GODDARD NEWS

GODDARD SPACE FLIGHT CENTER / GREENBELT, MARYLAND

VOLUME VI, NUMBER 1 — THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION — DECEMBER 2, 1963

IMP is Placed in Cigar-Shaped Orbit

Goddard's IMP, which was placed into orbit Tuesday by the twentieth straight successful Delta launch vehicle, is NASA's "toe" probing the "hot water" in the bathtub of cislunar space.

Before the manned lunar program can get off the ground, the cislunar environment (area between the earth and the moon) must be measured and mapped. A major attempt is being made by IMP (Interplanetary Monitoring Platform). At the extremes of its cigar-shaped orbit, IMP was designed to travel ¾'s of the way to the moon and as close to earth as 125 miles.

The major role of the satellite will be the study of interplanetary magnetic fields, solar winds, and cosmic rays. It is a compact 138 pound physics laboratory in space carrying Gieger counters, magnetometers, and other devices needed to accomplish its mission.

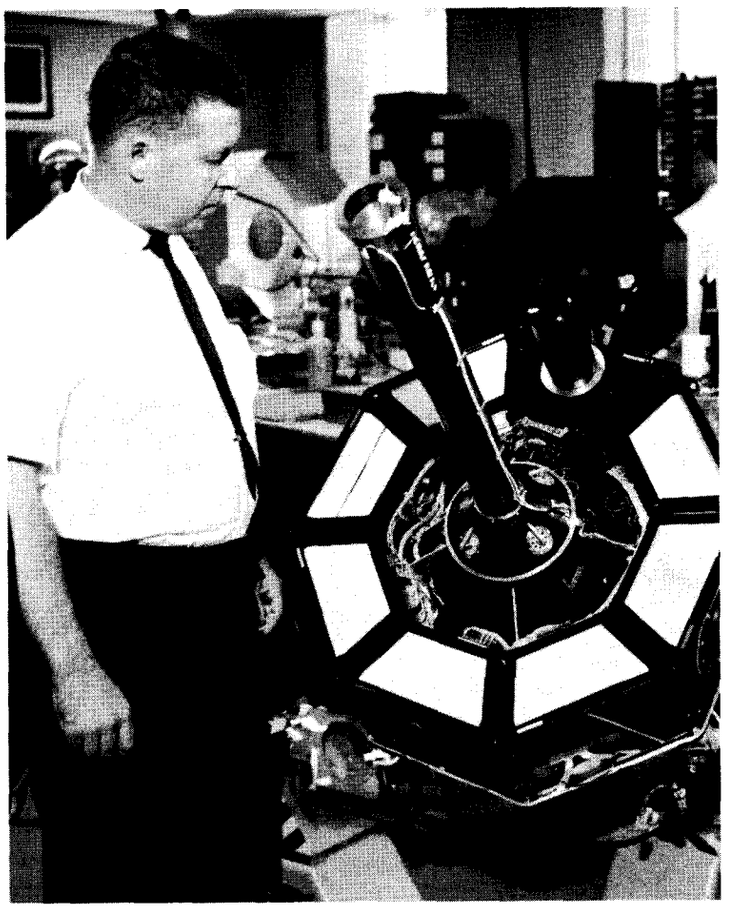
IMP is a Goddard project, designed, built, and tested in-house. Paul Butler is project manager, and Dr. Frank B. McDonald is IMP project scientist. The Delta launch vehicle is managed by Bill Schindler, the Center's Delta project manager.

Information gained by this IMP and its six follow-ups will be used in the design of protective shielding for manned spacecraft and will ultimately be used to form a basis for prediction of the solar events responsible for solar radiation in space.

Some previous data on radiation levels in interplanetary space has been obtained by earlier satellites—particularly the Explorer series—and by balloon and sounding rocket flights.

This information has shown that during periods of intense disturbances on the Sun, showers of solar cosmic rays (high energy protons) raise the radiation levels in interplanetary space.

IMP A's unusual orbit is also expected to give scientists added information on the composition and depth of the back of the magnetosphere (the envelope formed by the Earth's magnetic field which protects man from the radiation levels experienced in interplanetary space). The tear-drop shaped magnetosphere extends behind the Earth away from the Sun. IMP will attempt to map this region which is believed to trail off behind the Earth like the tail of a comet.



Beside IMP, at left, is project manager Paul Butler. The partially-completed satellite is in a Goddard lab area.

Overall, the series of interplanetary satellites will make observations in the same general area of interplanetary space over an extended period of the solar cycle. These long-term observations should result in clearer understanding of the development and dynamics of the solar system.

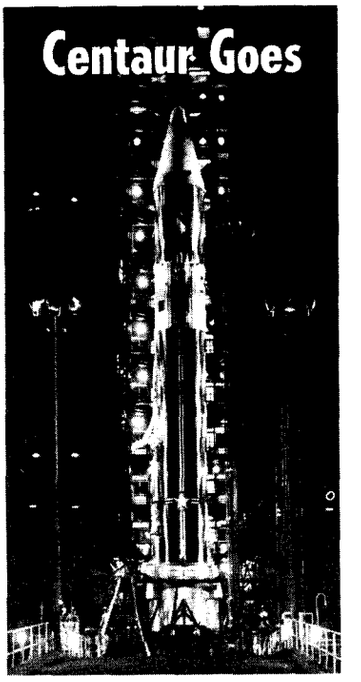
IMP A's basic design is similar to the earlier highly successful Explorer XII, XIV, and XV satellites, also managed and built by Goddard.

It is a continuation of the NASA series of "energetic particle" spacecraft on which some experiments have been successfully flown. It has an octagon-shaped base, 12 inches deep and about 28 inches in diameter. All but two of its experiments are mounted in this eight-sided base.

The satellite's distinguishing feature is the manner in which its magnetometers have been mounted to avoid interference from the weak magnetic field generated by the satellite itself.

(Cont'd on p. 4)

Centaur Goes



Goddard's field projects branch, under the direction of Bob Gray, last Wednesday, successfully launched Centaur a super-charged rocket vital to the United States manned and unmanned exploration of the moon. This was the second of eight planned Centaur vehicle test flights. The heavily instrumented 109-foot vehicle, weighed 10,200 pounds with 367,000 pounds of thrust generated by the first stage Atlas. The purpose was to check orbital insertion characteristics of the Atlas Centaur combination.

The Centaur project is under the overall direction of NASA's office of space sciences and applications, headed by Dr. Homer E. Newell. Dr. Richard B. Morrison, directs the launch vehicle and propulsion programs division.

It was developed by General Dynamics/Astronautics under the direction of NASA's Lewis Research Center.

