GODDARD NEWS

GODDARD SPACE FLIGHT CENTER / GREENBELT, MARYLAND

VOLUME V. NUMBER 12 — THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION — NOVEMBER 18, 1963

Second Generation Delta Joins NASA Launch Team

Solid Fuel Pods Nearly Double First Stage Thrust

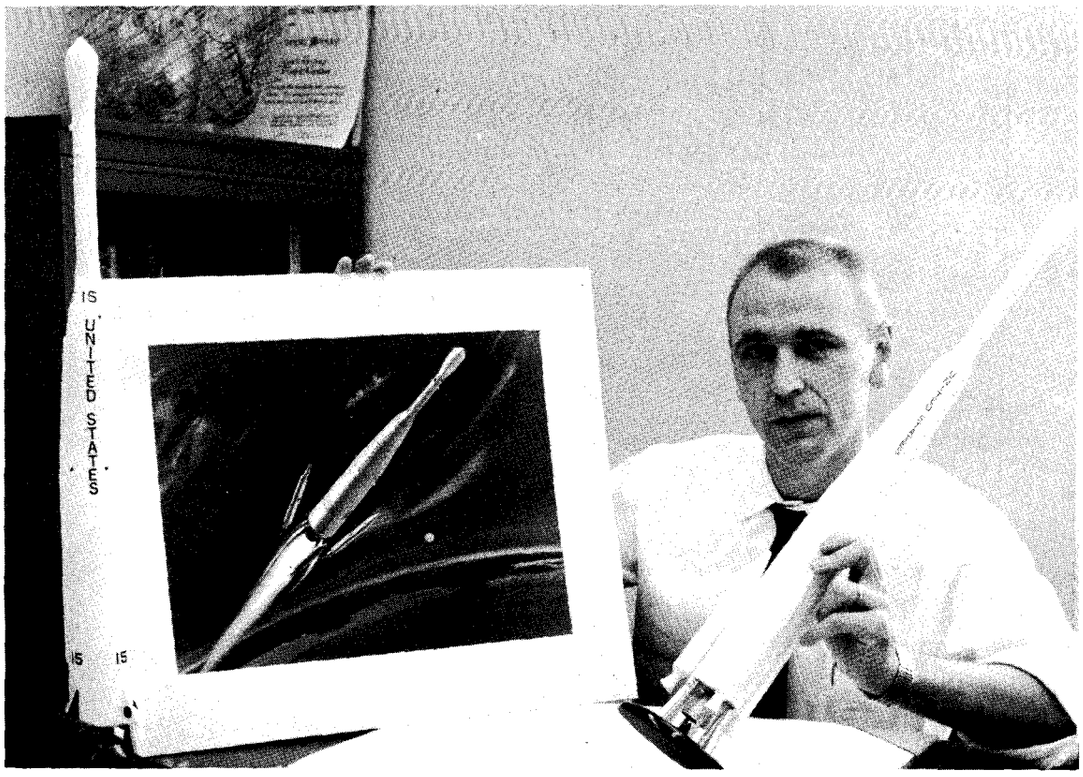
A second generation of the dependable Delta with more muscle and hustle has been added to NASA's stable of space boosters. TAD (Thrust Augmented Delta) has a 20 to 30 per cent increase in capability over the "standard" Delta. For example, TAD will place 1,000 pounds into orbit compared with 800 pounds for Delta.

In the new configuration, three solid propellant rockets (the same rockets used in the second stage of Scout) are strapped around the base of the Delta's first stage Thor booster.

Each of these solid-fuel rockets has a thrust of 54,000 pounds. All three ignite at launch along with the Thor stage engine. Total thrust at liftoff is more than 330,000 pounds compared to approximately 170,000 pounds for Delta.

After burning for about 40 seconds, the 31-inch diameter solid strap-ons are dropped from the Thor stage which continues powered flight.

The Air Force developed the Thrust Augmented Thor System and has flight tested it in boosting Thor Agena vehicles.

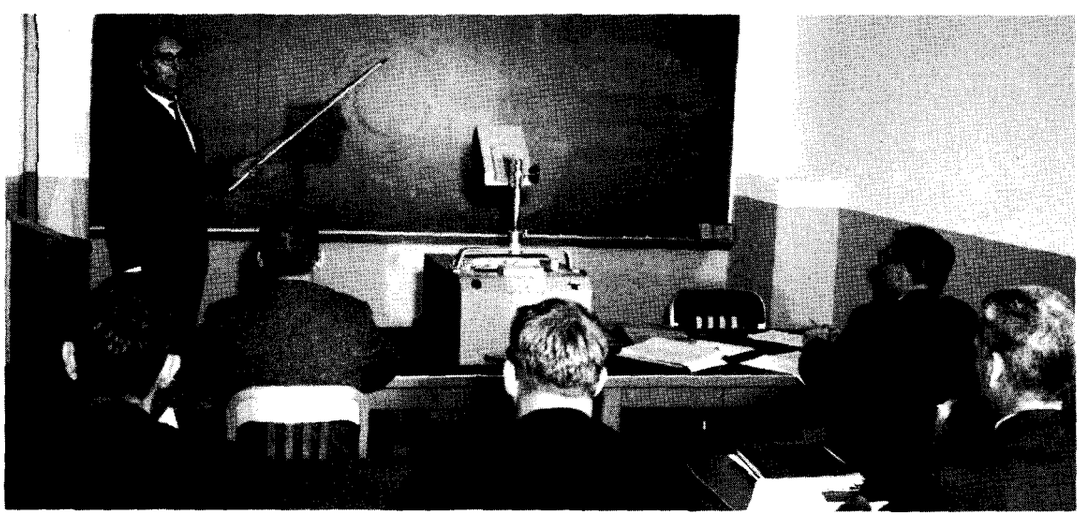


Bill Schlindler, Delta project manager, is shown here with a model of the new Thrust Augmented Delta and an artist's conception of the separation of the three solid-fuel strap-ons. The standard Delta model is at left. The solid boosters nearly double the thrust of the first stage Thor at lift-off.

Goddard Manages TAD

Delta's project manager, Goddard's Bill Schindler, says that "TAD will be used for the biosatellite series and perhaps for some of the seven scheduled IMP (Interplanetary Monitoring Probe) shots." The first TAD launch will probably take place in the second quarter of 1964.

Delta's performance has been nearly perfect, with 19 successes in 20 launches. Only the first Delta failed. Since that time the workhorse booster has scored 100%. The standard Delta will continue in use without thrust augmentation.



JUST ANOTHER CLASSROOM SCENE? No! This one is different. The students are from Africa, Europe and Mexico. The school is run by Goddard, but is located in Virginia. The students are preparing for Gemini. *See p. 6 for the story.*

Goddard Awards 46 Contracts During October

Goddard awarded 46 major contracts during October totaling more than $27 million. This compares with 21 in September totaling $4 million. The October contracts support the center's research program and physical plant.

Some of the major contracts are listed below in order of monetary value:

$800,000 — *American Science and Engineering, Inc.*, (Cambridge, Massachusetts)—Provide two experimental packages for spacecraft D of the Orbiting Solar Observatory program. One package is a pointing solar x-ray telescope for making a spectrum analysis of the sun between 8 and 20 angstroms.

The second package goes on the OSO spacecraft rotating wheel to measure extra solar x-radiation between the range of 1/10 to 10 angstroms, with a possibility of measuring up to 50 angstroms.

$700,300—*Space General Corporation*, (El Monte, California)—Provide five Astrobee 1500 sounding rocket vehicle systems for high altitude research.

