Grenier, have participated in reviewing designs of lubricated systems to recommend improvements; in suggesting procurement specification criteria for bearings and gears; in disassembling and inspecting and photographing bearings and geared components; in cleaning, assembling, and lubricating bearings; in vacuum cleaning and impregnating porous ball cages and reservoirs; in quality testing bearings with Smoothrator and torque meters; and in packaging components to minimize loss of liquid lubricants to the package.

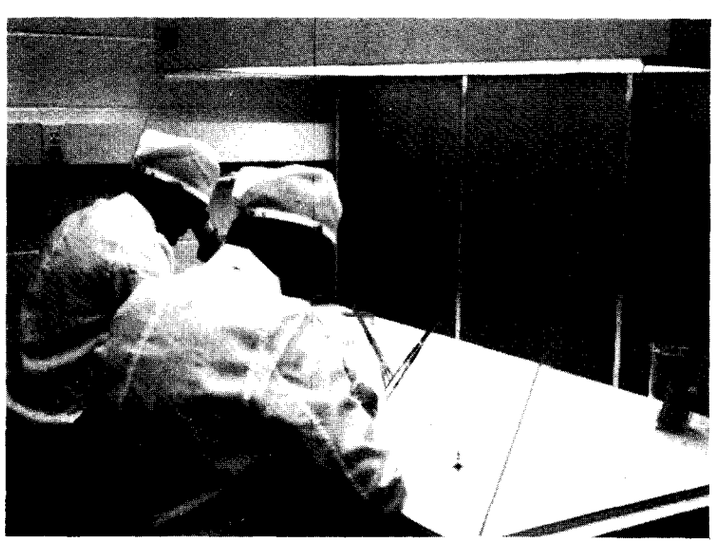
A DOW CORNING LFW-1 friction and wear test machine is used to test lubricants in sliding friction. Another similar machine was modified to test lubricated ball bearings.

Materials Technology Reports have been written on cleaning bearings, cages, and reservoirs (MTR 764-002); on lamellar solid film lubrication (MTR 764-003); transfer film lubrication (MTR 764-001); on deleterious effects of ultrasonic cleaning on assembled bearings and on selection of liquid lubricants (to be issued). Procedures have been issued for the cleaning and impregnation of porous ball cages and oil reservoirs. Test and flight bearings have been examined or processed for such spacecraft as ATS-F; Nimbus-D, E, and F; ERTS A and B; Tiros-N; RAE-B; ITOS-B/G; IUE; SMS-A; and Skylab.

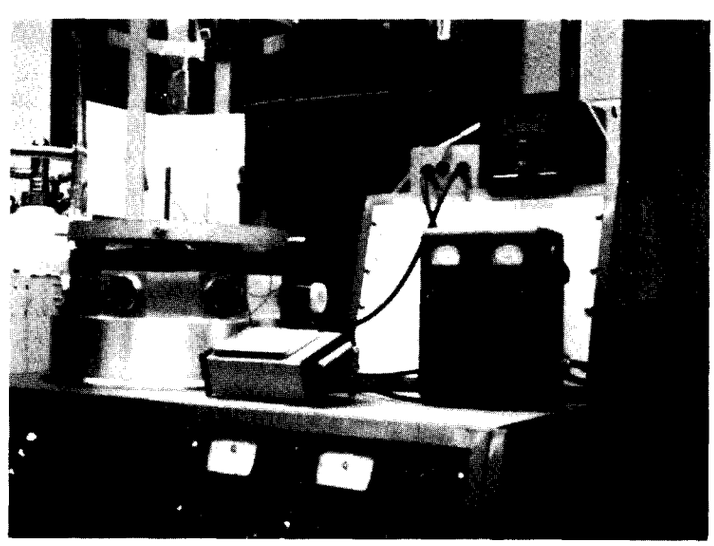
Room G93 in Bldg. 22 has been modified into a limited-access clean room Lubrication facility for the final processing and examination of lubricated components. Preliminary handling and processing is conducted in the Metals Processing facility, Room 293, with high magnification examination being performed in the Metallography facility, Rm. 237.