This was Goddard's field projects branch's first launch operation with the Centaur, but it has logged 20 straight successes with the Delta vehicle. Field projects branch acts as launch operations systems manager for all NASA unmanned spacecraft at Cape Canaveral which use the Atlas Agena (except for Gemini target vehicle), Atlas Centaur or Delta vehicles.

Adventure-Discovery are Ageless

"An exploration of this magnitude into the unknown will cost entirely too much money—I'm opposed to it," stated the politician firmly, as he addressed a large body of peers.

Shouts of "Bravo!" "I agree!" "Abandon the idea!" "Foolhardy!" came from other members of the group.

"Besides," the politician continued, "a venture like this will endanger the lives of many of our finest men."

Another politico jumped to his feet. "Many diseases continue to plague us," he began. "Why not put the money to better use in scientific research on cancer, diabetes . . . heart disease?"

"Millions of people throughout the world are hungry—even starving. War threatens. Our National debt is rising—and yet we talk about spending money for an expedition doomed to failure when our men hurtle off the earth and through space.

"Right!" "Right!" "Hurrah for Rico," came from the gallery.

"Shame on you! Shame!," said a feminine leader scornfully, as she arose from her seat. "Our country became great because it was founded by adventurous men—men who had the fortitude and the foresight to invest their time, energy, *and* money in the future. Have we grown so soft and effete we shrink like violets at the thought of risk in the name of progress?"

"We stand on the threshold of the boldest adventure of all time. What would our forefathers think if they could hear some of you popinjays this day? I say proceed with the plan as programmed—and Godspeed to you, Chris."

With a sweep of her sceptre the debate was ended and the voyage of the "Nina," the "Pinta," and the "Santa Maria," was officially blessed.

Recent Technical Publications Authored by Goddard Staff

M. Dubin, "Meteoroid Effects on Space Exploration," NASA Technical Note D-1839, October 1963.

Kaichi Maeda, "Acoustic Heating of the Polar Night Mesosphere," NASA Technical Note D-1912, November 1963.

L. J. Blumle, R. J. Fitzenreiter, and J. E. Jackson, "The National Aeronautics and Space Administration Topside Sounder Program," NASA Technical Note D-1913, November 1963.

Rudolf A. Stampfl and William G. Stroud, "The Automatic Picture Transmission (APT) TV Camera System for Meteorological Satellites," NASA Technical Note D-1915, November 1963.

David Fisher, "Comparison of the Von Zeipel and Modified Hansen Methods as Applied to Artificial Satellites," NASA Technical Note D-2094, November 1963.

A. C. Aikin and E. J. Maier, "The Effects of Auroral Bremsstrahlung on the Lower Ionosphere," NASA Technical Note D-2096, November 1963.

Theoretical Meeting Will Discuss Origins

The long-taught theory that petroleum originated from organic sources (ancient vegetation and animal life) is not a closed question. Scientists will also be discussing an inorganic theory at the theoretical division seminar tomorrow.

Dr. Irving Breger, head of the research program on organic geochemistry for the U.S. Geological Survey will be the speaker at the building 3 auditorium at 3 p.m.

His topic will be "The Origin of Petroleum," and he will discuss the factors involved in both the organic and the inorganic theories of same.

The organic theory is the most commonly accepted one, and is familiar to most laymen and scientists. Some factors involved in the lesser known inorganic theory are:

- Carbon-containing radicals and hydro-carbons have been identified in interstellar space, and in comets.
- Carbon and carbon containing radicals have been detected in the atmospheres of planets and the stars.
- Hydro-carbons are present in meteorites which fall to earth.

A Qualified Spokesman

Dr. Breger is well qualified to comment on this interesting topic. He received his PhD. in Geochemistry from MIT in 1950. He worked on an American Petroleum Institute research project on the origin of petroleum from 1945 - 1952.

He studied the origin and chemical structure of coal on a Fullbright scholarship to the Netherlands during 1950 - 1951.

Japan-U. S. Linked Via Relay

The Relay satellite was successful in sending the first transcript from the United States to Japan late in November. The 14-minute program was prepared by the National Broadcasting Company in conjunction with the American Broadcasting Company. It consisted of greetings from NASA Administrator James E. Webb and the Japanese Ambassador to the United States, along with live footage of the desert scenery about the transmitting American ground station in the Mojave Desert, 50 miles north of Barstow, California.

"Japanese officials have told us the reception was excellent," said Goddard's Daniel G. Mazur who was at the Mojave ground station. "It is the fourth continent other than North America which Relay has communicated with in her very useful and long life."

Besides Asia, Relay has been used for communications to Europe, South America, and in connection with her sister satellite Syncom, with Africa. In its 11½ months it has completed more than 2,000 experiments.

The Mojave station, which is equipped to send but not receive TV signals, is under the management of the Goddard Space Flight Center, Greenbelt, Maryland, and was built under contract by the Space Technology Laboratories, whose personnel also operated the station along with those of the Bendix Corporation.

The Japanese station, a 65-foot diameter parabolic dish, is located 90 miles northeast of Tokyo. It was built by the Kokusai Denshin Demwa Company for the Japanese Ministry of Post and Telegraph. The Kokusai Denshin Demwa Company is Japan's overseas radio and cable system.

Varice Henry, coordinator of ground stations at the NASA's Goddard Space Flight Center said "The excellent record Relay has made would not have been possible without the good cooperation of all involved. We are particularly grateful for the good work of the Space Technology Laboratories and the Bendix Corporation.

At approximately 3 p.m., PST, during the next Relay pass, a film clip NBC telecast of the life of the late President Kennedy went to Japan at the request of the Japanese.

This occurance, approximately five hours after the assassination, was probably the first such showing outside this continent.

Next Syncom Will Last Longer

A solar array characteristics test was run last month on the successfully orbiting Syncom II. A power loss of approximately 20% was noted due to the effects of radiation on the satellite's solar cells.

This test result will lead to future use of n/p solar cells with .012 inch quartz cover slides instead of the p/n cells with .006 quartz cover slides now being used. The n/p cells will be used on Syncom C, the next synchronous satellite planned.

The n/p solar cells were a development of research directed by Goddard's Bill Cherry, head of the space power technology branch. He was with the Army's Electronics Research and Development laboratories at the time, in the late 50s and early 60s.

The newer type cell has been proved by ground evaluation to last up to 20 times longer than the conventional p/n cells. For more complete information on the n/p cell, see GODDARD NEWS, April 29, 1963 issue.

