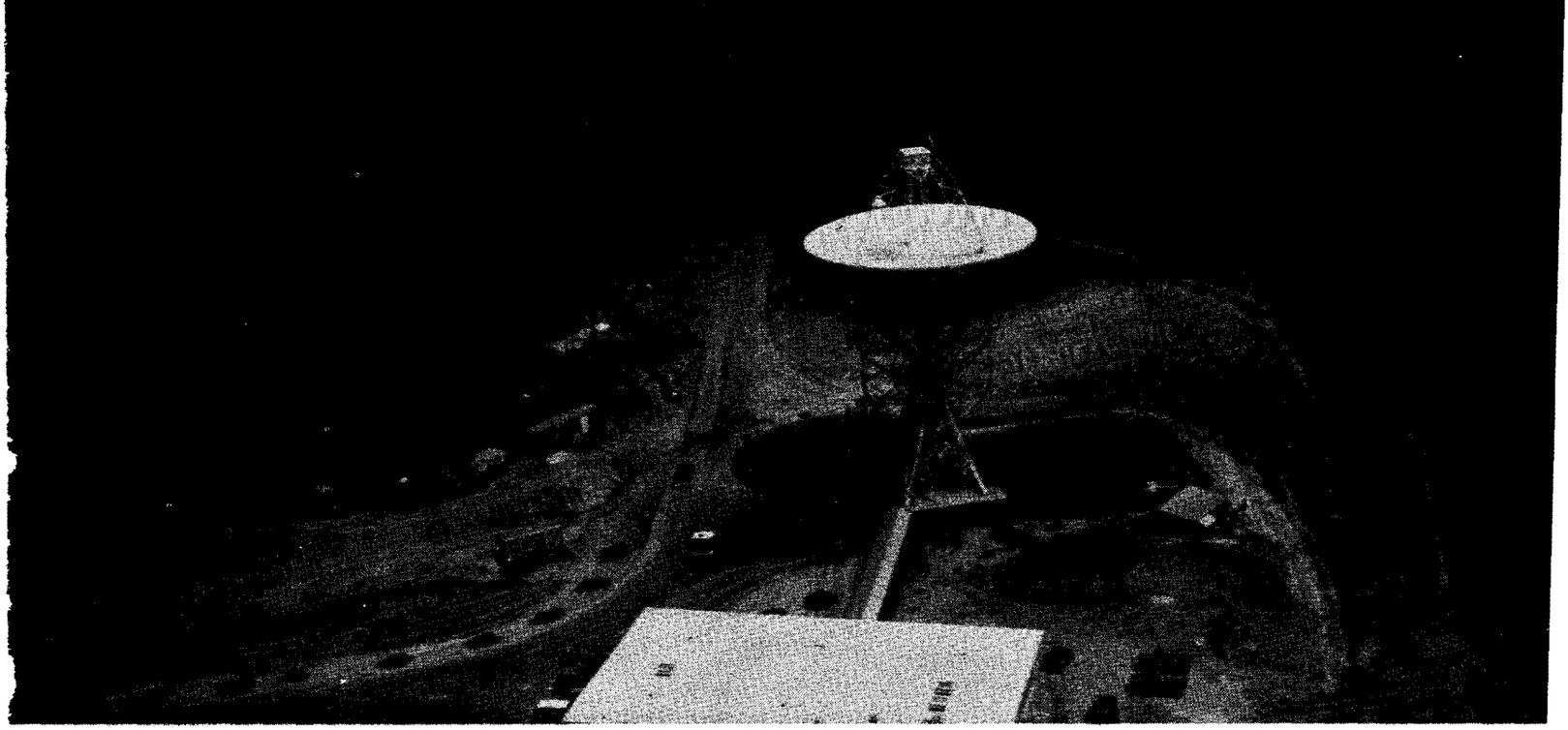
GODDARD NEWS

VOLUME V, NUMBER 10 THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION OCTOBER 21, 1963



Goddard's new Rosman tracking and data acquisition station will play an important role in tracking future scientific satellites. It can "hear" satellites 60,000 miles in space and perhaps beyond.

Goddard's Rosman Site to be Dedicated Saturday

Rosman's 85-foot antenna is 120 feet high and weighs 300 tons. The station is a part of Goddard's STADAN.

North Carolina Governor Terry Sanford has announced that dedication ceremonies for Goddard's newest tracking and data acquisition site, near Rosman, N. C., will be held next Saturday. The new $5 million facility is located in Pisgah National Forest. It is a part of NASA's world-wide Satellite Tracking and Data Acquisition Network (STADAN).