Bearings are too important to the success of flight hardware to be bought as "pigs in the poke," as they were in the past. Accordingly, it is recommended that realistic specs. be imposed on bearing procurement and that, either the MEB facility or other qualified outside facility (G.E., Battelle, Draper Labs.) be used to process the bearings, or at least that these facilities be used to thoroughly inspect a random sample quantity of processed bearings from each lot.

The MEB's lubrication expertise includes the mechanical engineer of the EMS, and the chemists and physicists in other sections of the MEB and the sophisticated equipment at their disposal.



CARL L. HAEHNER (left) and William G. Grenier conduct the final inspection of lubricated flight bearings in the Lubrication Facility of the Materials Engineering Branch.



A DIFFUSION PUMPED bell jar vacuum system with LN_2 trapping is used to vacuum dry porous ball cages.

ECO America Visits Goddard

ORGANIZERS of the ECO America project are (from left) Helga Busemann, Assistant Educational Director of Keep America Beautiful; Dennis McFaden, Research Assistant at the American University; and Lloyd Curtis, Director of Environmental Affairs for the Pepsi Cola Company.

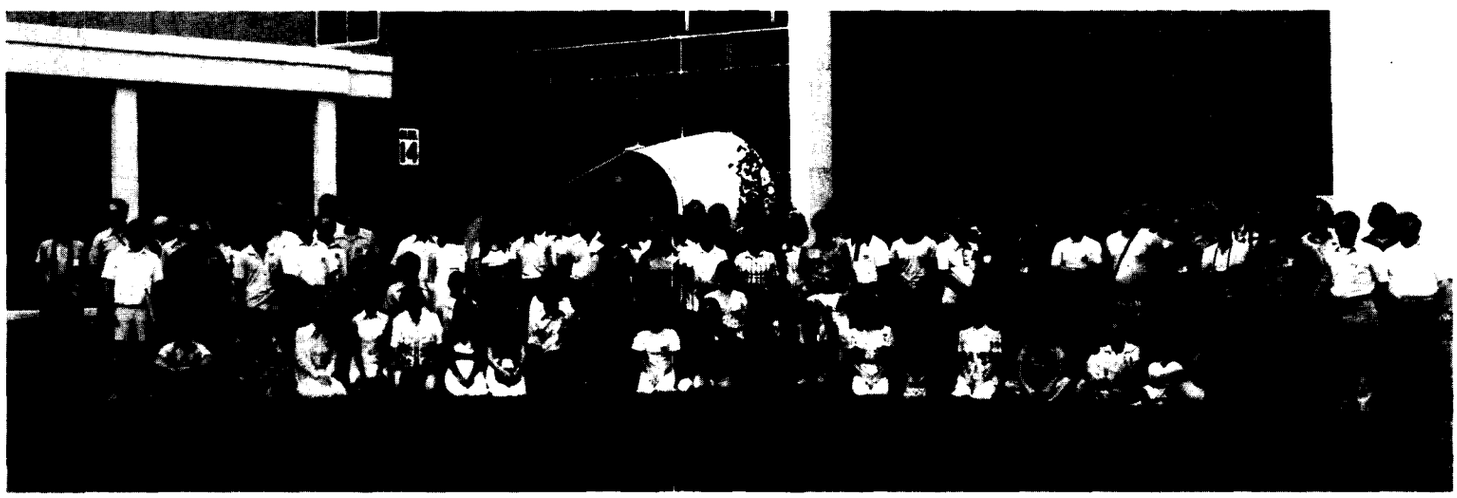
A day at Goddard was part of the prize for nearly 50 top high school students who recently won a nation-wide ecology contest by getting involved in practical, day-to-day solutions to neighborhood environmental problems.

The students and their teachers were here as part of the ECO America project, a seminar/workshop held for winners of the contest sponsored by Pepsi Cola and American Airlines under the auspices of Keep America Beautiful, Inc. In addition to their day at Goddard, the ECO America delegates attended a seminar and award ceremony held at American University and spent a day working at the Park Service's Lightship Chesapeake.