Goddard Coming Events

Demonstration of Equipment:

- **December 3, 10:00 a.m. to 3:00 p.m., Room 321, Building 7—Mr. J. J. Tully, Jr., Regional Sales Manager for Texas Instruments, Inc., will demonstrate the following: Strip Chart Recorders, Count-printer, Integrated Circuit Tester, Pulse Generators, Analog-Digital Converter, Multi-plexer, Precision Pressure Gage, Precision Pressure Control Units, Germanium Bolometer Systems, Dynamically Controlled Welder—for welding integrated circuit packages.**

Impetus

Editor's Note: This column of thoughts from various quotable sources will run whenever ideas are available which fit this definition—"comments which give impetus to the creative mind; which stretch and exercise the intellect." Publication does not necessarily imply endorsement.

"The Russians, I am told, report that they have not found God in outer space. On the other hand, a good many people in many different times and countries claim to have found God, or been found by God, here on earth.

"The conclusion some want us to draw from these data is that God does not exist. As a corollary, those who think they have met Him on earth were suffering from a delusion.

"But other conclusions might be drawn:

"**1.** We have not yet gone far enough in space. There had been ships on the Atlantic for a good time before America was discovered.

"**2.** God does exist but is locally confined to this planet.

"**3.** The Russians did find God in space without knowing it, because they lacked the requisite apparatus for detecting him.

"**4.** God does exist but is not an object either located in a particular part of space nor diffused, as we once thought 'ether' was, throughout space.

"The first two conclusions do not interest me. The sort of religion for which they could be a defense would be a religion for savages. The belief in a local deity who can be contained in a particular temple, island or grove. That, in fact, seems to be the sort of religion about which the Russians—or some Russians, and a good many people in the West—are being irreligious. It is not in the least disquieting that no astronauts have discovered a god of that sort. The really disquieting thing would be if they had.

"The third and fourth conclusions are the ones for my money.

"Looking for God—or Heaven—by exploring space is like reading or seeing all Shakespeare's plays in the hope that you will find Shakespeare as one of the characters or Stratford as one of the places. Shakespeare is in one sense present at every moment in every play. But he is never present in the same way as Falstaff or Lady Macbeth. Nor is he diffused throughout the play like a gas.

"If there were an idiot who thought plays existed on their own, without an author (not to mention actors, producer, manager, stagehands and what not) our belief in Shakespeare would not be much affected by his saying, quite truly, that he had studied all the plays and never found Shakespeare in them.

"The rest of us, in varying degrees according to our perceptiveness, 'found Shakespeare' in the plays. But it is quite different sort of 'finding' from anything our poor friend has in mind.

"Even he has in reality been in some way affected by Shakespeare, but without knowing it. He lacked the necessary apparatus for detecting Shakespeare.

"Now of course this is only an analogy. I am not suggesting at all that the existence of God is as easily established as the existence of Shakespeare. My point is that, if God does exist, He is related to the universe more as an author is related to a play than as one object in the universe is related to another.

"If God—such a God as any adult religion believes in—exists, mere movement in space will never bring you any nearer to Him or any farther from Him than you are at this very moment. You can neither reach Him nor avoid Him by traveling to Alpha Centauri or even to other galaxies. A fish is no more and no less, in the sea after it has swam a thousand miles than it was when it set out.

"Space travel really has nothing to do with the matter. To some, God is discoverable everywhere; to others, nowhere. Those who do not find Him on earth are unlikely to find Him in space. (Hang it all, we're in space already; every year we go a huge circular tour in space.) But send a saint up in a spaceship and he'll find God in space as he found God on earth. Much depends on the seeing eye."

—*C. S. Lewis in Show Magazine, February 1963*

GODDARD MOURNS PRESIDENT KENNEDY

As the flag at Goddard flies in memorium, the staff is of great significance. It was in its proper place on the right hand side of the reviewing stand that was in front of the White House when President Kennedy was inaugurated. It was purchased for Goddard to take its permanent place in front of building 1 on March 16, 1960, when the Center was dedicated.

GODDARD NEWS

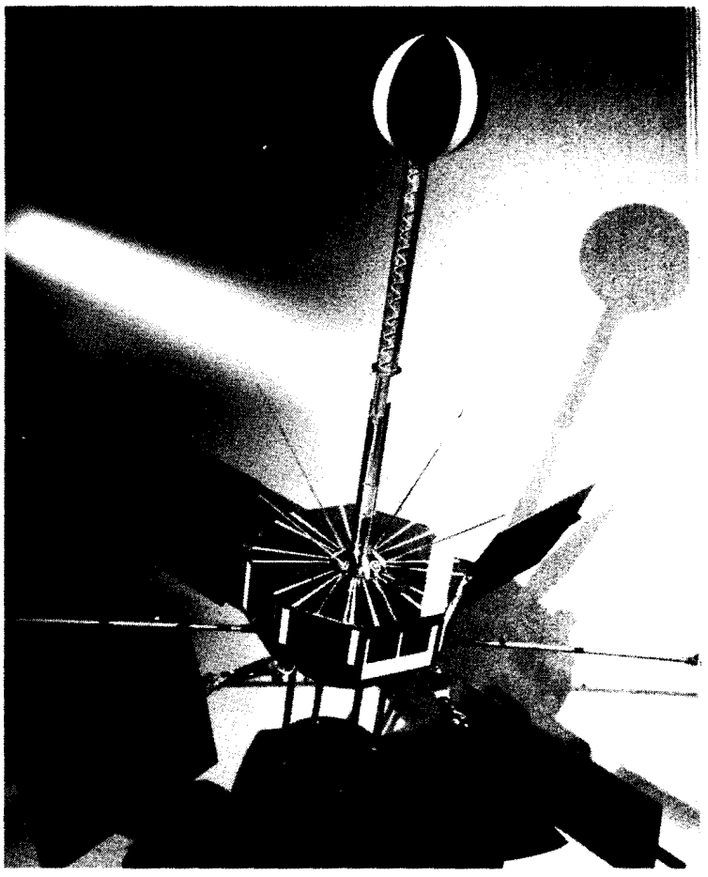
"It is difficult to say what is impossible, for the dream of yesterday is the hope of today and the reality of tomorrow."
—Dr. Robert H. Goddard