$315,000—*Advance Building Maintenance*, (Somerset, New Jersey)—Provide custodial services. This contract calls for the cleaning, waxing and sanitation of 800,000 square feet in the existing buildings of the Goddard Center.

$258,000—*Scientific Data Systems, Inc.*, (Santa Monica, California)—Provide a character/line printer. This device will be used to print out data computed during the integration, test and evaluation of the experiments on the Orbiting Geophysical Observatory.

$189,956—*Shieldtron, Inc., Shielding Division*, (Moorestown, New Jersey)—Furnish a mobile radio frequency monitoring and spectrum analysis laboratory suitable for land and air transport. This self-propelled unit will be used for equipment calibration and to make site surveys at Goddard spacecraft tracking facilities around the world. It also will be used to investigate radio frequency interference at Goddard and other NASA instrumentation facilities.

$167,400 — *RCA Victor, Co. Ltd.*, (Montreal, Canada)—Provide one frequency-modulated and one pulse-modulated receiver for use with the new 85-foot parabolic antenna at Goddard's satellite tracking station at Rosman, North Carolina.

$148,630 — *Textron Electronics, Inc.*, (New Haven, Connecticut)—Provide a vibration system consisting of two 10,000-pound force shakers with the associated power amplifiers and a control console. This system will be added to Goddard's Test and Evaluation facility.

$135,125 — *Smith, Hinchman & Grylls Assoc., Inc.*, (Detroit, Michigan) — Provide architecture and engineering services. This contract calls for working drawings and specifications for the construction of a Meteorological Systems Development Laboratory at Goddard. The contract includes site development specifications for the building's utility system, roads and parking areas.

$125,958 — *Telemetrics, Inc.*, (Gardena, California)—Provide a Pulse Code Modulation decommutation system. This equipment will be installed at Goddard to check out the telemetry system of the Orbiting Geophysical Observatory during integration and testing of the spacecraft prior to launch.

$120,000 — *Geophysics Corp. of America* (Bedford, Massachusetts)—Provide sodium vapor experimental packages for eight Nike-Apachee sounding rocket experiments to study winds at high altitudes. This contract also calls for data collection and reduction, as well as technical personnel support. The launchings will take place at Wallops Island, Virginia, and Fort Churchill, Canada.

$112,560 — *Western Electric Company*, (New York, New York) — Reduce and analyze 450 hours of real time radiation data acquired from Project Relay, the medium altitude active-repeater communications satellite. This contract also calls for special calibration of the particle detectors used on the Relay satellites to collect the radiation data.

$101,250—*Voorhes, Walker, Smith, Smith and Haines*, (New York, New York)—Provide architecture and engineering services. This contract calls for the fundamental design of a Meteorological Systems Development Laboratory and a Data Interpretation Laboratory at the Goddard Center.

Recent Technical Publications Authored by Goddard Staff

L. Biermann, "The Plasma in Interplanetary Space," NASA Technical Note 1901, October 1963.

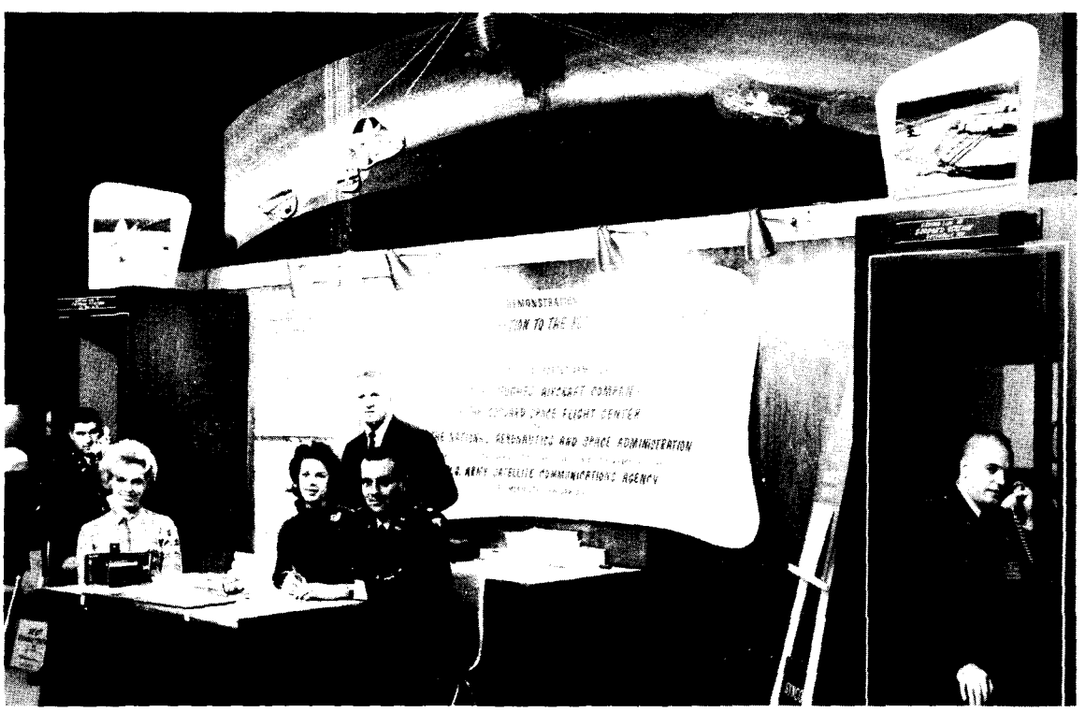
R. K. Jaggi, "A Theoretical Model for Sunspot Coolness," NASA Technical Note D-1906, October 1963.

John H. Marburger, III, "Galvanomagnetic Effects in Polycrystalline Many Valley Semiconductors," NASA Technical Note D-1840, October 1963.

W. B. Tereniak and S. A. Clevenson, "Flight Shock and Vibration Data of the Echo A-12 Application Vertical Tests (AVT-1 and AVT-2)," NASA Technical Note D-1908, October 1963.

Lloyd A. Williams, "Flight Vibration Data from the Delta 9 Launch Vehicle," NASA Technical Note D-1683, October 1963.

Syncom Demonstrated at Army Convention



Personnel from the Army Satellite Communications Agency and the Hughes Aircraft Co. (prime contractor for the Syncom) demonstrated the capabilities of the Syncom satellite at a recent convention of the Assn. of the U.S. Army at Washington's Sheraton Park Hotel. Convention-goers above talked to each other via satellite from telephone booths a few feet apart and to ground stations.

Goddard Speech and Paper Presentations

(Technical presentations approved as of November 8, for period of November 18 through December 1. Requests for copies of speeches and papers should be made directly to the author.)

PAPERS

Alfred J. Babecki, Sixth National SAMPE Symposium, Seattle Washington, November 18-20, ***"Quality Control and Nondestructive Testing for the Prevention of Failures in Scientific Satellites."***

R. L. Norman, The American Society of Mechanical Engineers, Gainesville, Florida, November 18, ***"NASA's Unmanned Space Research Program at the AMR."***

J. C. New, American Society of Mechanical Engineers, Philadelphia, Pa., November 19, ***"The Role of the Young Engineer in the Space Age."***

W. Nordberg, American Meteorological Society, El Paso, Texas, November 19-21, ***"Inferences of Stratospheric and Mesospheric Circulation Systems From Rocket Experiments."***

Bertram Donn, Conference on Micrometeorites and Cosmic Dust, New York Academy of Sciences, New York, N. Y., November 21-22, ***"The Origin and Nature of Solar Particles in Space."***

Richard Lehnert and Bernard Rosenbaum, NASA Conference on Communicating through Plasmas of Atmospheric Entry and Booster Exhausts, Langley Research Center, November 25-26, ***"Plasma Effects on Apollo Re-entry Communication."***

George Ludwig and Frank McDonald, International Symposium on Nuclear Electronics, Paris, France, November 25-27, ***"An Earth Satellite Experiment for Measuring the Charge and Energy Spectra of the Primary Cosmic Rays."***

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.

