Two Special Features Are Highlighted in this Issue
Mariner II—Venus, Pages 2-3; Open House, Pages 4-5

GODDARD NEWS

GODDARD SPACE FLIGHT CENTER / GREENBELT, MARYLAND

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TEST RESULTS of the S-3b satellite in the form of taped telemetry data are delivered by Daniel Dembrow, head of the operations section of the data processing branch, left to Leo Davis, head of the energetic particles section of the fields and particles branch, and to L. V. Medford, engineer with Bell Telephone laboratories. Mr. Davis and Bell Telephone are contributors of experiments to the new satellite.

S-3b Undergoes First Complete Electrical Test

The space data acquisition division last week participated in a full-scale electrical and calibration test on the S–3b satellite in a manner which may become routine for future Goddard satellites.

Test results were made available to experimenters only 18 hours after telemetry data was transmitted in real-time from Goddard's antenna test range to the College Park ground station.

"The procedure involved a data processing operation which now has become available to Goddard experimenters," explained Edmund Habib, assistant chief of the division.

The data was received and digitized in real-time and subsequently passed through quality control, editing, formating, decomutation and printing.

First Launch to Test Small Payload is Success

The first launch of a two-stage Nike Apachee sounding rocket to test a small payload version of the Seddon-Jackson cw propagation experiment was performed "perfectly" on Tuesday.

The launch was the first under NASA's international program of developing payloads suitable for small rocket launches, according to John Jackson, consultant to the planetary ionospheres branch.

"Once developed and checked out, design drawings will be made available to other countries interested in conducting ionospheric research programs."

Among interested observers who saw the successful launch from Wallops Station were Dr. Y. V. Somayajulu and Dr. R. G. Rastogi, ionospheric physicists from New Delhi, India.

The Seddon-Jackson experiment was selected for the program more than a year ago because its reliability had been tested and proved for more than a decade.

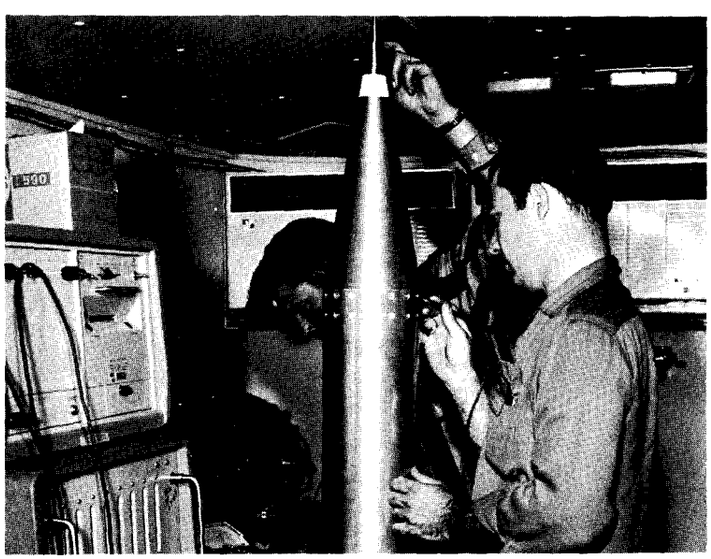
In addition to the international aspects of the launch, geophysical objectives consisted of

- Measuring ionosphere electron density and temperature, and
- Obtaining data on ion density and conductivity of the ionosphere.

The payload impacted in the Atlantic Ocean about 86 miles from launch site after reaching an altitude of 103 miles. No recovery was planned.

Project scientist for Goddard is Dr. Siegfried Bauer, head of the radio propagation section, planetary ionospheres branch. William Phillips, Nike Apachee-Nike Cajun vehicle manager, sounding rocket instrumentation branch, was the vehicle manager. At Wallops, Roger Navarro was the project engineer.

A similar payload is scheduled to be launched next month in conjunction with a sodium vapor cloud.



PRE-LAUNCH CONTINUITY check is made at Wallops Island on the Nike Apachee ionospheric research payload. Electronic technicians Roy Hagemeyer, behind rocket, and William Daniels, both of the planetary ionospheres branch, make the check.

Dr. Bowles Talks Here Friday

Personnel planning to attend the Goddard colloquium lecture scheduled for Oct. 26 will hear Dr. Kenneth Bowles, National Bureau of Standards, Denver, Colo., and the Lima Observatory in Peru, discuss the "Charged Particle Observations Out to 10,000 Kilometers Using Ground-Based Radar Backscatter."