Key speakers will include Senator Sam J. Ervin, Jr., and Senator B. Everett Jordan. NASA representatives will include Dr. Harry J. Goett, Goddard's director, and Dr. George L. Simpson, Jr., assistant administrator for technology utilization and policy planning. U.S. Representative Roy A. Taylor will serve as master of ceremonies. Governor Sanford will speak for the State of North Carolina.

Rosman will track, transmit commands to, and receive information from scientific satellites such as the Orbiting Geophysical and Astronomical Observatories.

It is the key station because it is common to both an east-west and a north-south chain of tracking and data acquisition stations. Rosman is the second of this agency's 85-ft. stations: The first was constructed at Fairbanks, Alaska.

As rapid advance in spacecraft technology results in large, complex spacecraft, such as OAO and OGO, there will be resulting increases in the amount of data gathered, compared to the satellites launched to date. These large amounts of data gathered by the newer spacecraft will exceed the reception and handling capabilities of the existing minitrack stations.

Also, the increased power of the launch vehicles will permit the programming of the highly eccentric orbits for certain spacecraft, with the related requirement of transmitting large amounts of data from great distances.

Rosman is Ideal Location

The location, about 35 miles southwest of Asheville, N. C.,

(Cont'd. on p. 2)

Rosman (from p. 1)

and about 7 miles from Rosman in a national forest, is almost completely free from radio frequency noise. This is essential because the transmitters in satellites are very low power (five watts or less) and some satellites, more than 60,000 miles away, will be difficult to "hear."

It is only about 400 air miles from Goddard. This reasonable proximity is important for reasons of communication and liaison.

Rosman also has the following advantages:

- It is one of the very few areas east of the Mississippi not covered by established commercial airline routes.
- There are no close high-voltage transmission lines.
- The site provides good terrain shielding, because it is in a natural bowl.
- It is on national forest land. Therefore, land acquisition did not require the government to purchase additional property.

Rosman's Large Antenna

Since spacecraft signals are rarely transmitted with a strength in excess of 5 watts (enough for a baby's night light), it is necessary that ground stations have large radio "ears." The principle is comparable to the cupping of the hand behind one's ear to hear a whisper.

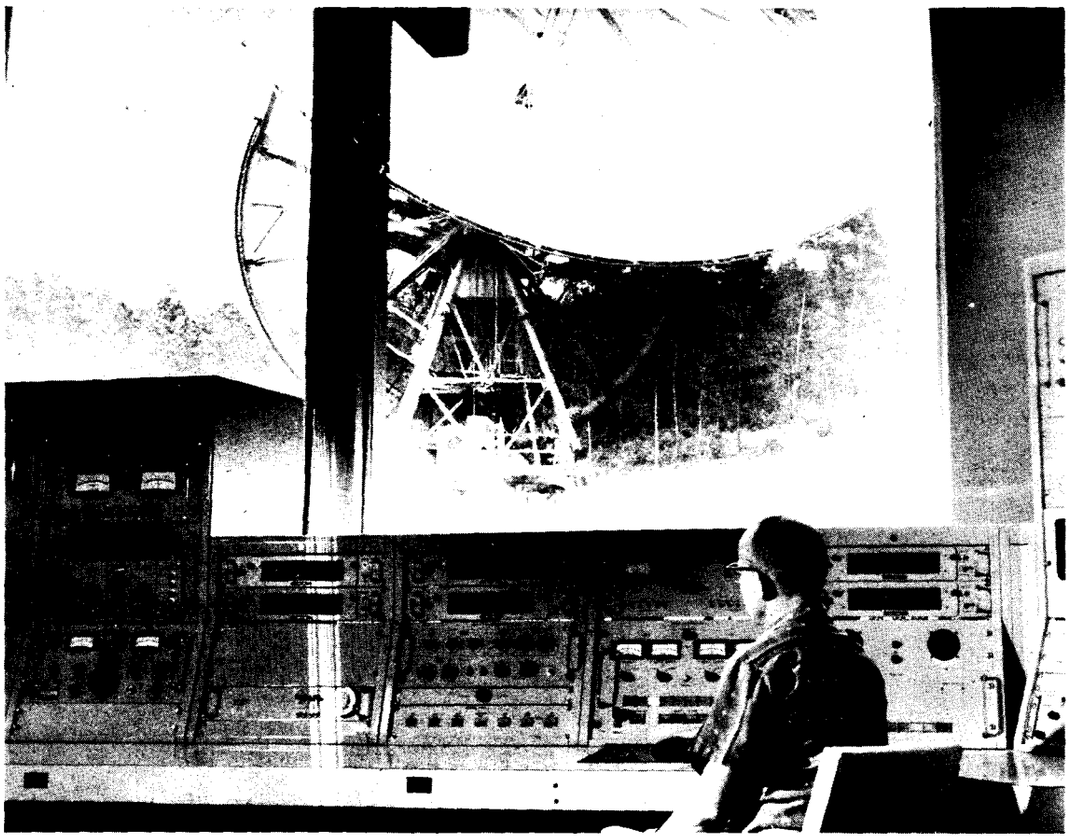
The 85-foot dish stands 120 feet high when aimed directly upward, and weighs about 300 tons. The antenna is moved by a hydraulic drive system using a 75-horsepower and a 150-horsepower electric motor for the upper axis and lower axis respectively.