"Let me list the principal reasons why our investment in manned space flight is sound:

"**1.** The current level of effort is vital if we are not to settle for second position in space . . .

"**2.** Almost all our advances in space technology will add directly or indirectly to our ability to deter aggression . . .

"**3.** The scientific capital we shall acquire in the lunar program will long serve the nation . . .

"**4.** The facilities we are building and the technology we are acquiring are tangible assets that will extend benefits to our children and grandchildren . . .

"**5.** The dollars that are putting us into space are being spent right here on earth . . .

"**6.** We are clearly demonstrating to the world the ability and determination of our democratic society to organize whatever large-scale scientific and industrial effort is required to meet critical national and international needs in time of peace as well as war . . .

"**7.** To meet the stringent demands of the space environment . . . engineers are developing new materials . . . certain to pay off dividends, many of which we cannot foresee, some of which may be of revolutionary nature . . .

"**8.** We are rapidly building up a large pool of highly trained and creative scientists, engineers, and technicians . . .

"**9.** We are currently devoting about one per cent of the country's income to the civilian space effort. If the inducement to hard work and inspiration of participating directly or indirectly in space exploration spurs our people to increase production of goods and services by only one per cent, the space program will pay for itself.

"**10.** Our swift progress has now brought us to the point where our space power can be employed in peace-making as well as peace-keeping."—*NASA Administrator James Webb at Iowa Bankers Association 77th Annual Convention, Des Moines, Iowa*

News About Space & Aeronautics

● Recently announced rephasing of manned flight missions among the three Saturn class vehicles—Saturn I, Saturn IB and Saturn V—include acceleration of the critical Saturn IB/Apollo spacecraft phase and deletion of four previously scheduled Saturn I/Apollo spacecraft flights.

Engineering design and development efforts related to the Saturn I manned flight program will be redirected to Saturn IB and V.

Concentration of effort and resources on these phases of the manned lunar landing program is expected to increase the assurance of meeting vital Saturn IB and Saturn V-based Apollo spacecraft milestones by taking advantage of the larger payload capability of the Saturn IB to make an earlier launch of an all-systems lunar orbit configuration—command module, service module and lunar excursion module (LEM).

• • •

● Ranger 6 has been rescheduled from the last quarter of this year to the first quarter of 1964.

JPL found deficiencies in a number of small transistor diodes from the same shipment of these devices as were installed in the spacecraft. In spite of the fact that the spacecraft had successfully completed its acceptance testing, a decision has been made to reschedule the launch.

• • •

● Marshall Space Flight Center has announced modifications of the J-2 engine development contract to increase engine burning time and provide test stand capability for the longer tests.

Rocketdyne Division of North American Aviation, Inc., J-2 prime contractor, will double engine run duration.

The J-2 produces 200,000 pounds thrust. One J-2 powers the S-IVB which is the second stage of the Saturn IB and third stage of the Saturn V moon rocket.

Five of the engines will be clustered to give the S-II, the second stage of the Saturn V, a total thrust of one million pounds.

The modification to the contract provides for increasing the capability of Rocketdyne test stands to handle runs of the engines for 500 seconds, plus a short "run-over" time.

• • •

● This M-2 lifting body—a wingless, maneuverable spacecraft capable of orbiting the earth and landing airplane fashion—is being flight tested at Edwards Flight Research Center, Calif. NASA pilot Milton Thompson has flown the craft during trials.

GODDARD NEWS

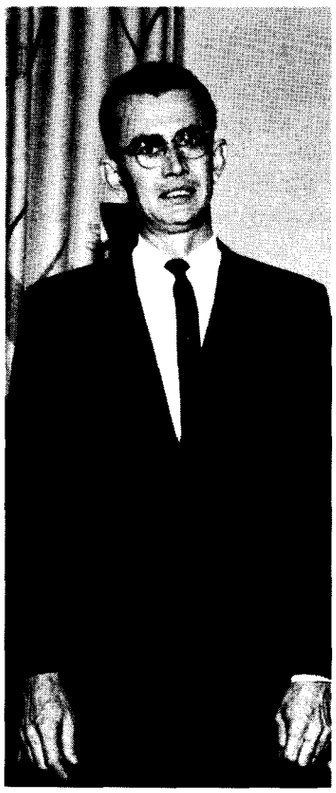
"It is difficult to say what is impossible, for the dream of yesterday is the hope of today and the reality of tomorrow."
—Dr. Robert H. Goddard

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.

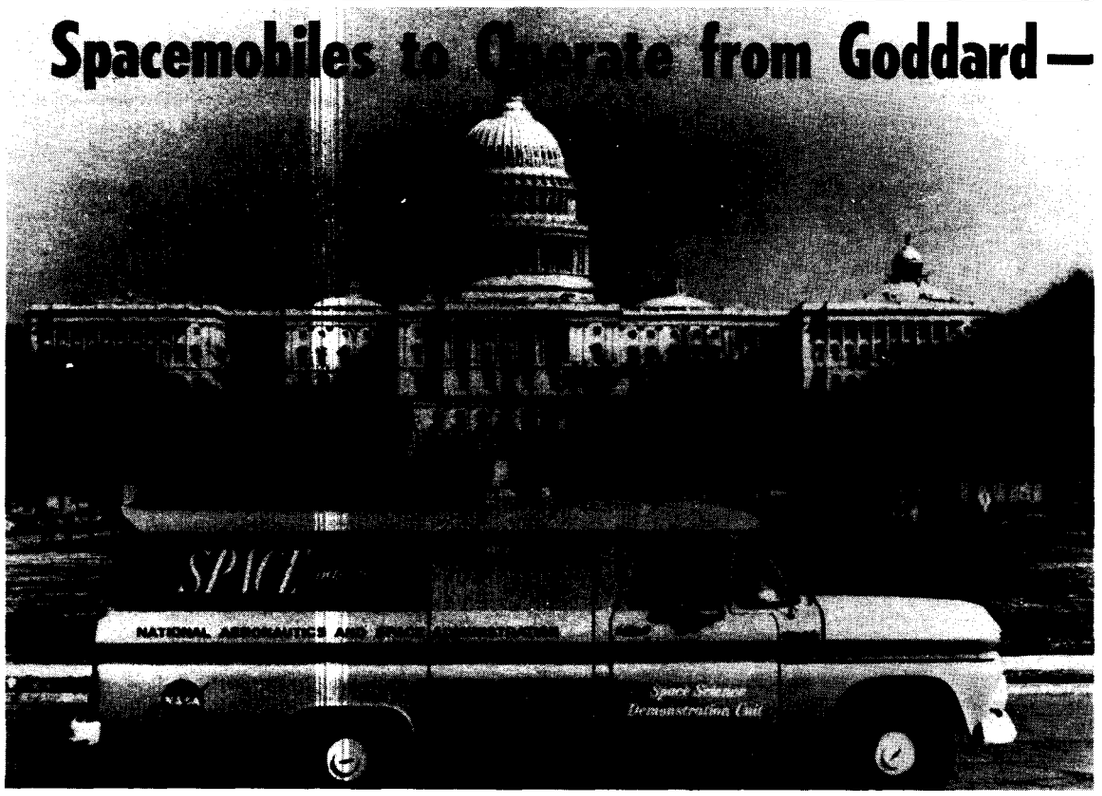
Phone—Ext. 4141 or 4142

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

Spacemobiles to Operate from Goddard—



Elva Bailey, head of Goddard's new educational programs and services group.