Dr. Bowles heads a group at the Jicamarca Radio Observatory in Lima, Peru. This group utilizes the technique of incoherent backscatter for the determination of electron density throughout the ionosphere.

Goddard Gets New Ambulance

Goddard's new ambulance is now on duty to respond to Center emergencies during regular and nonregular duty hours.

It is parked adjacent to the gate house and driven by security guards so it can be dispatched with a minimum of delay.

In the past, the Prince George's county fire board furnished ambulance service when needed by Goddard. By having its own ambulance, the Center removes the possibility of conflict with other calls the fire board may have, said Fred Hartman, safety officer.

Facilities available on the ambulance are inhalator, resuscitator and aspirator, an apparatus for mouth-to-mouth breathing, cot, hand stretchers and first-aid kit.

The ambulance represents a source of security to Goddard personnel since it never leaves the Center except for an emergency, said Dr. Rex Crago, Goddard's medical officer.

Expect UGF To Exceed '61

As the Goddard News went to press the UGF campaign results at the end of two weeks showed that Goddard had

- Achieved 66 per cent of its dollar quota with 82 per cent of the personnel participating and
- Received an average donation of $15.34 from each employee.

"Goddard expects to exceed the goal that was reached last year," said Hugh W. Easter, general campaign manager.

Here are the offices that have contributed 100 percent or more of their goal so far in the UGF campaign.

Organizations

Office of the Director
Asst. Director, O.A.
Public Information Office
Security Office
Project Support Office
Organization & Personnel Division
Management Services Division
Technical Information Division
Test & Evaluation Division
Facilities Engineering Division

PART OF the Goddard team involved in the operation of the ambulance discuss procedures and inspect the vehicle. They are, left to right, Ron Surgen, physical security officer; Mrs. Helen Chaney, clerk-typist in the physical security section; Sgt. Earl Hayes, guard sergeant; Mrs. Frances Tyndall, occupational health nurse, and Dr. Rex Crago, Goddard medical officer.

Goddard Adds Two New Branches; Hoffman, Cherry Are Heads

In addition to the new buildings program, the space science and satellite applications directorate is experiencing further growth with the addition of two new branches.

The spacecraft systems and projects division has added a new branch—stabilization and control—which is located in building 6.

Henry Hoffman, Jr., is head of the newly established branch.

H. Hoffman, Jr.

Prior to joining Goddard. Mr. Hoffman was employed at the Naval Ordnance Laboratory where he had been responsible for development and evaluation work on inertial guidance systems. Mr. Hoffman received a B.E. degree in electrical engineering in 1949 from Johns Hopkins University and a M.S. degree in electrical engineering from Maryland University in 1952.

Stabilization and control branch is responsible for the stabilization and control subsystems of scientific staellites such as OAO, OGO and OSO. The stabilization and control of satellite is the accurate orientation of a satellite with respect to the earth, moon, sun and/or stars.

The other new addition is the space power technology branch under the spacecraft technology division which is also located in building 6.

Space power technology branch will perform research and development in the application of power sources and systems that provide power to spacecraft by conversion of light, heat, chemical and other energies into electrical energy.

William Cherry, head of the new branch, came to Goddard from NASA headquarters, where he was head of direct energy conversion projects. Before joining NASA, Mr. Cherry worked at the U.S. Signal R&D Laboratory at Fort Monmouth, N.J. Mr. Cherry holds a B.S. degree in chemical engineering from Northwestern University.

William Cherry

Dr. Goett to Talk At 2 Conferences

Goddard's space program will be the subject of Dr. Harry Goett, director, when he speaks at two conferences this week.

He will keynote the ninth annual East coast conference on aerospace and navigational electronics at Baltimore tomorrow. The three-day conference is sponsored by the Baltimore Section of the Institute of Radio Engineers and Professional Group on Aerospace and Navigational Electronics.

Dr. Goett will speak on Friday to the New England bank management conference at Boston. In addition to Goddard's mission, he will talk on NASA's activities in the New England area.

The conference brings together banking and financial leaders in New England.