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

Bruce Brough, *editor*—Shirley Deremer, *Inside Goddard*

IMP Will Pave the Way for F



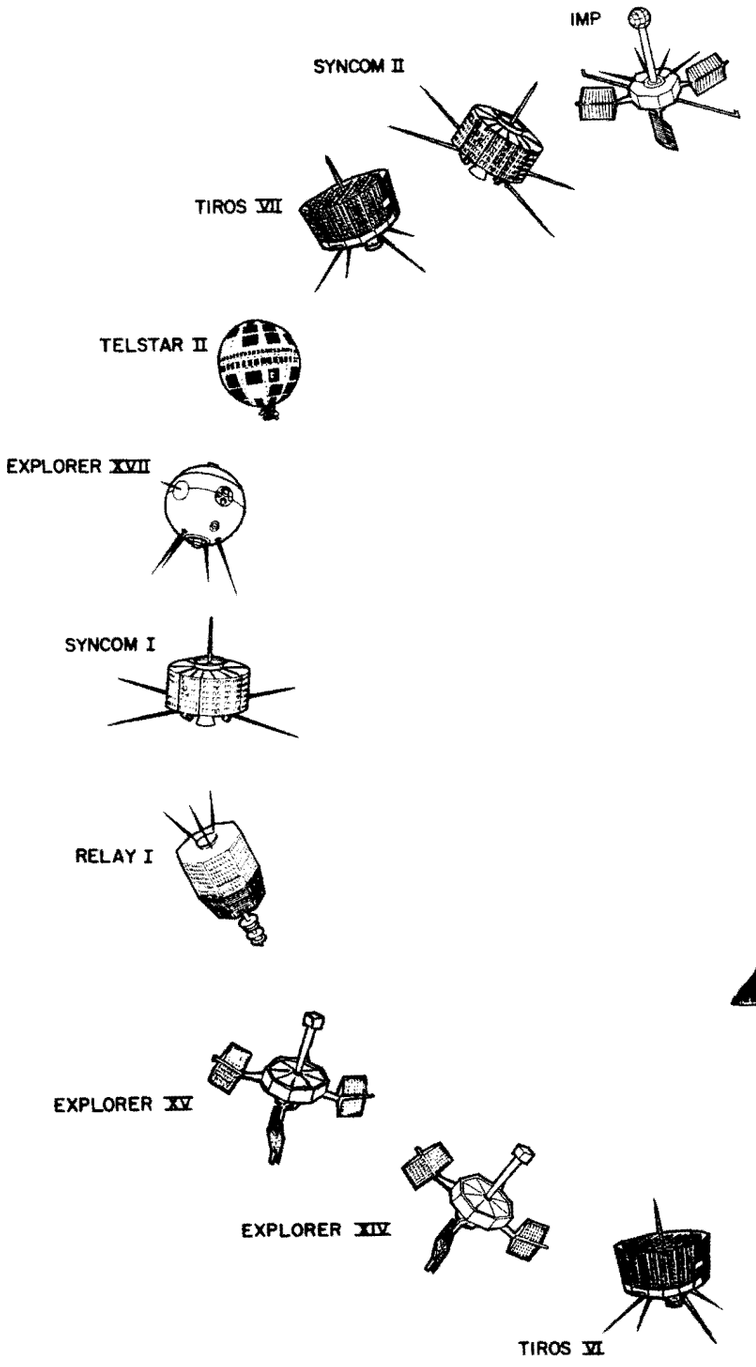
This is IMP, with boom and solar paddles extended, ready to go.

Here the satellite is set up for vibration testing in T & E.

Protruding from the top of the satellite is a rubidium-vapor magnetometer mounted on a boom which telescopes out to a distance of six feet. Two flux-gate magnetometer sensors—folded during launch—extend on booms each seven feet away from the satellite.

The spin stabilized "lab" is powered by solar cells mounted on four paddles which charge its thirteen silver cadmium batteries. Its tiny four-watt transmitter weighs 1.5 pounds and will be capable of transmitting at distances over 173,000 miles.

IMP's telemetry system is PFM (Pulsed Frequency Modulation). The satellite carries



IMP—Number T

INSIDE GODDARD

GODDARD SPACE FLIGHT CENTER / GREENBELT MARYLAND

December 2, 1963

Lavinia Tarr—Goddard's First to Retire

After 31 years, two months and four days (to be exact), Lavinia Tarr, accounting branch, has retired from Federal service.

As Lavinia retired, she remembered three "firsts" since she reported for duty at Goddard. Lavinia was the first person to be photographed and finger-printed when building 1 was finished and ready for business in August 1960. She was the first women to receive a 30-year service award pin in 1962 from Goddard and Friday, November 22 marked another first for Lavinia—she is Goddard's first optional retirement.

When anyone retires, they are pictured by others as sitting in a rocking chair on the front porch of their home in a very quite and restful manner. But for Lavinia Tarr, this is definitely not the picture.

It was quite a surprise for INSIDE GODDARD when Lavinia was interviewed and asked what her future plans were. Gracious, vivacious—it is almost impossible to describe Lavinia Tarr, as a person, with words. To meet her is to know her.

Lavinia plans on taking up art. Her father, George T. Thompson, was an artist and

Lavinia Tarr

for years she has wondered if she possessed this same talent.

Being very active in the Eastern Star, Lavinia, in 1962, served as Worthy Grand Matron of the Grand Chapter of the District of Columbia Order of the Eastern Star. This is the highest honor that can be bestowed upon any member.

Because of her interest and devotion in this organization, Lavinia organized, last year, the Star Ladies. They are like the well known Gray Ladies, except their time is given to the Masonic and Eastern Star Home. She also was responsible for the installation of the beauty parlor at the home. A stained glass window was installed in her honor at the home.

In addition to taking up art, Lavinia is going to be active as a Star Lady.

She serves on the board of directors of the Masonic and Eastern Star Home and is now busy working on the committee of General Grand Chapter for Triennial Session to be held in Dallas, Texas in 1964.

A native Washingtonian, Lavinia started her government career as a card punch operator at the Census Bureau in Washington, D. C. This was only going to be temporary. But instead it turned out to be the beginning of a career with the government.

Prior to coming to Goddard in August 1960 Lavinia worked as a retirement clerk for the U.S. Naval Ordnance Laboratory in White Oaks, Md.

She will be missed. This was evident at her retirement banquet on Nov. 20, which was arranged by her co-workers. Some 40 people attended the affair. Bill Probst, head of accounting branch gave a resume of Lavinia's career. After which Lucien Rice, section head, presented her with an electric blanket and a transistor radio.

Lavinia will make her home in Turkey Point, Md. with her only son Charles, his wife and their three children.

Lavinia received a letter of appreciation of her faithful service from Goddard's director, Dr. Harry J. Goett. Presentation was made by Dr. Michael J. Vaccaro, assistant director for OA. Dr. Vaccaro told Lavinia she would always be welcomed at Goddard. Looking on is, Bill Probst (left), head of accounting branch and Kenneth B. Foster, chief of financial management division.

UGF Goal Was Reached at Center

When the adding machine made its grand total at the close of Goddard's UGF campaign, it added up another first for the Center—its goal of $48,500 was surpassed.