Pictured here in front of the U.S. Capitol building is one of NASA's Spacemobiles. The modified panel trucks carry displays of space accomplishments and hardware for the education of the general public.

OBJECTIVES OF THE INTERNATIONAL SPACEMOBILE PROGRAM

A. To increase understanding among given foreign audiences of the scope and validity of the U. S. space program.

B. To identify the U. S. space program with the interests and aspirations of other countries.

C. To develop or maintain a climate conducive to the development or continuance of cooperative U. S. bilateral space programs.

D. To support the activities of national or regional space groups friendly to or engaged in cooperative programs with the U. S.

E. To provide a stimulus for strengthening foreign educational programs in the space sciences and to encourage the eventual development of foreign scientists disposed toward cooperation with the U. S.

The Spacemobile visits countries where NASA maintains tracking stations, or countries with which we have cooperative scientific contracts.

Programs in foreign countries are a cooperative effort between a national or regional space agency and NASA, sharing costs, personnel, and materials.

The Spacemobile has visited the following countries: Pakistan, Switzerland, Belgium, Holland, Brazil, and Nigeria.

The Spacemobile is presently operating in India, Madagascar, Mexico, Venezuela, and France, and will soon be going to Germany, Argentina, and to the English and French-speaking countries of Africa.

Five and one-quarter *million* school pupils in the Maryland, Delaware, New Jersey, Pennsylvania and West Virginia area may soon encounter their first NASA spacemobile lecture presentation. The spacemobile will come from Goddard—where few people have even heard of the wheeled classroom.

Elva Bailey, head of Goddard's new educational programs and services group, is in charge of the two spacemobiles that have recently been assigned here. He says these students from grade school through high school age, will discover that a spacemobile is a panel truck designed especially for carrying models of rockets, satellites, and space science demonstration equipment.

One or more lecturers drive the units to pre-scheduled destinations, set-up the demonstration in auditoriums and present a one-hour program. Service clubs, womens clubs, churches and other organizations are also served by the spacemobiles.

According to Bailey, the typical demonstration answers five basic questions: (1) What is a satellite? (2) How does it get into orbit? (3) What keeps it in orbit? (4) What good is it and what does it do? (5) What are the present activities of NASA, the results of these programs, and plans for the future?

Questions one through three are answered by an historic and basic scientific demonstration approach. The NASA family of launch vehicles is described following a brief discussion of the principles and techniques of rocket propulsion.

Establishment of satellite orbits is explained with the aid of a variety of demonstrations.

Application satellites are discussed, and by means of models and demonstration equipment an understanding of their operation and value is established.

Scientific satellites usually are considered far removed from utility by the general public. By explaining the interrelationships of sun, earth, and stars, and the effect of these on weather, transporta-

Cont'd. on p. 5

Teamwork & Quick Thinking Pays Off

At the recent Solar Flares Symposium a lost eleven year old boy caused alarm, but two Goddard employees came to the rescue with team work and quick thinking.

Instructed by his mother, the boy was to ride the Greyhound bus from Washington to College Park. From there he was to take a taxi to Goddard, where he would join his mother and travel to Friendship Airport in order to board the 7 p.m. jet flight for home. By 6:10 p.m. the boy had not yet appeared and the car taking other passengers to Friendship had to leave in order to make the scheduled flight.

Joe Manning and Bill Robertson, administrative services branch, had listed all possible places to look for the boy, and one paid off. Their suggested call to the Greyhound terminal in Baltimore found the boy there—lost and confused.

They instructed him to take a taxi at once to Friendship Airport. While the boy traveled, Joe Manning departed for the airport with the mother. With the mother and boy enroute for the airport other phone calls were made to hold the airliner.

Thus the family was reunited and had two minutes to spare before take-off.

60 Year-Old Shrubs Find Home Here

Many inquiries and comments have been made about the two large, well-shaped boxwoods that were recently placed on both sides of the front door of building 8.

Originally the two 60 year-old boxwoods 5 feet high—5½ feet in diameter came from England. They made their way to Williamsburg, Va. Ten years later they were transplanted to a private home in Silver Spring, Md.

Eugene M. Reading, plant engineering branch, is a friend and neighbor to the person who owned the boxwoods. The owner asked Mr. Reading if he would like to have the clipped specimens of (Buxus Sempervirens) American boxwoods. Mr. Reading accepted the offer and graciously donated them to Goddard.

INSIDE GODDARD

GODDARD SPACE FLIGHT CENTER / GREENBELT MARYLAND

November 18, 1963

DR. GOETT, MR. WASIELEWSKI, DR. VACCARO, DISTINGUISHED GUESTS AND FELLOW SCIENTISTS.....MY CHARTS DIDNT COME BACK ON TIME....

NASA Credit Union Offers Many Services To Employees

It is your Credit Union. You own all the shares and you elect the officials to manage the business affairs of the Credit Union from the ranks of your fellow members. No outsiders are allowed; only members can save and borrow. Borrowers pay interest on the loans, thereby providing the Credit Union income. This income pays operating expenses and the balance of earnings is divided as dividends to the shareholding members.

Need Cash for Christmas?

Avoid late shopping. Eliminate carrying charges. Shop now while there is a better selection available. Why not make a small loan now before Christmas in order to pay cash for your Christmas purchases? Repayment of the loan may be made in small monthly payments over the next year—sort of a Christmas savings club in reverse.

Credit Union Pays Dividends

The interest rate your credit union has returned to the members in the form of semi-annual dividends has been 4½% or more for the past 10-years. The latest interest rate paid was 4.6%.

Credit Union collection points have recently been established in the University and Greenbelt Buildings. Transactions may be made at these locations on the Monday following payday at the following times: University Bldg., Room 126, 9:30 a.m. to 11:45 a.m.; Greenbelt, Bldg. 5, Room W-221, ext. 4545, 1:15 p.m. to 3:15 p.m. This service is provided for your convenience.

Goddard Welcomes

Gerald R. Barlow
Spacecraft Integration & Sounding Rockets Division

Michael Calabrese
Spacecraft Integration & Sounding Rockets Division

Charles W. Carey
Ships Design & Instrumentation Office

E. C. Cranston
Procurement Div.

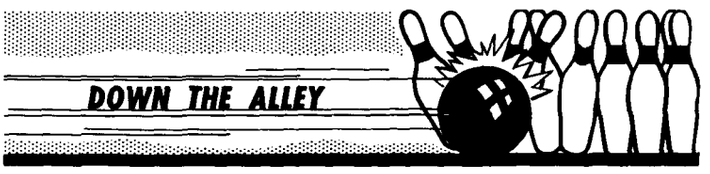
Charles E. Edwards
Advanced Development Div.

Paul M. Emmons
NASA Communications Div.

Carl O. Roberts
Manned Flight Operations Div.

Kurt H. Sundstrom
Procurement Div.

Edward Williams
Management Services & Supply Division



GODDARD MEN'S TENPIN LEAGUE STANDINGS

Wednesday (As of Nov. 6, 1963)

	W	L
Quiet Ones	23	13
Outcasts	20	15
Bandits	20	16
Gubaths	20	16
Boxcars	20	16
The Junto	18	17
Rackets	18	18
Rabs	18	18
Keglers	16	20
Rattfinks	15	21
Vibrators	14	22
Snakeeyes	13	23

Thursday (As of Nov. 8, 1963)

	W	L
Kiboshers	27	9
Pinspallers	25	10
Gutterballs	25	11
Longshots	22	14
Marvelous Ones	20	16
Fink's Group	20	16
Hi Lows	18½	17½
Old Goats	17	19
Bad Risks	17	19
Fat Sparks	16	20
Spoilers	15	21
Manywatts	14½	21½
Guided Muscles	14	22
A&M PM's	14	22
Tartars	12	24
Markers	10	26

All bowling standings should be submitted one week prior to publication.