COMING EVENTS

Seminar: University of Md., Institute for Fluid Dynamics and Applied Mathematics, Oct. 1 - Jan. 16, 1963.
IAS, Lewis Research Center, Cleveland, Ohio, Oct. 22-24.
Ninth East Coast Conference, Balt., Md., Oct. 22-24.
Federal Safety Council, National Safety Council, Chicago, Ill., Oct. 29-Nov. 1.
Ninth Annual Symposium, American Vacuum Society, Los Angeles, Calif., Oct. 25-Nov. 4.
Conference on Data Handling, Reduction and Interpretation in Geophysics, Yorktown, N.Y., Oct. 29-Nov. 1.
IBM Data Processing Symposium New York City, N.Y., Oct. 30-Nov. 1.

Lecture: University of Md., Physics and Astronomy Department Colloquias, 4:30 p.m., Rm. C-130, New West Annex to the chemistry building.
Oct. 24—"Rotational Invariance and the S-Matrix in Non-Retativistic Quantum Mechanics."
Oct. 25 — "Quantum Mechanical Long Range Order and Superconductivity."
Oct. 29—"K-p Interactions at 2.3 Bev/c."
Oct. 31 — "The Infrared Structure of Electrodynamics."
Oct. 26—Goddard Colloquium lecture, Friday, 3:00 p.m., Auditorium, Bldg. 3.

To include items in the coming events column, please call ext. 4141 or 4142.

Venus—A Space Mystery Answered?

Dr. Rasool is a citizen of Pakistan who is completing his second year at the Institute of Space Studies as a senior research associate under a NAS-NASA grant. At the Institute he is working on Tiros infrared radiation measurements with Dr. Robert Jastrow, director, and performing calculations on the structure of the atmosphere of Mars. He is a B.S. graduate in physics from the University of Lucknow, India, and received his Ph.D. in atmospheric physics from the University of Paris. He is a visiting professor of astronautics at the graduate center of the Polytechnic Institute of Brooklyn.

By Dr. S. Ishtiaq Rasool

One of the most interesting questions in space science has a prospect of being at least partially answered sometime after Dec. 14. On that date Mariner II will fly by Venus at 21,000 miles and for 30 minutes relay information which would help solve the long debated query: do conditions for supporting life as we know it exist on the earth's sister planet?

Venus, the closest planet to the earth, is the third brightest object in the sky. It has been observed and studied for centuries and yields only to the sun and the moon in attracting attention. Yet for all its popular appeal it has to this day remained an enigma to astronomers.

The main reason for this lack of information is that the planet is permanently shrouded by a thick layer of clouds. Consequently, no surface features ever have been observed even through the most powerful telescopes.

Clouds Are Barrier

The physical and chemical properties of the atmosphere of another planet are usually studied by the analysis of the sunlight as reflected and modified by the planet. In the case of Venus, the reflecting surface is the cloud layer and data obtained by means of optical, i.e., visible astronomy is limited to the atmosphere above the cloud level. Consequently, no information is available by this method on the atmosphere below the clouds and the planet's surface.

The measurements above the clouds, recorded in the visible spectrum during the past several decades, indicate that Venus' atmosphere at these heights is very dense. It consists primarily of carbon dioxide, probably mixed with nitrogen and perhaps very small amounts of oxygen and water vapor.

Apart from reflecting solar radiation, which registers in the visible and near infrared portions of the spectrum, a planet also emits its own radiation. Since planets do not generate any light, this radiation is confined to the far infrared and microwave regions of the spectrum, which is invisible to the eye but can be detected by sensitive instrumentation. Measurements of planetary radiation provide valuable information on the temperature structure of the atmosphere.

Radiation Penetrates

Such a study of Venus has been hampered by the presence of clouds that are opaque to infrared. However, the small amount of radiation emitted by the planet in the centimeter wavelength region penetrates through the clouds without significant attenuation and therefore can be usefully detected to determine the temperature of the surface of the planet.

First attempts to measure this radiation from Venus were made in 1956 by the radio telescope of the Naval Research laboratory. The temperature inferred from the measured radiation intensity was, however, unexpectedly high—of the order of 600°F, which is certainly too hot to support any imaginable form of life. Repeated measurements in the following years have confirmed this result and have forced a complete revision of our understanding of the surface conditions and the lower atmosphere of Venus.

One way of explaining such a high surface temperature is by assuming the presence of an extremely dense atmosphere composed of large quantities of carbon dioxide and water vapor. These molecules have strong absorption bands in the infrared region of the spectrum, but are relatively transparent to visible radiation. The major part of the sunlight which has not been reflected back by the planet will therefore penetrate through the atmosphere and heat the surface of the planet to a certain temperature.