Recently, a luncheon was held for the UGF-Government Unit Campaign which presented awards to 100-percent agencies. Herbert J. Fivehouse, chief, management services and supply, in behalf of Dr. Harry J. Goett, director, accepted the Merit Award for Goddard for achieving the Center's quota. Secretary of the Army, Cyrus R. Vance, made the presentation.

Due to the extensive efforts of the director, all assistant directors, Hugh Easter (who served as general campaign manager) and the employees, Goddard was able to meet its goal.

You are A Member . . .

GEWA

(Goddard Employees Welfare Association)

Did you know that . . .

Each time you patronize a vending machine here at Goddard part of your nickels and dimes go into the GEWA treasury.

Among the many clubs sponsored by GEWA, is the NASA-Goddard Gun Club. If anyone is interested, contact John Zegalia, extension 4946.

Letters To Dr. O'Keefe

When Dr. John A. O'Keefe, assistant chief of Goddard's theoretical division, read the stack of letters he received last month from a group of seventh grade students in Iowa, he must have relived the grass roots experience with some measure of satisfaction.

Dr. O'Keefe's great interest in determining the origin of tektites prompted a field trip to Monona County, Iowa to search for these strange meteorites that have baffled scientists for years. Iowa is known to have wide-open fields of loess (rock free) soil. Therefore, if a meteorite should fall—it would be more noticeable than in normal rocky ground.

In Dr. O'Keefe's view, tektites are produced by the impact of a foreign body on the moon, causing large chunks to break off. Some fall to earth and some go into orbit around the earth. Those, while in orbit, ablate and the drops which fall to earth are tektites.

News of Dr. O'Keefe's visit reached West Monona Jr. High School. He was asked if he would have time to speak before the seventh grade science class. Dr. O'Keefe naturally is interested in our future scientific talent and was glad to have the opportunity to talk to the science class.

The following excerpts from some of the letters he received answers the question: "Did the class understand Dr. O'Keefe and enjoy his visit?"

"A man of your high education wouldn't come to talk to a plain 7th grade class if he was not interested in tomorrow's leaders. I sincerely thank you."

(Cont'd on p. 2)

Their Thanks To Dr. O'Keefe

(Cont'd from p. 1)

"I learned a lot that I had never heard about before. I am more interested in space, the moon and the space projects since you explained them more clearly to me."

"I enjoyed you having come down to our school to speak to us. I got a lot out of talk and pictures. I will look for some specimens for you. We have about 60 acres of plowed fields. We also live in Harrison County."

"I hope that you will find what you are looking for."

"There was only one part I didn't understand, and that was when you wrote the formula on the board. It was V=4/3xE, or something like that. We haven't had anything like that yet in school. The part I liked best was when you told us how meteors hit the moon and knocked chunks of tektite off."

"It made me feel that this was something that concerned me as an individual and not that it only concerned VIP's. I can assure you everyone enjoyed your lecture. It must have been difficult speaking to us after speaking to so many universities. May God be beside you in all that you do."

"I feel very honored having heard you talk. I found out many things which once puzzled me. I walked plowed fields a little bit. I can't tell my dad to stop when he hits something because we have a hired man plowing. We are going back to regular science today."

"I learned a lot of new things from your talk and thank you for answering our questions. I hope no one told you but when we got back to our home room the class you later talked to were filing out and was there a conversation. I hope you get to go to the moon."

"I hope that someday you will get to the moon. P.S. Now I know the moon isn't made of 'Green Cheese'."

"It was a very pleasing privilege, and I wish you luck in finding more information to make this a better world."

"It isn't very often we have a privilege to have a scientist that talked to the astronauts, and he was here talking to us. But I still think that part of the moon could tilt the earth more. My dad has heard and seen you one time, he is a surveyor, geologist, and a dam and bridge builder, he works for the Corps of Engineers."

"Mrs. Cooper told us you have some children about our age. I bet they are proud to have a father like you."

"It is so very nice to know that we have such a bright team of scientists behind the moon trip."

"I hope you find the substance in which the moon is made up of and solve every other question."

Procurement Xmas Dance Soon

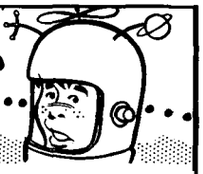
The holiday season is not far off so it's only natural that plans to celebrate are in the mill. Procurement division is extending an invitation to Goddard employees and their families to join them in the Antler Party Room at De Matha High School on Saturday, Dec. 14, for their annual Christmas dance.

The dress is semi-formal and music for dancing will be from 9 p.m. to 1 a.m.

In the past, procurement has been famous for their fabulous floor shows. The Christmas dance will not be an exception —for your pleasure another great floor show will be staged.

Including set-ups, the price is $1.75 per person (BYOL). Tickets may be purchased by contacting Hank Arista, extension 4897 or Charlie Trotter, extension 4881.

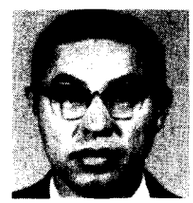
FROM "LIL ASTERNERTS"..



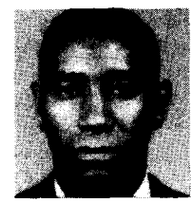
Dear Sir
In school I am giving a report on Satellites and am finding it hard to get information on them. So my Science teacher told me to write to you and see if you could help. I need information and pictures and if you have any charts I need them for a top-secret project I'm planning.
Thankyou.

Sincerely yours,
Steve Friedman

Goddard Welcomes



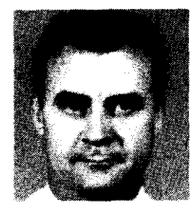
Toyo Sakamoto
Test & Evaluation Div.



Joseph L. Bishop
Theoretical Div.

Susan G. Gusy
Theoretical Div.

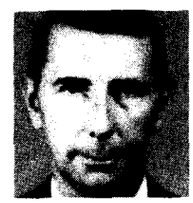
Pearl Keeney
Spacecraft Integration & Sounding Rockets Div.



Homer Hoyt
Space Sciences Div.

Ralph Stockhauser
Space Sciences Div.

Bruce G. Everett
Spacecraft Systems & Projects Div.



Willard G. Filkins
Spacecraft Systems & Projects Div.

Wilma J. Leidig
Technical Information Div.

J. E. Lichtenstein
Technical Information Div.

Cynthia Doyle
Technical Information Div.

Richard Wirth
Spacecraft Systems & Projects Div.

ıture Manned Space Flights

a PFM encoder with digital data processor for accumulation and storage of data.

The IMP A Delta used for the first time a higher thrust third stage motor, the X-258, which generates 5,700 pounds of thrust.