MIXED DUCKPIN LEAGUE STANDINGS

Tuesday (As of Nov. 6, 1963)

	W	L
Bluffers	19	8
Alley Catz	19	8
Bob Cats	17	10
Comets	17	10
Coles Coolies	17	10
Stargazers	14	13
Quicksilvers	14	13
Toppers	13	14
Alley Nauts	12	15
Dukes & Duchesses	12	15
Ducklings	11	16
Vagabonds	10	17
Moonshiners	8	19
Possibilities	6	21

Thursday (As of Nov. 7, 1963)

	W	L
Woodchoppers	19	11
Tick Tocks	19	11
Astronauts	18	12
Safety Pins	17	13
Wombats	16	14
Moon Pilots	15	15
Starliters	15	15
Bob Cats	15	15
Thor Heads	15	15
Syncoms	15	15
Space Katz	13	17
Meteorites	12	18
Satellites	11	19
Strikers	10	20

OA Presents Service Awards

In ceremonies held on Tuesday, November 5, ten and fifteen-year service awards were presented to personnel in the Office of Administration. Dr. Michael J. Vaccaro, assistant director for administration, officiated at the ceremony.

Dr. Vaccaro in his opening remarks said, "Ceremonies like these are indicative of the "growing up" period being reached by the Center."

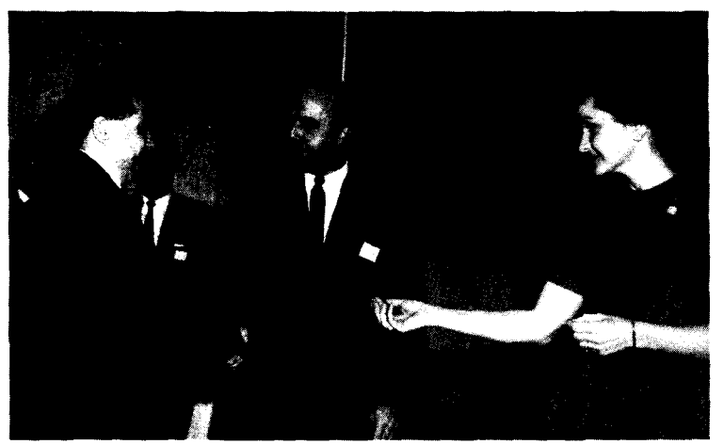
He also pointed out that two years ago emphasis was placed on "quantity," last year it was on "quality." Both emphases reflected the urgency which confronted us to get on with the job. The problem was—how to keep up with the tasks "forced upon us." There was no time to plan ahead. "Today, the time has come when we must plan ahead," he said.

"First of all we have tried to develop the 'where-with-all'—the tools with which to do the necessary planning."

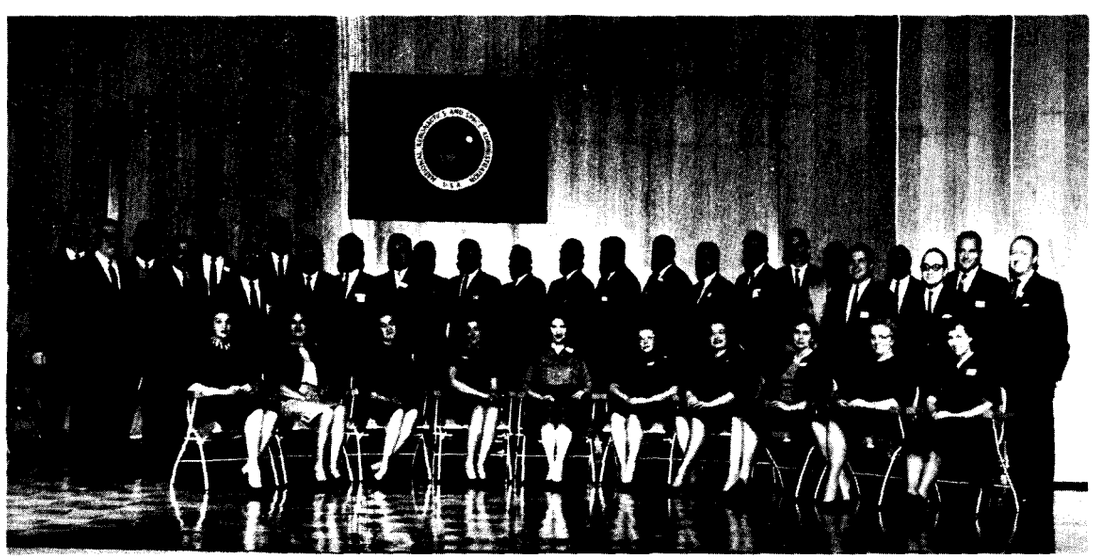
Dr. Vaccaro stressed several of OA's objectives: Know the area you are serving—truly provide "program support," use our manpower and talents wisely, and keep organization flexible to cope with changing requirements.

Twenty employees received 15-year awards while 20 others were recipients of 10-year pins.

Awards were given in the new auditorium of building 8. Refreshments were served immediately following the "main event."



Dr. Vaccaro congratulates Gordon H. Tyler, chief, Procurement division for 15 years service. Assisting is Jennie Wiseman, OA administrative assistant.



Recipients of OA Service Awards; first row from left: Doris B. Goucher, Helen W. Johnson, Margaret Hussey, Kathryn M. Van Keusen, Natalie M. Dutile, Frances D. Frederick, Eleanor Ritchie, Evelyn M. Vaughan, Bette L. Shannon, Adelaide M. Erwin. Second row from left: William P. O'Leary, James A. Maloney, James S. Lacy, Jr., Gordon H. Tyler, Richard Folea, Harold Zaret, Sydney E. Bradley, Dominick Marvaso, John A. Popp, William C. Probst, Edgar W. Barrett, William B. Melchi, Paul Woytovich, Charles A. Lee, Maceo A. Leatherwood, John Wiggins, Harry McCord, John M. Weaver, Warren E. Boerum, James A. Fleming, George Fogelman, Richard D. Austin, Dominick Cincirpini, Frederick W. Charles, Hugh W. Easter.

Five States to be Covered

tion, communication, power sources and other physical phenomena, the lecturer points out the possibility of future benefits from the information gathered by these satellites.

Man in space, from projects Mercury to Apollo, captures the imagination of all mankind. Models of these spacecraft, slides and time tested explanations of each program, enable the lecturer to explain the significance of the overall man in space program.

Medical advances resulting from space related research, significant technological advances, and various other practical applications of the age of space are audience-capturing aspects of space exploration developed throughout the lecture.

In addition to typical presentations, the lecturers provide services to the college community and to state, county, and local boards of education through the following activities: (1) special programs, (2) classroom visitation upon request, (3) work with teacher groups in institutions, symposia, and work shops, (4) work as consultants to curriculum development groups.