"Greenhouse" Effect

Venus, whose reflectivity of visible radiation is very high (76 per cent of the light received, as compared to some 40 per cent for earth), should be heated to only —40°F by the weak sunlight that filters through the clouds. Because of this cold surface temperature, Venus would emit radiation primarily in the far infrared, which would immediately be absorbed by the dense atmosphere. Re-radiation from the atmosphere, according to this theory, then returns a major part of the radiation back to the ground, heating it to a very high temperature.

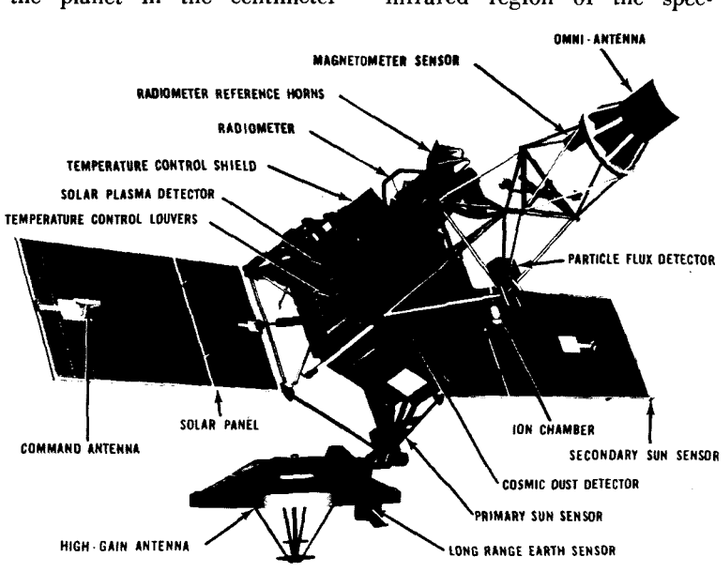
This phenomenon is called the "greenhouse effect" of the atmosphere, being an allusion to the glass cover of a greenhouse that is transparent to the sun's visible radiation, but opaque to the infrared radiation emitted from the plants. Thus the infrared is trapped within the greenhouse and heats it up. If it were not for the greenhouse effect of the earth's atmosphere, the average temperature of the earth's surface would be a cold —20°F instead of a comfortable 60°F.

In the case of Venus, it is difficult to imagine a greenhouse effect so efficient as to raise the ground temperature to 600°F. This would require an atmosphere of extreme opacity in the infrared, and at the same time considerable transparency in the visible spectrum. Since such an atmosphere would be quite unique, this explanation of Venus' high surface temperature is very controversial.

Dust Cover Possible

According to another hypothesis, Venus is covered by a thick layer of dust that prevents the penetration of any solar radiation. With a surface

(Continued on page 3)



MARINER SPACECRAFT

Alexander's Dust Detector Is On Mariner II

The mysteries of dust particles in space and around Venus, which have baffled scientists for years, may be answered if a dust detector designed by Wesley Alexander, head of the astrochemistry section in the astrophysics branch, is successful.

W. M. Alexander

The experiment, aboard Mariner II, consists of a rectangular magnesium "sounding board" with a crystal microphone in the center of the plate. The acoustical device measures the impact of particles or minute cosmic dust as small as 5 trillionths of a pound, according to Mr. Alexander.

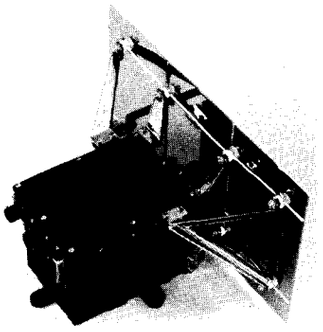
Here is how the detector works:

As a particle hits the acoustical plate it is recorded by the microphone whose output excites a voltage-sensitive amplifier. The number of dust particles striking the plate is recorded on two counters, one for particles of high momentum and one for those of low mementum.

Every 37 seconds while Mariner II is cruising in its trajectory, the data conditioning system will read out the counters to the ground. When the spacecraft nears Venus, the rate will be reduced to 20 second intervals.

"By measuring the flux and momentum of cosmic dust matter, we hope to learn more about their distribution in space relative to the sun," said Mr. Alexander. "The findings will contribute to a better understanding of the evolution of the solar system and the hazards of manned flights."

Several theories about dust particles exist. One is that they could be remnants of comets that rush through the solar system leaving a trail of dust behind.