This launch was one of Delta's most crucial tests. It will take at least a week to confirm that the satellite has indeed achieved its planned orbit. The nominal orbital period is 153 hours—more than six days. A little too much velocity could have allowed IMP A to elude the earth's

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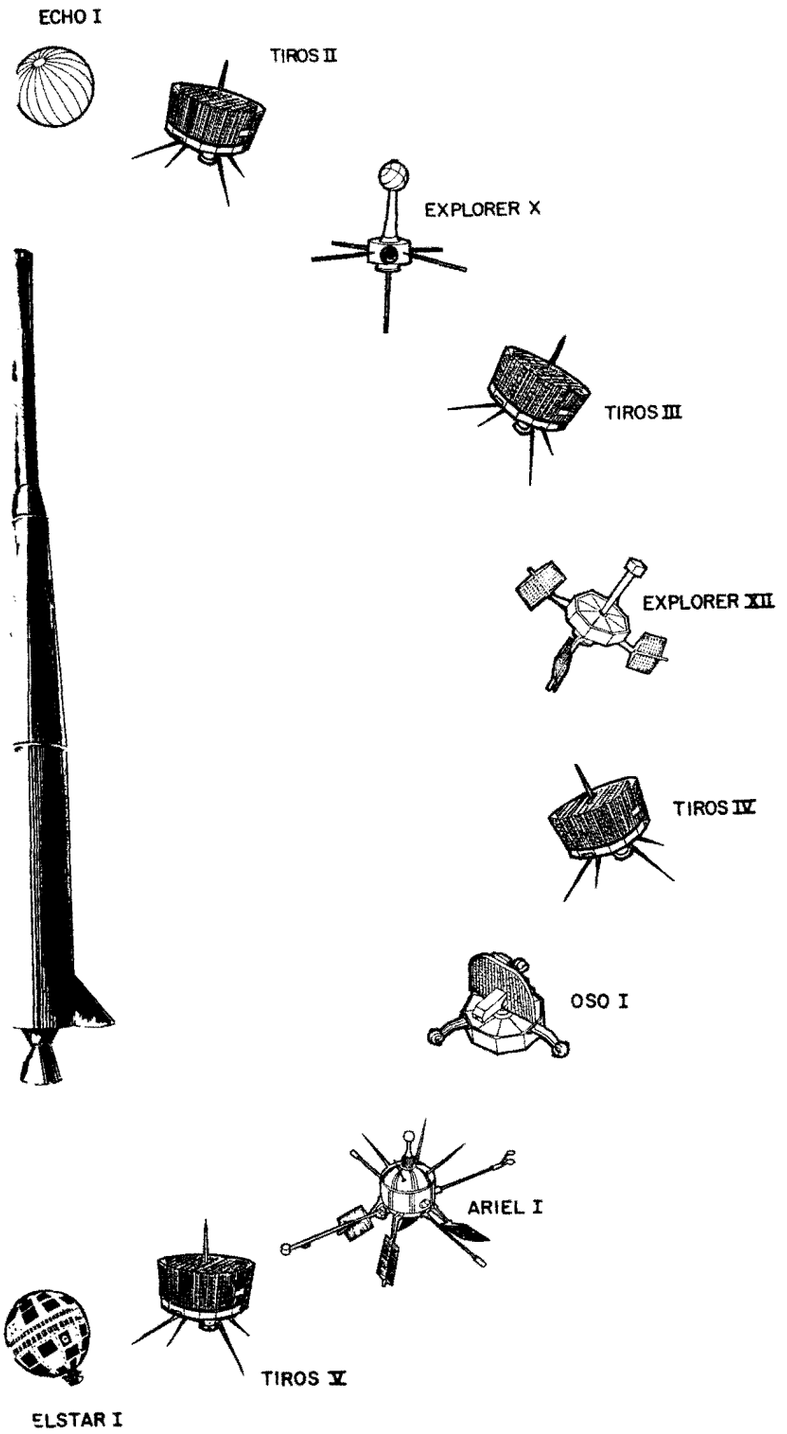

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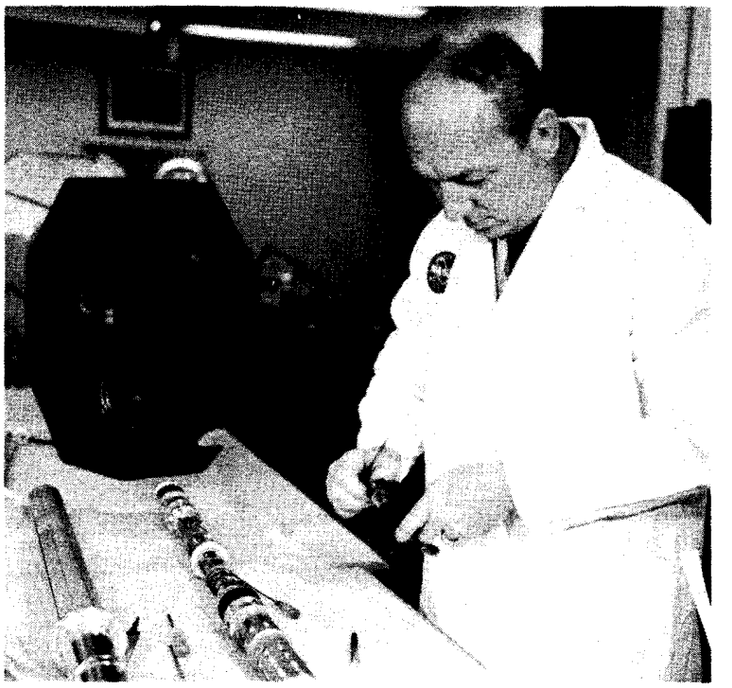
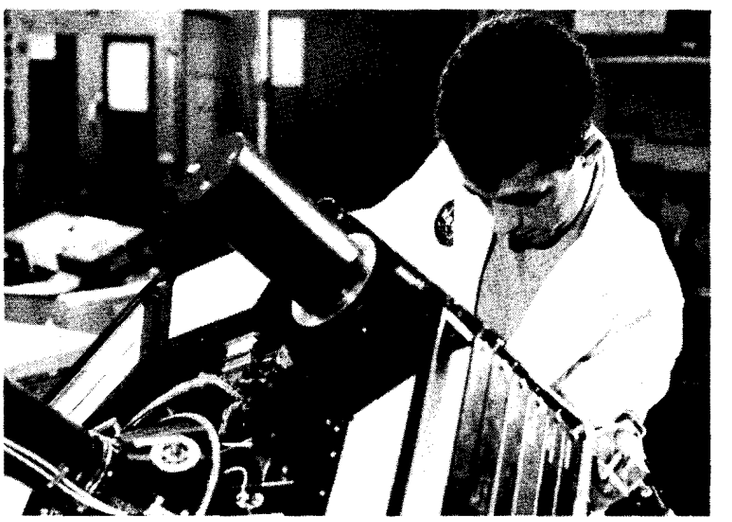


Ray Berkley is assembling the Rubidium vapor magnetometer.