Each student represented the top high school ecology club in his or her state. Their prize-winning clubs had all organized and carried out practical ecological projects aimed at creating parks and outdoor environmental classrooms by cleaning up and landscaping, building nature trails and classifying plant and animal life; organizing reclaimation centers for recycling waste materials such as aluminum cans and old newspapers; cleaning up tons of litter along highways and on public lands; publishing ecology booklets, making films and conducting lecture series to educate the public of all ages about environmental problems and what to do about them; planting and seeding trees and shrubs to create wild-life habitats; and conducting studies of water and air pollution.

At Goddard, the delegates received a first-hand look at how advanced technology can be used to solve environmental problems. In a program organized by Elva Bailey and Richard Crone of the Goddard Educational Programs Office, they listened to lectures by William P. O'Leary, Head of the Protocol and Briefing Branch; Dr. Stanley C. Freden, Chief of the Missions Utilization Office; Howard Galloway, of the ATS-6 Project; R. G. Pillai, Technical Representative for the Indian Space Research Organization; and Harold J. Peake, Chief of the National Needs Office. Lecture topics were Goddards research and development missions, environmental monitoring from space, health and educational telecommunication using ATS-6, and the uses of solar energy.

One highlight of the day at Goddard was a tour of Center facilities which included an ERTS satellite presentation. As one student put it, referring to the tour and what he had learned about ERTS, "It completely blew my mind."



ECO AMERICAN DELEGATES face the camera during their visit here in June.

Goddard Mourns. . .

Bernard Nowotarski of the Data Processing Branch in the Mission and Data Operations Directorate died suddenly on Wednesday, July 10, 1974.

Mr. Nowotarski came to Goddard in 1962 when the IPD data processing facility was located in College Park. He played an important role in bringing the central data processing facility to its present state of development.

Mr. Nowotarski is survived by his wife, Helen, and his two children, Adam and Sharon.

Charles W. McCarty of Greenbelt, Maryland, died at the age of 54 on Thursday, July 11, 1974.

Mr. McCarty, who worked at Goddard for 11 years, was a mechanical engineering technician in the Space Technology Division. Recently, he worked on the EOS project and the Delta propulsion system.

A member of Goddard's Music and Drama (MAD) group, Mr. McCarty participated in the 1972 production of "Guys and Dolls." Also, he served as choir president, trustee, and elder in the Berwyn United Presbyterian Church.

Marie Marr Builds OSCAR Here

For about three years, Marie Marr has formed a one-woman "team" responsible for the fabrication and testing of the Radio Amateur Satellite Corporation (AMSAT) OSCAR satellites. An AMSAT employee working here at Goddard, Mrs. Marr assembled and checked out the highly successful OSCAR-6 that was launched in October of 1972, and is presently involved in preparations for the upcoming launch of OSCAR-7. OSCAR stands for Orbiting Satellite Carrying Amateur Radio.

AMSAT is a non-profit scientific corporation centered in Washington, D.C., but with sponsorship on a world-wide basis. The organization has been working with NASA since 1969 to provide small piggyback communications spacecraft which are used in the amateur service by thousands of individuals around the world. The purpose of the spacecraft is to provide an educational tool to enable interested individuals and students to learn in a first hand way about space science and technology.

OSCAR-6, AMSAT's most complex satellite yet launched, is still in operation after nearly two years in orbit and has been used by some 2,400 radio amateurs in 85 countries and all 50 United States. Spacecraft experiments were built by and for radio amateurs on a shoestring budget using donated parts. The satellite was launched by NASA on a space available basis along with NOAA-2 from WTR. OSCAR-6 is unique in that it is the only satellite of its kind designed for free access international communications on a non-commercial basis. It is also the first OSCAR to use solar cells to extend its operational lifetime.

Much of the responsibility for the construction, testing and integration of OSCAR-6 fell to Marie Marr.

Certainly no newcomer to Goddard, Mrs. Marr has worked here since 1961. Although less than three years of her Goddard tour have been as a government employee, she has been employed by a variety of contractors on Center. She has worked on non-flight systems as well as being directly involved with the fabrication of subsystems which have flown or will fly on many of Goddard's most important missions. These missions include OAO, SAS, IUE and numerous sounding rocket experiments.

MARIE MARR poses with OSCAR-7 shortly before it was shipped to WTR where it is scheduled for launch aboard a Delta rocket along with ITOS-G.