LOCATED ON the top of Mariner's hexagonal bus, the cosmic dust detector designed by Mr. Alexander weighs 1.85 pounds and consumes .08 milliwatts of power. Its "sounding board" is 5 inches wide and 10 inches long.

Some scientists believe cosmic dust has its origin in gallactic space and is somehow trapped by the interaction of magnetic fields from the sun and planets.

Another is that when the solar system was formed billions of years ago by the condensation of a huge cloud of gas and dust, these cosmic particles were debris left over.

Scientists have been trying to study cosmic dust recently with earth satellites and sounding rockets. For example, experiments on Vanguard III and Explorer VIII are adding important information about the nature of dust particles near the earth. But Mariner may provide the first opportunity to obtain data on their distribution in interplanetary space, according to Mr. Alexander.

(Continued from page 2)

shrouded in total darkness, the high temperature of 600°F would be due to the intense friction generated by the windswept dust clouds.

There is also a possibility that high electron densities in the ionosphere of Venus give erroneous values of the measured temperature. With allowance for such a variation, the surface of Venus may be a relatively comfortable 100 or 150°F.

We hope that the results of the two experiments conducted by the Mariner spacecraft will help determine which of these models of the atmosphere and surface of Venus comes closer to reality. Then again the data derived may introduce an entirely new explanation.

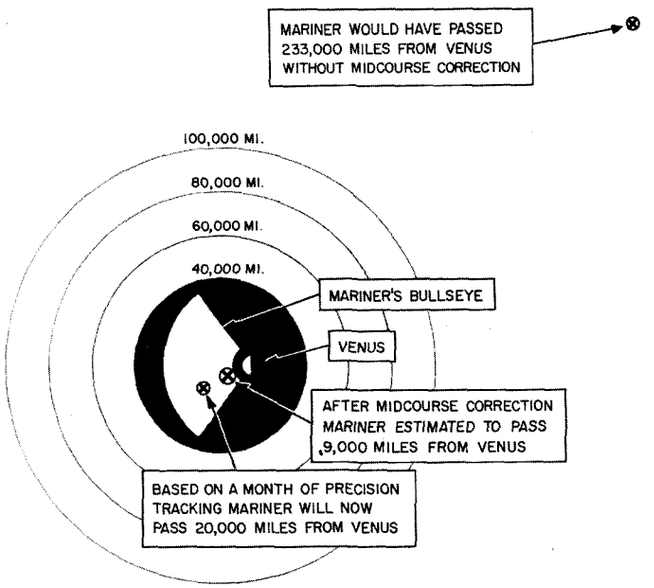
Mariner Tests Theories

In one experiment, measurements of the radiation emitted by the planet in the microwave region will be made at two discreetly chosen wavelengths—13.5 microns and 19 microns. The radiation at the first wavelength is strongly absorbed by water vapor, while the longer wavelength will probably pass through the atmosphere unattenuated and measure the ground temperature.

A comparison of the measurements made at the two wavelengths therefore will offer important information regarding the presence of water vapor in the atmosphere. The result will have a direct bearing on the validity of the "greenhouse" hypothesis.

The measurement of the 19 microns radiation also will test the possibility that the high temperatures observed on Venus originate from a thick ionosphere rather than from the surface. This can be easily proved or disproved by measuring the radiation emitted from different parts of the planetary disc. If the ground has a high temperature, then measurements made of the edge or "limb" of the planet should show a slightly lower temperature or "darkening" due to the greater thickness of the intervening atmosphere. If the high temperatures are caused by a high electron density in the ionosphere of Venus, then the readings at the limb should indicate a "brightening" because of the greater thickness of the ionosphere in view.

The second Venus experiment concerns the measurement of the infrared radiation of the planet. The observations of Venus from earth in this infrared region have to date indicated a temperature of −40°F. As clouds are opaque to infrared, it is believed that this temperature exists at the top of the clouds. (A temperature similar to that frequently observed at the top of terrestrial clouds.)