There is a two-story operations building built of prestressed concrete structural members (see photo).

A generator building, of the same construction, houses six 250 kw. generators; the generators will use about 1000 gallons of fuel per day.

Other smaller, special purpose antennas will be installed at the site for testing and calibrating the main antennas, for transmitting command signals to satellites, and for determining the exact locations and relative rates of travel of satellites.

The network, of which the Rosman facility is a part, will consist of three data-acquisition facilities using 85-ft. antennas, and twelve Minitrack stations located as shown (see artists' drawing).



Rosman's 85-foot antenna as seen from the control building is operational. Another 85-foot antenna is planned for the North Carolina site within two years.

Goddard's Own Dish

Rosman will be the first "big dish" to be operated exclusively for Goddard's second-generation scientific satellites. Satellite data from electronic receiving and processing equipment on the main floor may be examined on the spot by experimenter representatives who will have facilities on the lower floor of the operations building.

In addition, a microwave radio link to Goddard will permit data relay and real-time insertion of the data into reduction equipment located at this center.

Future plans include the use of a microwave link for remote operation at the Rosman facility. Coded command signals originating at Goddard will then be transmitted to Rosman and through equipment there to operating satellites. The satellites will respond by sending data back to Rosman, to be relayed directly via the microwave link to Goddard.

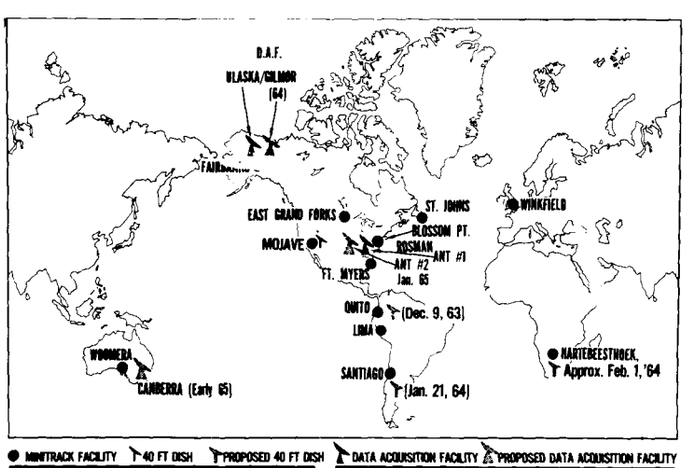
The operation of the station will require approximately 65 people for around-the-clock operation. This number will be increased when a second antenna becomes operational.

The NASA station director is M. Gary Dennis, who has worked at Goddard for some time.

The Rosman project is under the overall direction of John T. Mengel, assistant director, tracking and data systems. Harold L. Hoff, associate chief, network engineering and operations division, is Rosman operations director; and Lloyd E. Hightower, tracking systems branch, has been designated Rosman project manager.

The North Carolina State Roads Commission has improved existing roads so that heavy construction machinery could be moved in, and paved all dirt and gravel roads to the site (about 2½ miles).

All installation work for the first antenna has been completed and has undergone a "shakedown" period devoted to checking out the equipment. After Saturday's ceremony, Rosman will be a fully operational and vital link in Goddard's STADAN operation.



This chart gives some idea of the world-wide scope of the STADAN facilities of which the Rosman site is now a part.

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 source of the present-day manager-scientist tension is simply that management principles have not adjusted to the current growth rate of scientific knowledge. In the traditional bureaucracy, a subordinate is expected to hold his own judgment in abeyance and accept that of an acknowledged superior as correct. In dealing with creative scientists, the administrative pattern ought to be the exact opposite.

