GODDARD NEWS

THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

GODDARD SPACE FLIGHT CENTER

GREENBELT, MARYLAND

VOLUME [illegible] NUMBER 3 JUNE 15, 1964

NASA's Silent Sentry at Sea . . .

In the picture above, an acquisition aid antenna on Goddard's tracking ship Rose Knot stands like a silent sentry against the gray sky. This three-purpose antenna will be "on guard" as project Gemini gets under way.

It will listen for the spacecraft beacon signal, then acquire the two-man capsule as it comes over the horizon. The antenna will continue to track the bird, and send and receive both voice and telemetry until the spacecraft completes its six-minute pass and slips below the horizon. Then—silence!

And the electronic sentry will stand guard again, even as above, ready for the next pass—waiting for the beacon.

These antenna, on land and at sea around the world, are operated by manned space flight network personnel.

The antenna system was fabricated by the Bendix Radio Corp., Towson, Md., under contract.

It was a joint design effort between Goddard and Bendix engineers.

FORTRAN:

Computers Use Special 'Lingo'

Do you realize that computers have their own languages? One of these is called FORTRAN (*For*mula *Tran*slation), and a course in its latest version—FORTRAN IV—begins today.

Approximately 30 students will be taught under the sponsorship of the employee development branch by Miss Elise Fisher, theoretical division. The course will be repeated as the demand dictates.

Bill Cahill, head of the mathematics and computing branch, considers the course important to anyone who needs answers quickly. With an understanding of FORTRAN, a scientist who needs an answer to a problem could place it into computer "language," and come up with his answer more quickly than by "going through a middle man."

According to Cahill, the scientist himself, familiar with a problem, would often be able to do a more accurate job of computer translation as well as a faster one. "He could spend hours explaining a complex problem to a computer programmer which he could write in FORTRAN himself in minutes," said Cahill.

(Cont'd. on p. 2)

Computer Class

(from p. 1)

"Once a person learns French and is fluent in it, he still must know what he wants to say. The FORTRAN language is no different."

With the advent of problem-oriented languages in 1956, the writing of computer programs —especially from small problems—became relatively simple.

"In all instances when larger, more advanced computers are being used," said Miss Fisher, "the *newest* FORTRAN language, FORTRAN IV, should be used."

The scientific programmer is an expert problem solver: The actual writing of computer programs is only a small part of his job.

He works with the problem sponsor in defining the problem, he divises the procedure to solve the problem and must worry about truncation and round off errors, stability or convergence, etc.

The programmer works with the problem sponsor in discovering whether such peculiar looking answers have physical meaning or are due to errors in the physical model or the computer program.

The difficulty in using the computer to solve problems lies in devising the numerical procedure to use. Once this is done writing the FORTRAN program is straight forward.

The newest version of FORTRAN for IBM computers and the UNIVAC 1107 is FORTRAN IV, which contains a number of improvements over the language of FORTRAN II. The course on FORTRAN IV developed by Miss Fisher in cooperation with Ed McHugh of employee development branch, consists of thirty hours of lectures and workshops where the students write practice codes.

Supervisors interested in the course should contact Ed McHugh, employee development branch, for information on the next session.

A Message from The President

The loss in skill and earning power of every man and woman who suffers a preventable work injury improverishes still more a Nation already at war against poverty. We must prevent this flank attack on our progress in enriching the skills and extending job opportunities for all our people.

To devise voluntary action to reduce the human and economic waste of needless work injuries, leaders of American business, labor, agriculture, science, government and safety organizations will convene in Washington for the President's Conference on Occupational Safety.

To enlist the natural leadership in each worker, farmer, teacher or businessman, I have designated the Conference week of June 21-27 as Job Safety Week.

I call upon every American to work safely and to safeguard his fellow workers. I am confident a week's trial will commend the practice of safety all year round.

I urge Governors and Mayors to use their good offices in their own States and communities to invoke the leadership of every employer and worker to protect the lives, limbs and skills of all who toil.

Signed by The President
LYNDON B. JOHNSON

On the blackboard is a polynomial (top), with a two-line FORTRAN IV version written below. Pictured (from left) are: James S. Barrowman; Miss Elise Fisher, teacher; Richard L. Kutz; Patricia G. Johnson; and S. S. McEaddy. The four were students in the FORTRAN class session that terminated early in June.