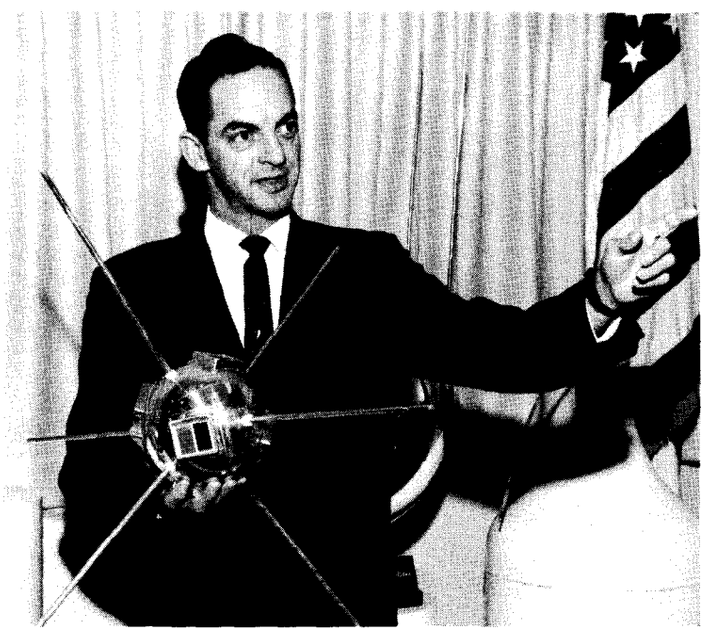
Bailey, whose group is organized under the public affairs office, came to Goddard on October 28. He will be the overall coordinator of the spacemobiles operating from this center. Before his current assignment, he was a space science lecturer under the educational services branch, NASA headquarters.

Bailey is a native of Kentucky. He earned his Master of Arts degree from George Peabody College in Nashville, Tenn.

For eight years Bailey taught biology and chemistry at Lincoln College, Lincoln, Illinois, and served as Dean and Registrar. He has also taught several years in the Michigan public school system.

Four Lecturers Assigned Here

Also in the spacemobile program as contract personnel assigned to Goddard by NASA headquarters, are: John Callow, who joined the spacemobile program in 1961 and has lectured in 49 of the 50 states to a wide variety of audiences; Robert Perry, who taught physics and higher mathematics for seven years at Bluefield High School, Bluefield, W. Va. and has also lectured on space to a wide variety of audiences; Robert Bush, who is a jet pilot, has served a number of years as a teacher and as an elementary school principal; and Hendrik Hudson, who was an assistant professor of physics and astronomy at Agnes Scott College, Decatur, Ga. for four years before coming to NASA.



John Callow

Hendrik Hudson

Robert Perry

Robert Bush

The spacemobile program was initiated early in 1961 under the direction of the office of educational programs and services. The interest of educators and the public on a national basis stimulated a rapid expansion of the program.

Under the direction of headquarters, and with the cooperation of several major centers, the OEPS activities are in the process of being decentralized, with each space flight center managing the spacemobiles for their surrounding areas. Goddard's five-state assignment is an example.

Gemini Trackers Training at Wallops Facility

This is the fourth in a series dealing with Goddard's Manned Spacecraft Tracking Network stations around the world.

When is one of Goddard's manned space flight tracking stations really a classroom and engineering center?

This is not a pun, but a reality embodied by the manned space flight network engineering and training center, a facility operated by Goddard at Wallops Station, Va. Director of the training station is George J. Karras, manned flight operations division.

The MSFN E/T center is located in Building N-161 at Wallops. Following the installation in April, 1960, of the "Mercury" prototype equipment an intensive testing program was initiated for evaluating the capabilities of the Mercury Network equipment and its testing procedures. At the end of this testing program in December, 1960, the site was deactivated.

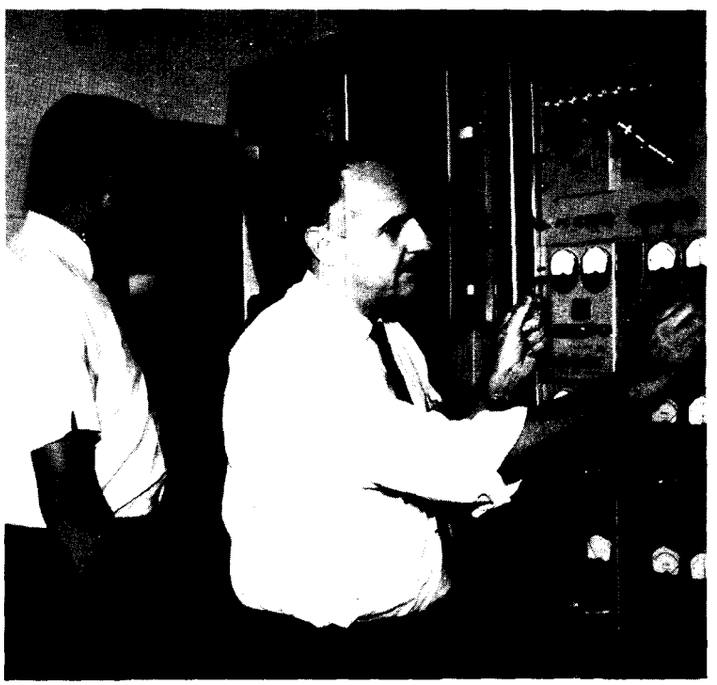
It was reactivated in July, 1961, as a facility to train replacement personnel for the network and to serve as a test facility for evaluating the effectiveness and compatibility of any proposed modifications to the network equipment. Also, NASA needed a facility for experimentation, testing, and demonstration of new equipments being added to the network in support of future programs.

Still "in business", it provides a complete training facility for personnel assigned to the world-wide manned space flight network. This training consists of operation and maintenance courses to fulfill all the varying needs of the network.

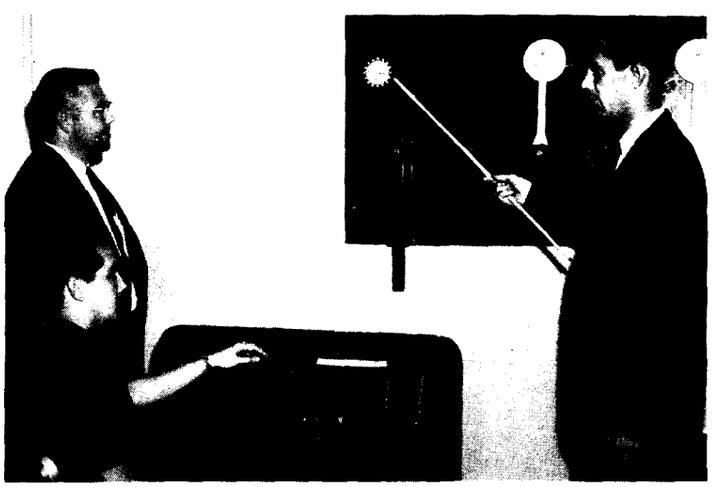
The MSFN E/T center's program objectives are:

To make available and provide various levels of training to all supervisory, maintenance, and operating personnel associated with the manned space flight network, and;

To provide engineering assistance to the manned flight operations division at Goddard concerning testing, modifications, and procedures required during Project Gemini installation and implementation.



Maintenance and operation personnel of MSFN E/T center performing signal strength calibration on new wideband receivers which will be used at ground stations during Project Gemini. From left: Tom White, Jim Noland.



R. Dudley, the teletype maintenance instructor at the center is shown giving a lecture utilizing one of the various teaching aids prepared by the training aids section.

Training Objectives

The training program is utilized to improve the level of competence of the personel operating the stations, and to prepare these individuals for equipment implementation, operations, and maintenance for Project Gemini. Both classroom lectures and practical laboratory training are involved, using the site equipment and laboratory mock-up systems.

The training center uses the latest methods and techniques. There are four classrooms and five laboratories provided by the center. The training center can accommodate up to 50 students at one time in any course of training.