Tony Pierro is shown here during the mechanical assembly of IMP.

During final inspection of IMP, she is examined by (from left): Dennis McCarthy, Ray Berkley and Paul McConnell.

Goddard's IMP Has Numerous Objectives

(Cont'd from p. 5)

gravity and "escape" into solar orbit—out of range of ground stations.

Major Objectives

The primary interest in the study of the interplanetary medium is the interplanetary magnetic field. The basic device for measuring these fields is called the magnetometer. For its mission, IMP A will carry two different types of magnetometers, both Goddard experiments:

- A rubidium-vapor magnetometer—a three-pound ball-shaped device 13 inches in diameter, mounted six feet above the satellite's main base.
- Two fluxgate magnetometers, each mounted on seven-foot booms in the base of the satellite.

The magnetic field experiments will measure the magnitude and direction of the magnetic field in space with high accuracy and precision. This data will be particularly significant regarding the development of theories on the present physical state of the interplanetary medium, its dynamical characteristics and the interactions of the streaming solar plasma with the geomagnetic field.

Another objective is the study of cosmic rays—which are not rays at all but high energy particles—consisting of protons, alpha particles and heavier nuclei. There are two sources of cosmic rays: those which originate from outside the solar system and are of very high energy and those which come from the Sun during certain periods of solar flare activity.

Both types of cosmic radiation—galactic and solar—will be studied by instruments on board IMP A. Four experiments will measure their intensity, composition and direction:

- A University of Chicago device designed to be flown on Mariner which employs solid-state detectors and a range-energy loss telescope to search out charged particles of comparative low energy. This device will study the particle spectrum and its nuclear composition, concentrating on hydrogen, helium and lithium.
- Two pancake-shaped Geiger counters—called particle telescopes—(Goddard experiments) will be employed to obtain data on the direction and flux of cosmic rays produced by a large solar flare.
- A particle telescope (Goddard experiment) which will measure the flux of galactic cosmic rays and identify hydrogen, deuterium, tritium and helium in energy ranges of from 12 to 80 million electron volts.
- A University of California ion chamber to measure the presence of proton radiation and determine its quantity in terms of a dose rate of reontgens per hour. Changes in intensity of cosmic radiation caused by flare activity also will be recorded.

Three IMP A experiments will study the effects of solar wind in interplanetary space:

- A curved-plate electrostatic analyzer from Ames Research Center will separate solar particles in terms of their energy. After separation, the particles will produce a current—which is a function of the energy level—and can be measured by an electrometer circuit.
- A MIT experiment which measures the solar wind using a device which permits particles to enter a six-inch-diameter surface through a series of grids which separates electrons and low-energy positive particles.
- A small sensor, a Goddard experiment, called the thermal ion electron experiment will collect particles and measure the amount of electrical charge they carry. Portions of solar wind to be measured include positive and negative ions and electrons.

The first IMP carries the following experiments contributed by scientists from the universities of California and Chicago, MIT, Ames and Goddard.

The experimenters are: Dr. Norman F. Ness, Goddard, *rubidium vapor magnetometer* and *fluxgate magnetometer;* Dr. J. A. Simpson, Enrico Fermi Institute, University of Chicago, *range versus energy loss;* Dr. Frank B. McDonald and Dr. George Ludwig, Goddard, *energy versus energy loss;* Dr. Kinsey A. Anderson, University of California, *ion chamber and Geiger counter tubes;* Dr. John Wolfe, Ames, *low energy proton analyzer;* Dr. Herbert S. Bridge, Massachusetts Institute of Technology, *plasma probe;* Robert Bourdeau and Gideon P. Serbu, Goddard, *thermal ion electron sensor.*

Joe Cochran checks a car at the gate.

'Round the Clock:

Security Force is 'On Guard'

On a gray day or a black night, there's a man in blue at Goddard's gate. After regular hours or on holidays, Goddard property is under watchful eyes. An ambulance stands ready for emergency calls—and it too is manned by the men in blue, Goddard's security guard force.

Fingerprinting job applicants, making identification photos and badges, enforcing the traffic safety program, and numerous other duties fall to the guard force. All the guards, including the new Captain, Bradford Barrows, are contract employees of Federal Services, Inc. They report, through Captain Barrows, to Ronald Surgen, head of Goddard's physical security branch.

The term "physical security"

nicely describes the major duty of the force. Goddard's physical plant and equipment represent millions of dollars. Like any private organization, this investment needs protection from theft, vandalism, pilferage, or other criminal acts. Traffic must be regulated, and certain rules and regulations must be enforced for the benefit of all.

The guards are responsible for the enforcement of the Center's entire physical security program. The guard force "implements and carries through the various elements of this overall program," says Ronald Surgen.

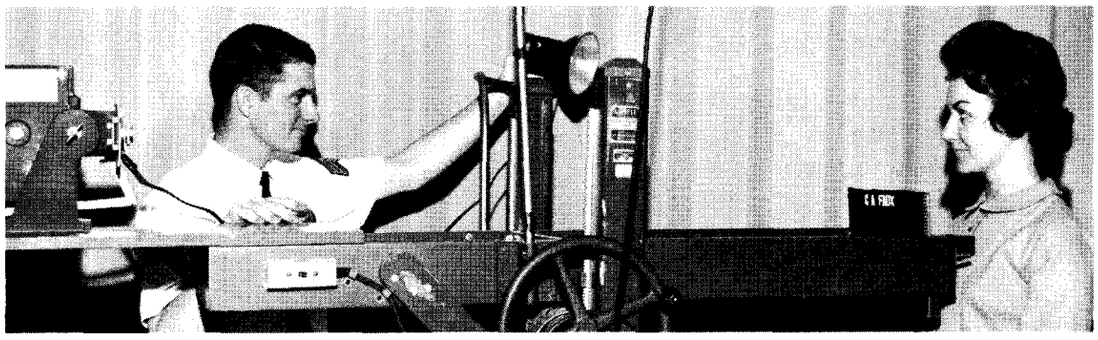
Each guard is given a complete course of training covering:

- general orientation
- purposes and principles of the system of security as applied to NASA and GSFC.
- organization and functions of the guard force
- authority and specific duties of each guard
- discipline
- employee and public relations
- instruction in the use of safe practices and maintenance of sidearms
- weapon qualifications and firing on practice courses
- elementary first aid and fire protection
- report writing
- traffic control.