Families of Accident Victims Acknowledge Flowers

The tragedy which occurred in April in the spin test facility at Cape Kennedy involved the loss of Goddard's John W. Fassett, field projects branch; Lot D. Gabel, and Sidney J. Dagel, Ball Bros. Research Corp. (payload contractors). Goddard's Employee Welfare Association sent flowers to these families.

Goddard's Director, Dr. Harry J. Goett received notes from each of the families which read: "To the Director and GSFC employees," and expressed thanks for the Center's kind expression of sympathy.

Recent Technical Publications Authored by Goddard Staff

P. Musen, "On the Application of Pfaff's Method in the Theory of Variation of Astronomical Constants," NASA Technical Note D-2301, April 1964.

C. R. Somerlock, "Transistorized VHF Transmitter Design for Spacecraft Applications." NASA Technical Note D-2104. May 1964.

News About Space & Aeronautics

● The first two-way telephone call between the United States and Japan through a communications satellite was conducted late in May.

The telephone conversations via Relay satellite were between NASA technical personnel at Goddard and their Japanese counterparts at the Radio Research Laboratory Station at Kashima, Japan.

The transmissions originated in the United States at the NASA ground station at Mojave, Calif., and from Greenbelt. Greenbelt and Mojave were connected by conventional land lines.

• • •

● A completely assembled 72-foot-long Scout launch vehicle was flown from Wallops Station on Virginia's eastern shore to Langley Air Force Base, Hampton, Va., in a C-133 transport provided by the Air Force last month.

• • •

● The Hebrew word "NASA" means "to lift away!" This can be found under the 103rd Psalm, Scoffield Reference Bible.—*NASA-Washington Federal Credit Union Newsletter*

GODDARD NEWS

"It is difficult to say what is impossible, for the dream of yesterday is the hope of today and the reality of tomorrow."
—DR. ROBERT H. GODDARD

The Goddard News is a bi-weekly publication of the National Aeronautics and Space Administration's Goddard Space Flight Center, Greenbelt, Md., suburban Washington, D. C. Phone—Ext. 4141 or 4142

Photography by Goddard's photo branch

Bruce Brough, *Editor* Shirley Deremer, *Inside Goddard*

Right Angle Screwdriver Conquers Corners for its Creators

The proverbial left-handed monkey wrench is always good for a chuckle, but not so the right-angle screwdriver designed and built here at Goddard to fill a space-age need.

John W. McKiernan, network operations branch, needed a tool that could get at some difficult nooks and crannies for equipment adjustment. Some of this complex equipment had to be disassembled to be adjusted.

This "problem" equipment was pre-adjusted before assembly, and some of it was impossible to correct without being at least partially taken apart.

The problem was presented to Joseph W. O'Connor of fabrication division's mechanical design group. The right-angle instrument design was the result.

How well does it work? McKiernan's group has been using it for some time now and reports "excellent results, with a big savings in time and effort, not to mention wear and tear on the equipment that had previously resulted from disassembly and reassembly."

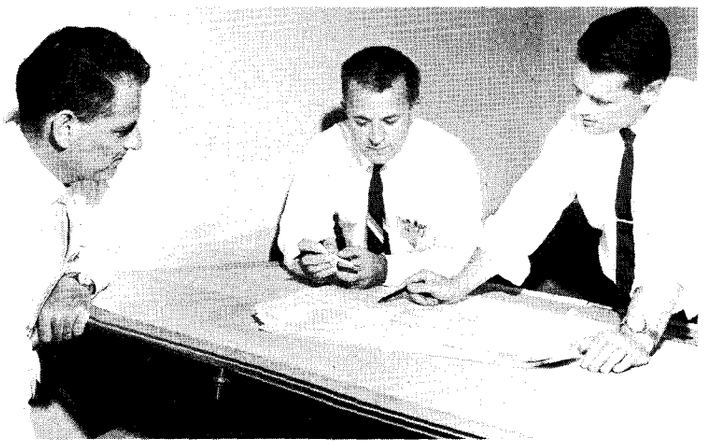
Do you have a perplexing problem in your area that seems to call for equipment that is not available commercially? Perhaps fabrication's mechanical design group can solve it for you (excluding left-hand monkey wrenches)!