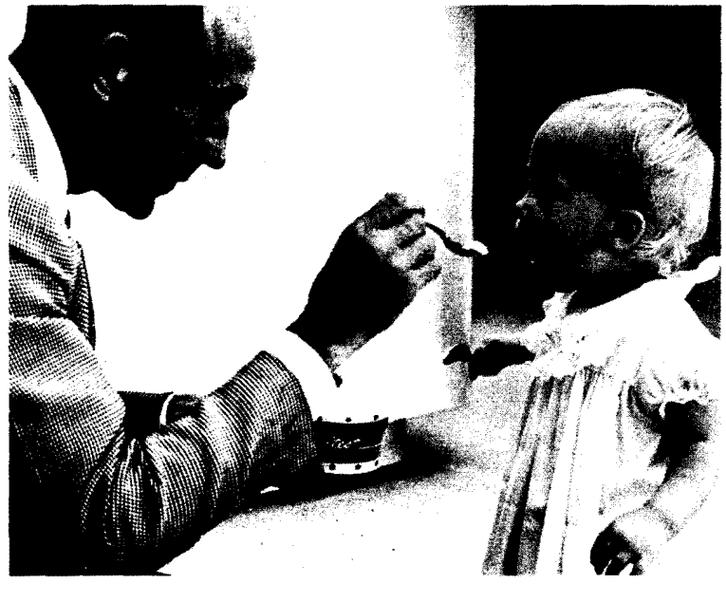


Cloud Breaks Possible

The wavelengths for the infrared radiometer have been so chosen that this experiment will give information regarding the temperature at the cloud top, and the amount of carbon dioxide above the clouds. The device may also indicate whether there are any breaks in the clouds of Venus—a question that has been debated for the last several decades.

The two wavelength regions used in the infrared experiment are 8.0-9.0 microns and 10.0-10.8 microns. Both these spectral regions are absorbed to a similar degree by clouds, but only one (10.0-10.8 microns) contains a strong absorption band of carbon dioxide. If there are breaks in the clouds, then the difference of temperatures measured in the two wavelength regions will show erratic variations when the radiometer scans the planetary disc.

Goddard Hosts Greenbelt, Employe



ees In 2-Day Open House Weekend

Relay To Link America With Brazilian Ground Station

Portuguese is another language we'll have to brush up on to keep abreast of the space age. When Goddard's active communications satellite "Relay" is orbited, it will boost telephone messages from a ground station at Nutley, N. J., nine miles west of New York City to a ground station 4,820 miles away on the outskirts of Rio de Janeiro, Brazil.

The Nutley station is on the grounds of Goddard's contractor, the International Telephone and Telegraph Corporation Federal Laboratories. This station, beefed up at NASA expense for the coming Project Relay, is a veteran of space communications, having taken part in the Echo and Courier programs. It employs a 40-foot dish antenna and support equipment housed in two igloo-type structures at the foot of the antenna tower. Inside the Nutley igloos are a 10-kilowatt transmitter power supply, tracking and communications receivers and antenna control equipment that will combine all voice communications into one signal for ease in handling.

Rio Trailer

The station in Brazil is a mobile unit, a completely self contained ground terminal designed and engineered by ITT Federal Laboratories to provide telephone, teletype and high-speed data transmission via satellite. The transportable ground station can be produced at moderate cost, and can be delivered to very remote areas.

It will be operated by Companhia Radio Internacional do Brasil (Radional), a subsidiary of ITT, by authority of the Brazilian Administration in cooperation with NASA.

Novel Equipment

The Rio station can handle twelve simultaneous two-way telephone conversations. If voice messages are not being transmitted, the station has a capacity for twelve simultaneous teletype or high speed data circuits per voice channel, or 144 total circuits for those purposes. Future equipment may be modified to include television transmissions.

The equipment can be shipped by sea, air, railroad or highway to any remote destination. The mobile station travels in a van and three trailers. The "package" includes a 30-foot dish antenna which can be dismantled into pie-shaped sections, and the antenna support tower. In dry runs, four men have set up the station in as little as 16 hours.

A 30-foot van is used as a control center of the station. Besides the control consoles from which operators direct the reception and transmission of communications, the van contains a 10-kilowatt FM transmitter, power supply, and terminal equipment such as telephone, telegraph and teletype. multiplexing equipment, and test and monitoring gear.

The steerable 30-foot parabolic antenna, with the radio frequency portions of the transmitting and receiving equipment mounted directly behind. will scan the horizon as the Relay satellite approaches in its pass. When the spacecraft comes into view, the ground station's automatic tracking system will lock on the beacon signal and follow the satellite during its line-of-sight path.

System Flexibility

The equipment is designed to operate in the frequency range of 1725 to 8000 megacycles. By interchanging several components in the system, ITT engineers claim the station can be adapted to operate with any present or planned communication satellites.