Day and night protection at the Center is only a part of their protective obligation. They also serve Goddard leased facilities at Jackson Street, Lawrence Street, the University Building, College Park Building, and Beltsville.

They provide protection after normal working hours, on weekends and holidays. They also patrol the perimeter road around the Center and Goddard property located at the Agriculture Research Center Airport.

Guard Sgt. Hollis White discusses an accident with safety officer Bob Murray prior to writing up accident report.



Sgt. Simms prepares to take Carol's identification picture, another step in the processing of a new employee.

Carol Faux is being fingerprinted by Sgt. Edward Simms.

Edward Simms, Robert Christian and Melvin Allan practice with the handguns, as required, for qualification.

Ron Surgen (left) and the new captain of the guard Bradford Barrows examine the lock on a file drawer.

Planned Holes Improve Chamber

Holes in the wall are not always defects. Holes in Goddard's vacuum chamber in building 7 (which houses the new vacuum optical bench), represent teamwork, tremendous monetary savings, time savings, and in-house ingenuity.

James Diggins, engineering design branch, who is in charge of this optical facility, ran manufacturer's qualification tests on the chamber to determine whether or not it was constructed properly to meet the requirements of Goddard experimenters.

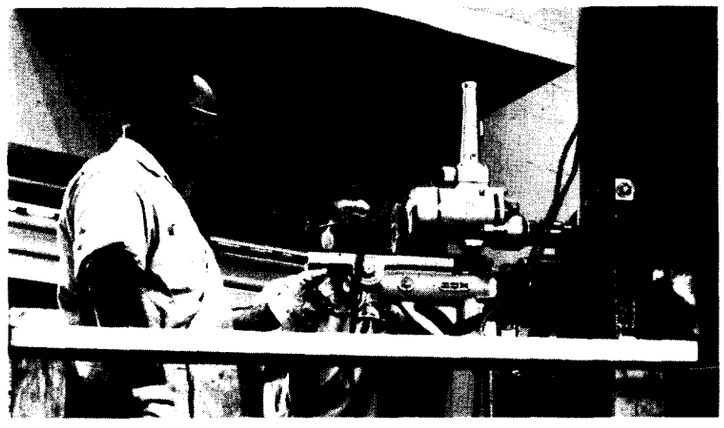
He realized that the chamber would be of greater use for experimental purposes if it had four additional holes in its sides. This would make it possible to perform the optical calibration of the Oribiting Astronomical Observatory (OAO) experiment packages using the same electrical cabling which they will have on-board the spacecraft when it is launched.

The problem of drilling the 16-inch diameter holes in the side of the stainless steel chamber was posed to Fred Taub, head of the machine branch, and Lawrence Fontaine, head of the instrument shop section. This was a rather unique problem because the vacuum chamber was already completely installed. It would have been too costly to disassemble the entire vacuum chamber and send it back to the factory for the alteration.

Taub, who worked at Langley before coming to Goddard four years ago, remembered that there was a portable boring bar machine at Langley. Taub and Boschert went there to borrow the boring machine. Then the shops designed the drilling and boring fixtures, and took care of arranging all other necessary physical details of the operation.

After all the details had been worked out, and a mounting fixture had been located, two drilling teams (two men each), began drilling a series of ½ inch holes in a circle smaller than the required hole size.

These teams worked 24 hours a day for three days. One team worked during the day and the other at night. William Gibbs and Maurice Beaton were on the day team. At night, Andrew Boschert and Robert Vogelsang were on the job.



William Gibbs (left) and Maurice Beaton are beginning the drilling operation with a series of ½-inch holes.

Gibbs is shown inside the chamber during the final boring to size. Note the series of ½-inch holes.

The operation had a seven day deadline, which created the need for a 24-hour round-the-clock workday.

When the series of ½ inch holes was finished, the circle was completed by sawing from one hole to another to form a circle. Then the center section mass was removed. After this was removed, the portable boring machine was attached to the vacuum chamber to machine the rough sides of the preliminary circle to the required size, to within .005 of an inch tolerance. This accuracy was necessary for vacuum seal weld.

The final step in the operation was to insert a premanufactured flange which was to be welded in place to provide a vacuum seal and to hold a penetration plate. The welding on the project was done by D. Wiley Jenkins, head of the welding section, and Sidney McClure of the sheet metal welding section. After this had been done, the whole chamber was tested for vacuum leaks: none were found. The entire operation had been successful.

The vacuum optical bench (VOB) facility was designed and constructed primarily for the testing of optical experiments of the OAO series of spacecraft.

The entire facility is located in a three story room in building 7 near the environmental test facilities of the test and evaluation division.

The principal elements are the vacuum chamber, approximately 25 feet high by 7 feet in diameter and a removable vertical optical bench.

The bench has its own integral optical system which includes a light source, a U-V monochromator, a 38-inch clear aperture collimator, and a movable beam probe.

Goddard Speech and Paper Presentations

(Technical presentations approved as of November 22, for period of December 2, through December 15. Requests of copies of speeches and papers should be made directly to the author.)

SPEECHES

J. E. Jackson, Regional Meeting on Aeronomy, University of Tucuman, Argentina, December 2-4, ***"Rocket and Satellite Research in Brazil and Argentina."***

W. N. Hess, Carnegie Institute of Technology, Physics Department Colloquim, Pittsburgh, Pennsylvania, December 16, ***"The Radiation Belt and Particles from the Sun."***

PAPERS

Frank On, 33rd Symposium on Shock, Vibration and Associated Environments, Washington, D. C., December 3-5, ***"A Theoretical Basis for Mechanical Impedance Simulation in Shock and Vibration Testing."***

William Bangs, 33rd Symposium on Shock, Vibration and Associated Environments, Washington, D. C., December 3-5, ***"Sinusodial Vibration Testing of Nonlinear Spacecraft Structures."***

Joseph P. Young, 33rd Symposium on Shock, Vibration and Associated Environments, Washington, D. C., December 3-5, ***"The Effects of a Spring Clearance Nonlinearity on the Response of a Simple System."***

W. R. Forlifer, 33rd Symposium on Shock, Vibration and Associated Environments, Washington, D. C., December 3-5, ***"The Effects of Filter Bandwidth in Spectrum Analysis of Random Vibration."***

T. G. Butler, 33rd Symposium on Shock, Vibration and Associated Environments, Washington, D. C., December 3-5, ***"Frequency Properties of the Duffing Equation."***