Ted Jaramillo, network operations branch, is shown making an adjustment on a spectrum analyzer using the right-angle screwdriver. fabrication div. made the screwdriver.

Mr. Celestin Kabanda, Ambassador from Rwanda — a small democratic nation in the heart of Africa with about the area and population of the State of Maryland—is pictured here during a tour of Goddard early this month. He is seated at a computer console in the manned spaceflight computer control center.

William O'Leary, office of public affairs (center) and Mr. John E. Jackson, planetary ionospheres branch (right) are explaining the system to the Ambassador.

During the tour, the Ambassador renewed a friendship with Stewart Tinsman of public affairs. They were acquainted during Mr. Tinsman's previous employment in the international Spacemobile program.



Maurice Cridlin, Goddard designer, looks on as contract employee John Kosoloski (center) holds the screwdriver and Joseph O'Connor, mechanical design (right), discusses the project.

Goddard Speech and Paper Presentations

(Technical presentations approved as of June 8, 1964 for period through June 29. Requests for copies of speeches and papers should be made directly to the author.)

SPEECHES

Gordon H. Tyler, University of California at Los Angeles, Los Angeles, May 4, ***"Experimental Efforts in Contracting."***

A. G. W. Cameron, Atomic Energy of Canada, Chalk River Nuclear Laboratories, Chalk River, Ont., June 18, ***"Neutron Stars and Celestial X-Ray Sources."***

R. W. Rochelle, American Society for Engineering Education Annual Meeting, Orono, Me., June 24, ***"Information and Communications Theory—Applications to Space & Satellite Communications."***

A. G. W. Cameron, Gordon Conference on the Chemistry and Physics of Space, Tilton, N. H., June 30, ***"The Early Evolution of the Sun and Stars."***

PAPERS

N. F. Ness, Manned Lunar Exploration Symposium, Houston, Tex., June 15-16, ***"Magnetic Measurements."***

Harriet H. Malitson and J. K. Alexander, One Hundred-Sixteenth Meeting American Astronomical Society, Flagstaff, Ariz., June 24-27, ***"Observation of A Moving Type-IV Solar Emission Region at 26.3 Mc/s."***

W. M. Neupert and Elske v. P. Smith, One Hundred-Sixteenth Meeting of American Astronomical Society, Flagstaff, Ariz., June 24-27, ***"Possible Identification of Permitted Fe XIV Line in the Extreme Ultraviolet Solar Spectrum."***

Kenneth L. Hallam and John Mangus, One Hundred-Sixteenth Meeting of American Astronomical Society, Flagstaff, Ariz., June 24-27, ***"An Ultraviolet Spectrophotometer for Satellite Astronomy."***

T. Kelsall, American Astronomical Society, Flagstaff, Ariz., June 24-27, ***"Main Sequence and Hydrogen Burning Phase of Intermediate Mass Pop. I Stars."***

J. K. Alexander and R. G. Stone, American Astronomical Society, Flagstaff, Ariz., June 24-27, ***"Low Level Decameter Emissions from Jupiter."***

A. Boggess III, American Astronomical Society, Flagstaff, Ariz., June 24-27, ***"Ultraviolet Photometry B and A Stars."***

Hong-Yee Chiu, American Astronomical Society, Flagstaff, Ariz., June 24-27, ***"Neutron Stars and Galactic X-Ray Sources."***