In her job with AMSAT, which began in October of 1971, Mrs. Marr is responsible for just about everything associated with OSCAR fabrication from wiring harness development through the assembly and repair of solar cells. She has followed the construction of the tiny spacecraft through the integration phase and testing in Goddard's Test and Evaluation Division and is also responsible for maintaining spacecraft cleanliness during operations at the launch site.

Since subsystems for OSCAR's 5 and 6, and the upcoming OSCAR-7 have been provided internationally by four countries—Australia, Canada, West Germany and the United States—Mrs. Marr has been responsible for inspecting and qualifying the electronics modules received from a variety of sources.

Says Jan King, OSCAR Project Manager and a member of Goddard's Data Collection Systems Branch, "Her job is certainly one that requires her to be resourceful in many areas. Variety is certainly no problem for Marie who, at times, has to be five people in one."

Higher Awards Approved by Inventions & Contributions Board

The NASA Inventions and Contributions Board recently increased the amounts of monetary awards to be presented to individuals and groups for inventions leading to patent applications and for the publication of NASA Tech Briefs.

MINIMUM AWARDS:

The minimum award for a contribution on which a United States patent application is filed has been increased from $50 to $100.

The minimum award for a contribution on which a Tech Brief is published is increased from $25 to $50.

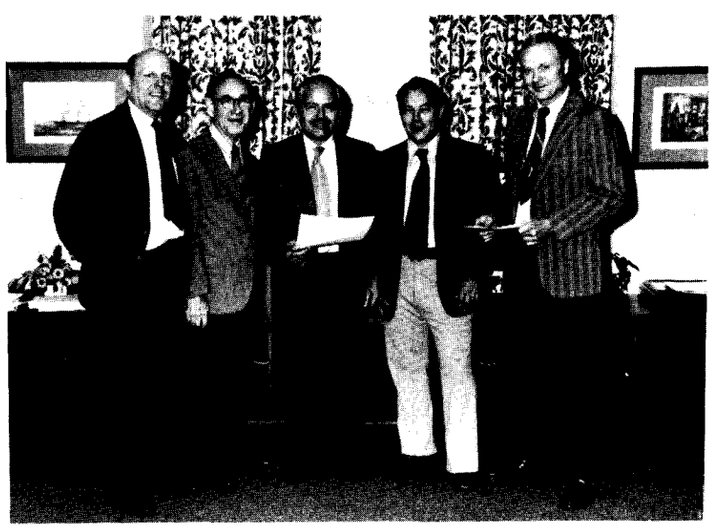
NOMINAL AWARDS:

Nominal awards will normally be granted in the amount of $250. If the award is shared by individuals, the award will be divided equally, and the Board may recommend that the amount be increased to a total amount that will insure that each individual receives at least $100.

MAJOR AWARDS:

Major awards will normally be awarded in the amounts of $500, $1000, and $2000. In cases of multiple contributors, the total amount of the award may be increased to insure that, when it is evenly divided, each individual will receive at least $100.

Invention Award Presented



INVENTION AWARD. Aaron Fisher, Head of the Special Materials & Projects Office; and Carroll Clatterbuck, of the Chemistry & Physics Section; have received awards for their invention entitled "Microscope Multi-angle, Reflection, Viewing Adaptor and Photographic Recording System." Shown during the presentation on June 28 are (from left) Charles Staugaitis, Head of the Materials Engineering Branch; Maurice Levinsohn, Chief of the Engineering Services Division; Aaron Fisher; Robert Baumann, Deputy Director of Engineering; and Carroll V. Clatterbuck.

Driver Survival Symposium Opens Here

By Ben B. Pagac
Safety Training Coordinator

On June 18, the first driver survival symposium was held at Goddard by the Center's Health and Safety Engineering Office. Stephen V. Versace, a Senior Instructor of the Maryland State Motor Vehicle Administration's (MVA's) Driver Rehabilitation Clinic, was symposium director.

In a unique example of Federal-State Agency cooperation, the symposium was especially designed and developed for Goddard by Versace with the sanction of Ejner J. Johnson, MVA's Administrator. Judging by the comments of the first participants, the symposium approach is a success in instilling a new kind of safety awareness in Goddard's licensed drivers.