There are 18 training section personnel under contract. The following courses are made available to the network people: R.F. Command System, Digital Command System, Timing System, Spacecraft Communications System, Test Equipment, FM/FM telemetry and Display, Acquisition Aid System, PBX and Intercom System, Teletype Maintenance & Teletype Operation, Semiconductor Techniques and Application, Basic Digital Logic Techniques, PCM Telemetry, and a Maintenance and Operation Supervisor Course.

Station Director, George J. Karras, of Goddard's MSFN E/T center, discussing the manned space flight tracking stations are to be used during Gemini.

The MSFN E/T center has trained several hundred students this year, from the Department of Defense, Bendix, and NASA.

Individual Evaluation

Each student is evaluated by the training center for technical ability (both theoretical and practical) and his personal attitude. A minimum grade of seventy percent is necessary for graduation.

The MSFN E/T center, although it has a different role, is configured the same as all manned space flight network tracking stations. Buildings, equipment, and personnel are similar.

Engineering changes are incorporated in various systems to satisfy operating conditions prior to being issued to the rest of the stations.

Simulation procedures are accomplished by instrumentation aircraft and station ground equipment in order to determine equipment performance, exactly as in the regular stations in the network.

Employee in Virginia Aids Sounding Rocket Program

With Goddard's vital role in the sounding rocket program reaching larger proportions each year, and with Wallops Island handling the lion's share of the launches—this center needs someone at the launch area to represent the interests of our vehicle managers and project people.

The vehicles section of the sounding rocket branch has assigned a full-time man, Lloyd Lohr, to Wallops as flight range coordinator. He has been at that post since June, 1962.

In addition to representing the interests of the vehicles section, Lohr says, "I've been assigned here to help any Goddard payload people in any way I can. They can call on me any hour of the day or night."

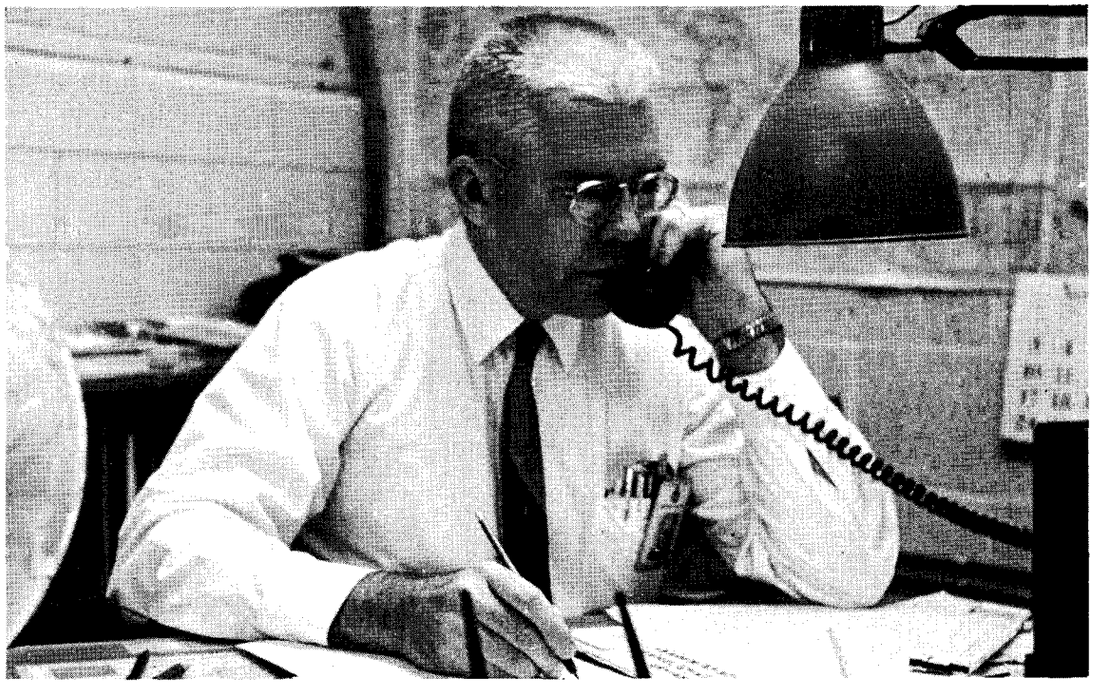
Vehicle managers as well as Goddard project scientists have been able to save thousands of hours by working through Lohr at Wallops. Their media has been the telephone (direct line), rather than premature and time-consuming travel.

Lohr acts as our "man on spot" to take care of details arising from the interplay between Goddard people involved in a shot and the Wallops project engineers assigned to work with them.

On occasion, when Goddard scientists are interested in the results of an experiment managed by another center, Lohr is available to keep abreast of the date and time of launch, or to gather information for the interested party and relay same back to Greenbelt.

Some of his informal responsibilities include liaison with the ionospheric sounding station operated at Wallops by the Central Radio Propagation Laboratory (CRPL), an operation of the Bureau of Standards. He is especially suited for this phase of the work, since he has experience as ionosphere data coordinator in shots where payloads examined the upper atmosphere.

Lloyd is responsible for the gathering of sounding information during and prior to flights, and the relay and recording of same. Before the ionospheric sounder was established at the launch site and the permanent CRPL employee come along to man it, he often had to do the actual soundings, in addition to other tasks. Now, Lohr makes arrangements with the CRPL personnel when ionospheric sounding information is needed.



Lloyd Lohr, of Goddard's sounding rockets branch, is shown here at his desk at Wallops Island. Lohr is flight range coordinator in Virginia.

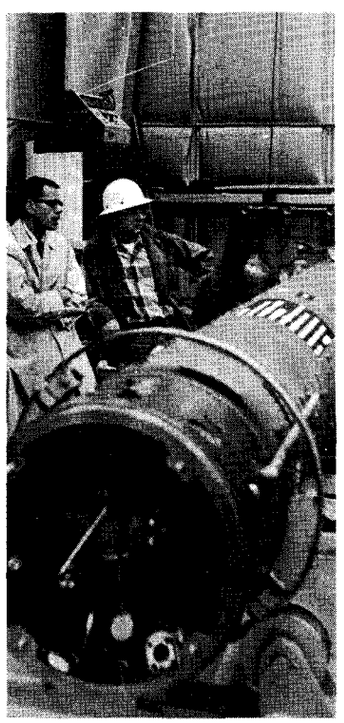
He must also give a full report to the vehicle manager, and in some cases act as vehicle manager in the absence of the regular man assigned to that function. After vehicle managers leave Wallops, they address questions which arise to Lohr.

After the shot, "first look" data from the plot boards and telemetry is relayed to the project scientist at Goddard. Vehicle performance information is sent to the vehicle manager (if he is not present).

Even though he is directly responsible to the vehicles section, Lloyd's attitude is, "I work for Goddard." As a result, he has been a workhorse for the whole center.

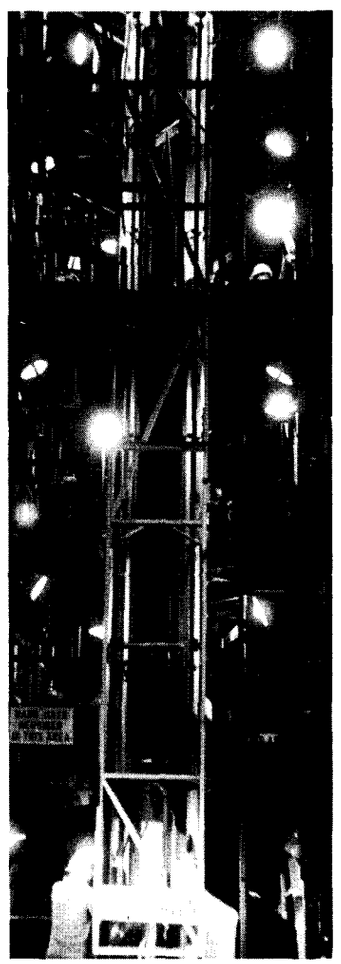
For example, many of the project scientists have to use ground station trailers with their experiments. Lohr encourages them to send the trailers down in advance, and he makes the necessary arrangements and accomplishes the scheduling with Wallops personnel.