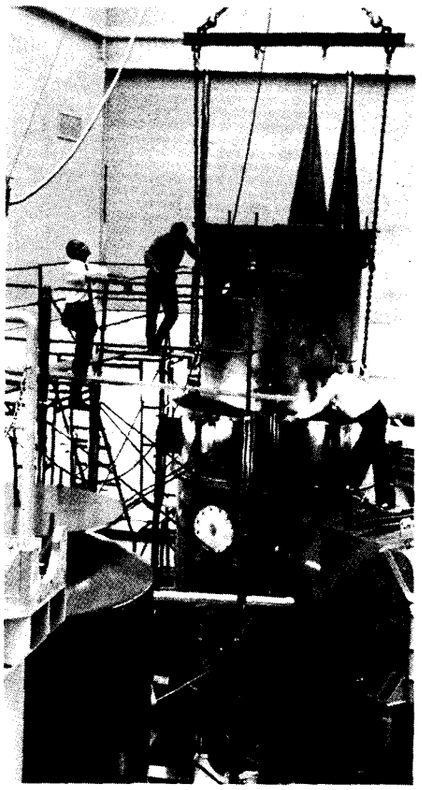
C. E. Vest, American Society for Testing & Materials, Chicago, Ill., June 22-26, ***"On the Lubrication of Scientific Satellite Components—State-of-the-Art Summary."***

Marla G. Hoke, AIAA Annual Meeting, Washington, D. C., June 29—July 2, ***"A Thermal Vacuum Technique for Measuring the Change in the Solar Absorptance of Satellite Coatings as a Function of Angle of Incidence."***

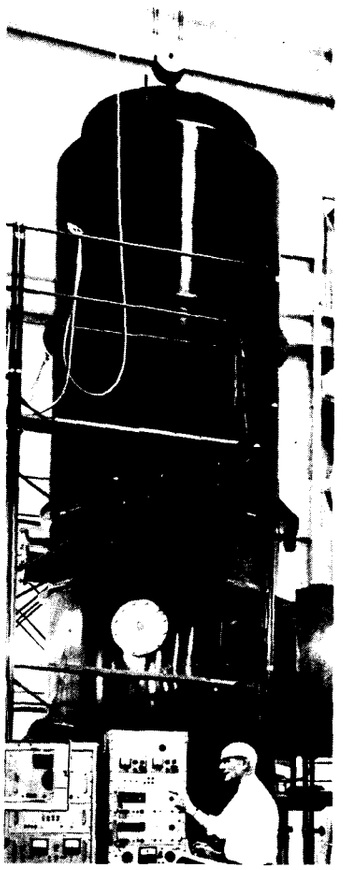
J. C. New, First International Congress of Vacuum Techniques in Space Research, Paris, France, June 29—July 4, ***"Experiences in Simulating the Space Environment for Scientific Satellites."***

E. W. Travis, American Institute of Aeronautics & Astronautics Spacecraft Session, Washington, D. C., June 30, ***"Ariel II—The Second International Satellite."***

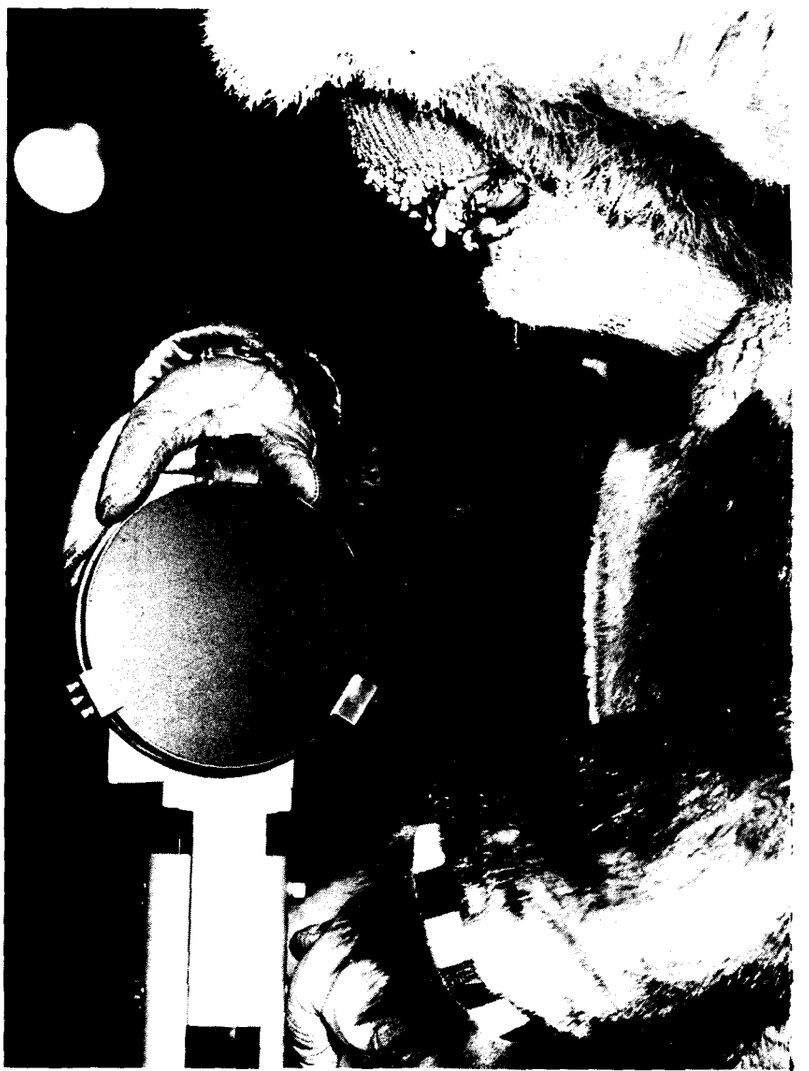
Two Unique Optical Facilities Are Ready for OAO