The GSFC driver survival symposium begins with the premise that the vehicle is a most deadly weapon. It causes more deaths than all other types of weapons combined, over 50,000 deaths in the U.S. last year alone. The second premise is that the highway is the most dangerous place in the world. More deaths occur on it than anywhere else.

With this in mind, the symposium is designed to acquaint the driver with basic yet frequently unused skills and techniques of safe driving which when correctly applied, greatly increase the driver's chances of avoiding a collision entirely or can save his life in an actual collision.

In the symposium's first two-hour session, the director explains and discusses the man-machine environment, the basic handling characteristics of the vehicle, and the assessment of risk/hazard.

The second session is devoted mainly to the explanation and discussion of the so-called "IPDE" system as a means of understanding and employing the effect of Time-Distance-Speed relationships in the driving task. "IPDE" is the acronym for a four part sequence of events which every driver experiences when faced with a potential collision situation. In this sequence he *I*dentifies the clues, *P*redicts their significance, *D*ecides what to do, and *E*xecutes his decision. Also included in this second session is the introduction to the "2-12 adjust" system which is a rational method of estimating proper following distance. The "2-12 adjust" system replaces the discredited "one car length for each ten miles per hour of speed being traveled" method which was previously taught for many years.

The third session is devoted to a discussion of the effects of alcohol and drugs on driving, the fatal synergism which can result from the mixing of drugs and alcohol, the need for and meaning of traffic laws, passive and active restraint systems, and the critical effect of emotions and attitude on safe driving. At the conclusion of this session, a simple vision screening is administered to each symposium participant, to determine whether his vision acuity, depth perception, and color perception are within normal limits—a vital factor in an individual's ability to drive safely.

DRIVING TASK DEMANDS GOOD VISUAL ACUITY. Participants in the first Goddard Driver Survival Symposium check out their visual acuity, depth and color perception. Shown administering the test to Ed Bronsnan, Jr., is Stephen Versace, Symposium Moderator. Waiting their turn are (from right) Jim Baden, Isaac Payne, Andrew Schade, Gary Moyer, and Gladys Chasnoff.

What do those who have attended the first symposium say about it? Here are three examples:

Ms. Gladys Chasnoff, Employee Development Specialist, MUD: "I found the Symposium Director, Mr. Versace, to be a dynamic speaker. His enthusiasm and sincerity spill over immediately to the symposium's participants and succeed in awakening in them a new sensitivity and awareness to the driving environment around them."

James Baden, NASA Hq. Shuttle Run Driver: "I drive a minimum of 180 miles per day on my run under every kind of driving condition imaginable. I found the 2-12 adjust method of limiting following distance to be the most interesting part of the course. I've checked it out repeatedly on the road and it works."

Ed Brosnan, Jr., Plant Operations and Maintenance Division: "I was skeptical when I first came to the classroom, thinking 'What can they show me about driving that I have not heard before?' At the end of six hours, I knew I had learned a lot."

The symposium consists of three consecutive two-hour sessions for a total of six hours. One two-hour session is given each week over a three week cycle. A symposium participant who unavoidably misses one of the sessions can thus make up the missed session in the next cycle. Priority for participant quotas is given to government licensed drivers who frequently drive GSA vehicles in the course of their work. However, any licensed driver at Goddard who is concerned about the hazards of today's driving may apply for a quota. Quotas may be obtained by calling the Health and Safety Engineering Office, Code 205, Extension 2441. Until further notice, the symposiums will be held in Classroom #177, Building 18, on Tuesday mornings from 9:30 to 11:30. Your call for a quota could be an investment in your survival.

Blood Bank Returns

Thanks to the generosity of 997 blood donors, the Goddard Blood Bank quota for fiscal year 1974 went over the top. Because every potential donor is also a potential receiver, we all have a stake in the success and efficiency of the Red Cross Blood Bank System. Blood transfusions undoubtedly save hundreds of thousands of lives each year, and no reliable substitute is known for many of the uses of blood. The second Blood Bank visit of fiscal year 1975 will be on Wednesday, September 25, from 9 a.m. to 2:45 p.m. in the Building 8 auditorium. Come and be a donor, helping this year's contributions outnumber those of fiscal year 1974. Remember the slogan, "Giving Blood Saves Lives."

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