This example of cooperation results in the project scientist having his trailer on site and ready to go when Goddard project people arrive for the shot.



John Busse (left) is vehicle manager for the Aerobee being assembled. Busse and Lohr work together before, during and after launch.

With an average of five Goddard sounding rocket experiments a month, Lloyd Lohr has more than enough responsibility to keep him on his toes—and he's willing (and able) to fulfill his words, "I'm here to help any Goddard people at Wallops in any way I can."



This is the scene inside the Aerobee launch building prior to a shot. The presence of a full-time man at Wallops saves time and travel for Goddard project and vehicle personnel.

Scientists Work Underground Out on the Range

Out on the range (the antenna test range), some underground operations are being carried on. Goddard's ground plane facility is the scene, located on ARC property near the Dept. of Agriculture's airport.

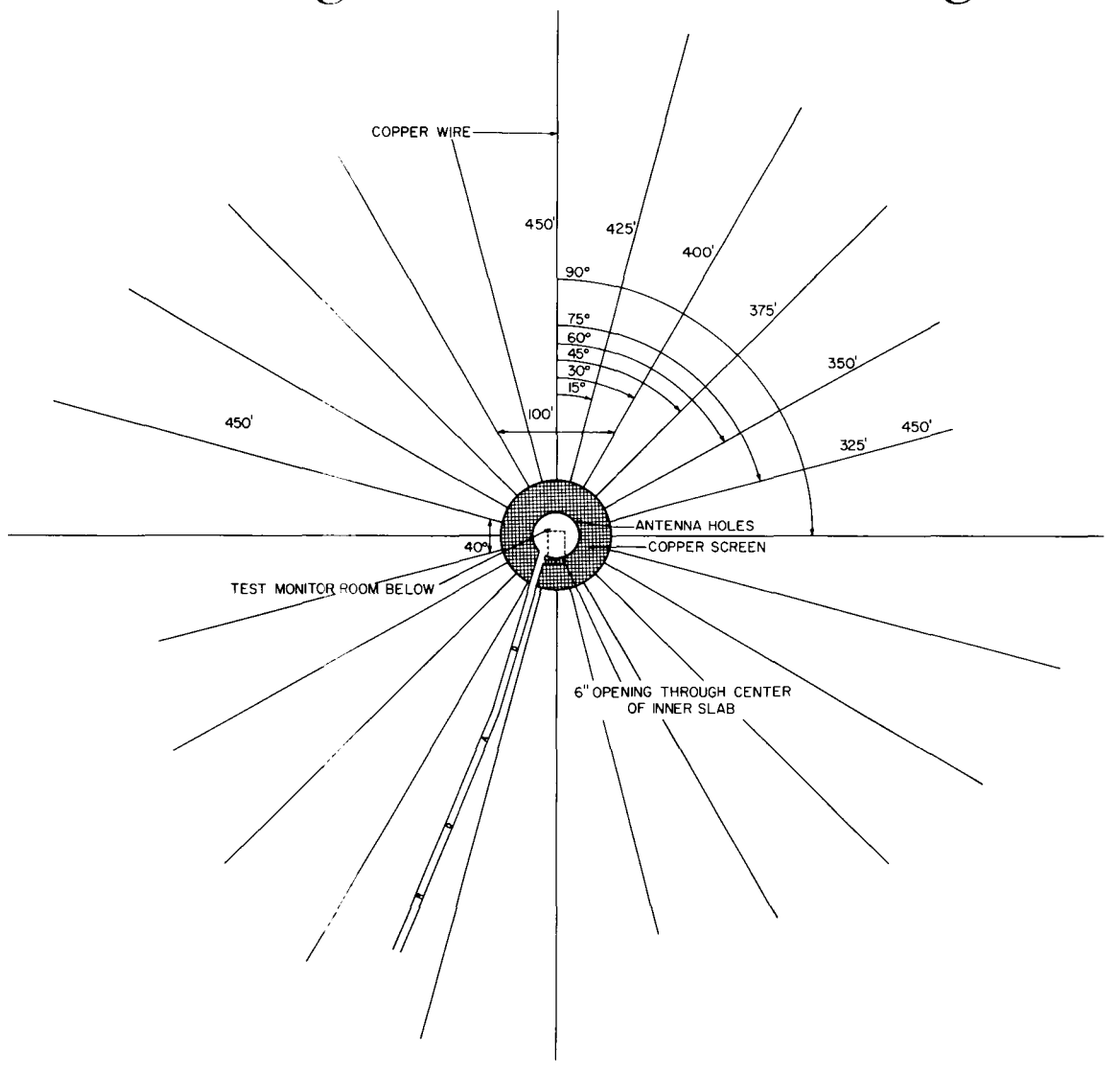
On any given day, people disappear into the ground as they enter the control room beneath the facility, which was designed by Giles Spaid, planetary ionospheres.

The ground plane is used primarily to measure the characteristics of rocket-borne antennas, but radio astronomy experiments are also conducted there.

In an electrical sense, ground plane is simply defined as a plane reflecting surface at ground level. It consists of a circular copper plate 40 feet in diameter surrounded by a circular copper screen which extends the diameter to 100 feet. There is a hole in the center of the plate for antenna wires to enter the control room below.

A series of highly conductive copper wires are extended radially beyond the screen. They are of slightly differing lengths, and increase the effective radius up to 450 feet. Electronic test equipment is housed in a control room beneath the copper plate which is supported by a concrete roof.

Antennas to be used in ionospheric studies aboard sounding rockets are calibrated on the ground plane, which acts as an "electrical mirror."



The diagram above shows the elements in the ground plane facility. It has an effective diameter of 450 feet, as shown.

Here are two Airtronics Corp. contract personnel with a half rocket and antenna model for testing. They are (from left): Ralph Whelan and Howard Huffman. John Hubbard of the Univ. of Md. radio astronomy group is at right.

A scale model of the rocket body, which is to bear the experiment, is neatly cut in half from tip to tail. This half configuration is placed flat on the center of the ground plane facility, which forms a mirror effect (like placing half an apple on an optical mirror) since at radio frequencies the facility appears to be a perfectly reflecting surface.

In this artificially created free space environment, the characteristics of antennas on the half rocket body can be measured. These measurements can be used as a basis for adjustment and comparison to the reaction of the antennas in the electrically-charged ionosphere.

Radio Astronomy

The same "well behaved" electrical properties make the ground plane desirable for radio astronomy experiments according to Joe Alexander, planetary ionospheres.

In these experiments, a simple long wave length antenna (in the 10 meter radio band) is used, placed at the center of the copper plate.

The major mission has been a study of the radio noise bursts which accompany solar flares. The mysterious radio bursts from the planet Jupiter are also being examined.

When you see someone going into a hole in the ground out on the range—there's more to the story than meets the eye.

Goddard Coming Events

Goddard colloquium lecture:

- **November 19, 3 p.m., Auditorium, Bldg. 3—Dr. W. Calvert, Central Radio Propagation Laboratory, National Bureau of Standards, Boulder, Colorado, "Spread F and Plasma Resonances from the Alouette Satellite."**