Here the vacuum optical bench (VOB) is being removed from its vacuum tank with an overhead crane. Looking on are (from left): William Fortier, optical engineering section; and Paul Soules and Robert Irwin, contract personnel. Adjustments are made after removal.



William Fortier, optical engineering section, is shown here monitoring the instrumentation for the vacuum optical bench (VOB). The bench is inside the vaccum tank in the background.



The Abominable Snowman? No! This is a technician working in Goddard's low temperature optical facility (LTOF) in the test and evaluation division. Baby, it's cold inside!

Two unique optical facilities, probably the first of their kind in the world, have been added by the test and evaluation division here at Goddard in preparation for testing second-generation satellites.

The facilities are a vacuum optical bench (VOB) and a low temperature optical facility (LTOF). Both will be used first to test optical experiments of the Orbiting Astronomical Observatory (OAO).

Before and after an optical experiment for OAO undergoes an environmental experiment, it will be placed in the VOB for alignment and calibration. The principle elements of this facility are a vacuum chamber, approximately 25 feet high by 7 feet in diameter, and a removable vertical optical bench.

The bench has its own optical system which includes an ultraviolet monochromator, a 38-inch clear aperature collimator, and a movable beam probe. The collimator is a Cassegrainian mirror system which directs the light provided by the monochromator into a 38-inch diameter beam parallel to the optical system under test.

An optical facility of this type with a vacuum capability is required inside the T&E laboratory due to the ultraviolet range of the stellar light which exists in outer space but which is filtered out by the Earth's atmosphere.

The optical experiment to be tested will be mounted within the optical bench structure and held rigidly in place on mounting lugs identical with those which hold the experiment on the OAO spacecraft. Experimental packages up to 40 inches in diameter by 120 inches long and weighing up to 1,000 pounds can be accommodated by the bench.

Special handling equipment permits the entire bench, with an experiment installed, to be positioned vertically with either end up (in or out of the chamber as necessary).

Once the OAO optical experiment has passed launch environment tests, it is subjected to the thermal conditions of orbital environment to see if any distortion in the optical systems will be caused by the low temperature of outer space. This test will be accomplished in the low temperature optical facility (LTOF)—a controlled-temperature chamber 13 feet wide by 43 feet long by 7½ feet high. It has a thermal lock for personnel access at low temperatures.

The temperature in the chamber can be varied from plus 23 degrees Centigrade to minus 60 degrees Centigrade. Test temperature is held to plus or minus one degree Centigrade. The dew point is maintained below —65 degrees Centigrade to prevent any condensation on components in the chamber.

The LTOF uses a 39-inch aperature collimator (a Newtonian mirror system) which directs light from interchangeable sources in a 39-inch parallel beam to evaluate the optical experiment. An automatic autocollimator aligns the experiment reference mirror to the beam.

The entire optical system of the LTOF is thermally compensated. A special handling device receives the OAO experiment in the vertical position, rotates it to the horizontal position, transports it into the chamber and serves as a mounting structure during tests.

With it, optical experimental packages can be rotated in pitch and yaw plus or minus 15 degrees about the geometrical center and 360 degrees about the roll axis.