The station at Nutley is capable of performing a wide variety of communications experiments with Relay and other future satellites.

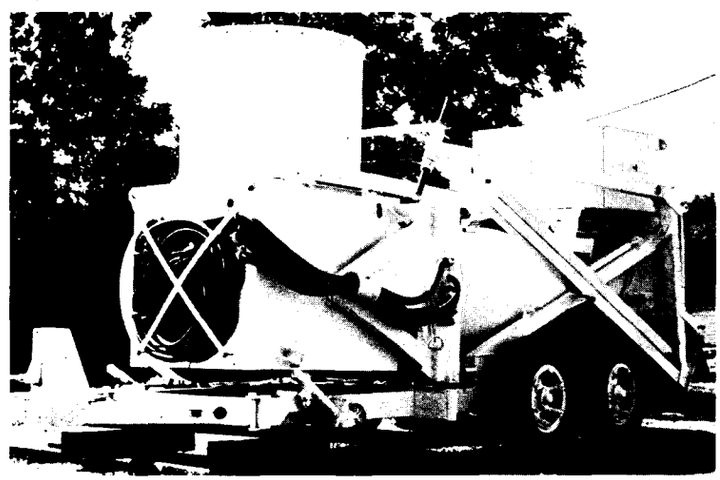
Other stations involved in Relay experiments are the big AT&T horn antenna at Andover, Maine; an identical station at Pleumeur-Bodou, France; and an 85-foot diameter parabolic antenna at Goonhilly, England. These are currently experimenting with Telstar. Others are a 30-foot parabolic antenna to be operated by Telespazio in Italy from a site about 50 miles east of Rome and a 75-foot diameter antenna which the Federal Republic of Germany will build at Raisting, about 30 miles south of Munich.

A test station for Project Relay, operated under contract with NASA-Goddard by the Space Technology Laboratories, Inc., is adjacent to the station at Nutley. This station will turn on, acquire and track the Relay spacecraft to check its operational status before turning the satellite over to the ground stations for intercontinental experiments between Europe and South America and the United States.

Relay should be visible to the test station five or six times a day for useful periods of from ten to 60 minutes.

If Relay's South American experiments are as successful as expected by Relay Project Manager Joe Berliner and Ground Manager John Flaherty, a big advance in genuine worldwide communications will have been made.

AT NUTLEY, N. J., the antenna and structures of the northern ground terminal of the North-South America link are shown in the foreground. Antenna and control van of the transportable ground station to be set up in Brazil are shown in the background.



"BUTTONED UP": Support tower and antenna mount of the transportable Relay network are retracted for shipment.

Photo Project of Otto Berg Placed on Exhibit at Smithsonian

A unique project in rocket photography undertaken by Otto Berg, physicist in the astrophysics branch, is a new exhibit at the National Air museum of the Smithsonian Institution.

Feature of the exhibit, a three-by-four foot photo montage of the earth in color from 100 miles in space, became a part of the space frontier room in the air and space building at presentation ceremonies Friday.

Framed and mounted in a cabinet along with the flight camera and original film, the picture faces a portrait of Dr. Robert H. Goddard.

The unusual achievement of Mr. Berg has resulted in a long list of "firsts" in space photography.

Otto Berg

It even has been referred to as the father of modern rocket and space reconnaissance, said Mr. Berg.

The picture is a composite of 90 color transparencies painstakingly assembled by Mr. Berg as a personal project while an employee with NRL. The picture was brought by him to his new office at Goddard. The transparencies were enlarged from 16 mm. motion picture footage taken aboard a Navy Aerobee rocket. The rocket was fired from White Sands Proving Ground, N.M., in 1954. It rose to 100 miles, filming on fifty feet of film more than a million square miles of North America from Iowa to Lower California.

The composite picture:

- Exhibits the largest land area ever photographed in color to this date.
- Discovered a full scale hurricane that had gone unnoticed by the weather bureau and displayed its characteristics in a single photo.
- Resulted in the beginning of three separate programs in rocket photography by the defense department.
- Was judged one of the "most significant" pictures of 1955 and received a two-page recognition in Life magazine.

The vast whirlpool of clouds 30,000 feet over the Rio Grande Valley demonstrated that normal low altitude cloud cover can hide from visual or radar view a dangerous, high energy cloud system. The discovery lead at that time to new discussions on weather reconnaissance from space.

While Tiros now transmits pictures of large areas of the earth's surface, Mr. Berg's achievement still stands as a best in color.