"A scientist tends to accept the opinion of a superior whom he respects as a peer or as one highly qualified in a certain phase of administration. In other words, in a vital scientific community, value and deference are given to the truth, not to the ideas of the man on the top rung of the ladder. When the top and the truth happen to coincide, administrators usually find life more compatible with the working scientists and vice versa . . .

"Can one honestly say that the administrator is less understanding of the creative scientist than the scientist is of the administrator? The working scientist tends to overlook the existence of such realities as budgets, production schedules, mission orientation, and the sometimes embarrassing post-audit. A tense 'gulf of mutual incomprehensibility' results between the two groups when neither makes effort toward detente.

"The easing of this tension might be effected through compromise. Supervisors should consider the human, even the irrational, side of subordinate scientists and learn not to expect the organization chart and mission statement to perform some strange feats of alchemy. In turn, scientists should recognize that creativity cannot find constructive outlets without support—which may be in the form of goading, at times! . . .

"The researcher should not look upon such guidance as 'the scheduling of break-throughs,' the 'crank-handle production of inventions,' or simply as unnecessary harassment. Rather, researchers might well consider such guidance as management's conscientious attempt to devise a practical art of systematic innovation, an art that takes account of more factors than scientists themselves consider . . .

"It should be acknowledged that no organization, Government or private, can afford to sponsor a totally random course or unpredictable pattern in research and development. Nevertheless, administrators could remember that intelligent planning for research is not the planning of research results; that is, one can plan the investment of time and brain power in presumably profitable research areas, although the outcome may be uncertain.

"The communal entropy factor of creativity seems to work against the orderliness of predetermined R&D decisions. Administrators and scientists therefore, need to acknowledge the hazards of one another's existence and seek to achieve a state of dynamic equilibrium out of the inherent conflict.

"Conflict in itself is not all bad in the R&D business. It may have a highly salubrious effect on the process of creativity. First, differences among researchers indicate a nonconformist environment wherein potential creativity germinates. And, second, conflict resulting from the interaction contributes to the inter-disciplinary approach in problem solving . . . —*Dr. T. W. Adams in the August issue of Army Research and Development Newsmagazine.*

News About Space & Aeronautics

● Nearly ten months after launch, the modulation of Explorer XIV "space weather" satellite transmitter stopped working in August.

Goddard officials say there is only a remote chance the satellite will resume normal operation.

Although intermittent signal modulation has occurred since August, almost no usable data have been received.

Explorer XIV, an 89 pound, solar cell-powered satellite was launched on October 2, 1962. Originally, its orbit took it more than 61,226 miles away from Earth and as close as 175 miles.

During its ten months of operation, Explorer XIV radioed some 6,500 hours of data on the six scientific experiments aboard. Although all the data have not been analyzed, University of New Hampshire Scientist, Dr. L. Cahill said a number of new insights have been provided into various space phenomena; such as

- A mapping of energetic particles shows that the Earth's magnetosphere flares away from the Earth to take an ogival shape similar to a somewhat pointed oval.
- General confirmation that the vector magnetic field merges gently from its dipole configuration to a radial field with increasing distance on the night side of the Earth near the equatorial plane.
- Further evidence probably supporting Explorer VI's finding of a ring current flow on the night side of the Earth.

• • •

● This test stand being constructed at Marshall Space Flight Center, Huntsville will be used for static firing the 7.5 million pound thrust Saturn V booster, the first stage of the U.S. manned moon rocket.

The concrete pillars seen here are nearly 150 feet tall; on top of them is going up more than 100 feet of steel superstructure. A derrick will be mounted atop the steelwork, giving the entire structure a height of 405 feet.

• • •

● NASA's Flight Research Center at Edwards has announced that final tabulation of radar tracking data showed research pilot Joseph A. Walker reached a record altitude of 354,200 feet, or 67 miles, in his X-15 flight of Aug. 22.

This is 3,200 feet higher than the preliminary figure and is 6,400 feet above the previous record for the X-15 research plane which was set by Walker July 21.

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*

Sultan Rules Zanzibar, Site of Goddard Tracking Station

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

Just south of the equator in the Indian Ocean, about 20 miles east of the Tanganyika mainland, lies a cluster of small islands. The largest, Zanzibar, is surrounded by coral reefs. From the sea, one can see countless coconut palms, stone buildings and scores of dhows (Arab vessels). This is Zanzibar, one of the few Sultanates left in the world.

Goddard's Manned Spacecraft Tracking Network station has become a vital part of the life of the island, according to Goddard's Thomas K. Spencer, station director.

Twenty Bendix Field Engineering personnel under NASA contract work at the site, in addition to nine contract employees of the British Cable and Wireless Ltd. Twenty-eight native employees round out the staff.