Tiros Photos May Save $1.6 Million

Detection of imminent breakups of ice packs in the St. Lawrence Seaway by Tiros satellites may save an estimated $1.6 million a year, the National Weather Satellite Center reported.

The savings amount to $960,000 for ice-breaking activities and $700,000 for replacement of conventional aerial surveys, the Center said.

Use of Tiros for this purpose is possible because the satellite can distinguish between ice and clouds, according to Bob Rados, Tiros project manager.

Because of this capability, an international program known as Tiros Ice Reconnaissance — TIREC—was undertaken. Representatives located in ground stations during winter months watch Tiros photos to determine spring breakups.

The photos of ice conditions are compared with conventional means of watching spring breakups, such as ocean vessels, ice breakers, and commercial airplanes, to improve the detection.

Recent Technical Publications Authored by Goddard Staff

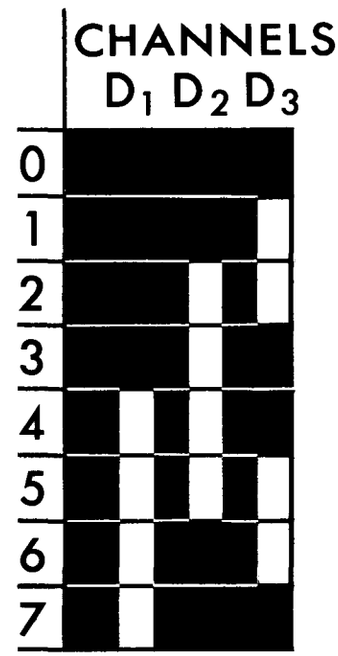
Ludwig, G. H., "Spacecraft Information Systems," NASA Technical Note D-1348, October 1962.

Hanel, R. A., "Radiometric Measurements From Satellites," NASA Technical Note D-1463, October 1962.

Fisher, D., "Satellite Motion In The Vicinity Of Critical Inclination," NASA Technical Note D-1470, October 1962.

How It Works—

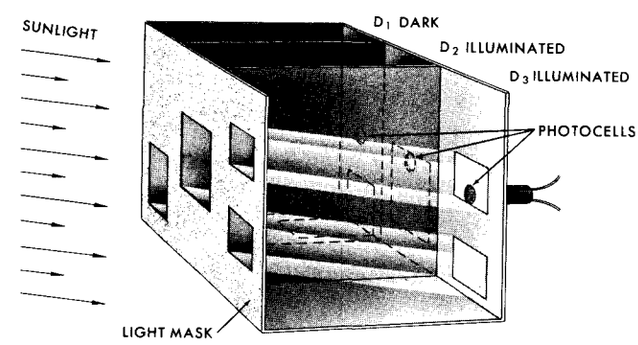
Digital Solar Aspect Sensor



The principle behind this ingenious invention (by Goddard's Jim Albus, acting section head, video section, flight data systems branch) is familiar to many of us—binary arithmetic! Sunlight entering the four holes at a particular aspect angle illuminates *none*, any *one*, any *two* or all *three* of the photocells. This produces one of the seven possible light-dark combinations shown at the left—information easy to telemeter in binary digital form.

For example, if channel D_2 and D_3 are lighted and D_1 is dark(as in the drawing) the binary indication is TWO. This tells us that the sunlight is entering at that particular angle; any other angle will illuminate a different combination of photocells.

The big advantage of a *digital sensor* is ease and accuracy of interpretation: Each photocell "channel" is either *lighted* or *dark* (a binary *one* or *zero*); so the aspect information remains unambiguous despite signal fading, "static", and similar disturbances that interfere with *analog data* systems.



8,000 Visit Center For Open House

Nearly 8,000 persons visited Goddard last weekend during the two-day open house for the Center's employees and residents of Greenbelt.

"It was one of the best open houses I've seen conducted," said Dr. G. G. Manov of the NASA headquarters exhibits office.

Said Dr. Harry Goett, Goddard director: "I am sure that each and everyone of the Goddard staff felt a deep satisfaction and pride in the impact that the open house had on the visitors from their own families and community. I would like to add my thanks and praise to those who made this event notable."

Most of the visitors went through the whole tour, reported Gerald Griffin, Goddard visits director. "In fact, Dr. Sheldon Seigel of the tracking and data acquisition office at NASA headquarters brought his family both days in order to see and hear all the presentations."