Thus the operation of the station is international in scope. At least three nationalities and many races are represented.

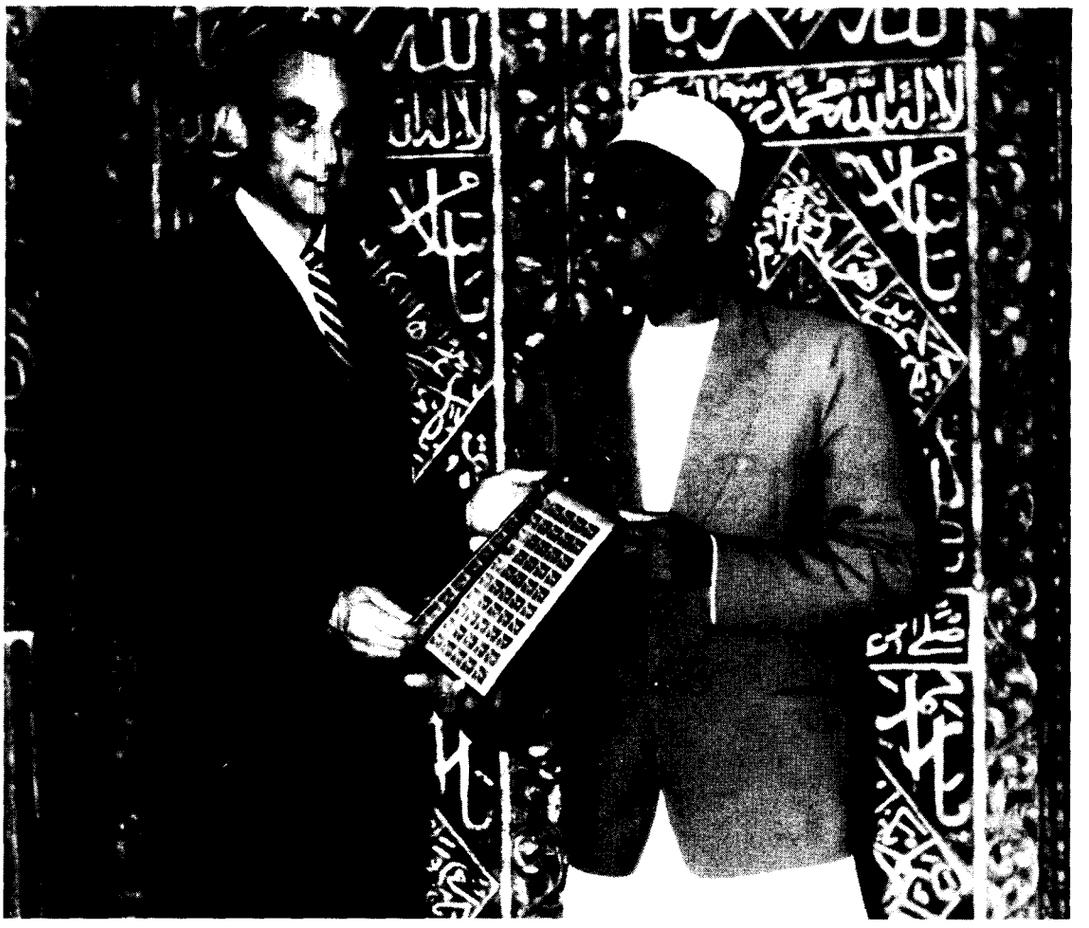
The Zanzibar station is a typical remote non-radar site—acquisition aid tracking, telemetry reception, capsule voice communications and point to point teletype and capsule voice communications comprise the station maintenance and operations responsibility during manned space flight missions.

As with all other network sites, Zanzibar serves as an important link in the network essential to the continued progress of manned space flight.

The majority of the station's families live in a suburb called Mazizini only a short drive to the shops and market place of Zanzibar city, which is commonly referred to as "Stonetown."

Although the local population is largely Moslem, there are two Christian churches, Protestant and Roman Catholic. Also there are many Hindus, Buddhists, and a few of lesser known religious sects.

The British Government maintains a hospital with European doctors and nursing sisters. While the facilities are limited in general to government employees, Americans are afforded emergency treatment there.



The American Consul, Mr. Frederick Picard, is shown presenting an autographed color picture of John H. Glenn and an album of Project Mercury commemorative stamps to the Chief Minister of Zanzibar, Sheikh Mohammed Shamte. The picture was taken in front of the elaborately carved Arab doors outside the Chief Minister's office.

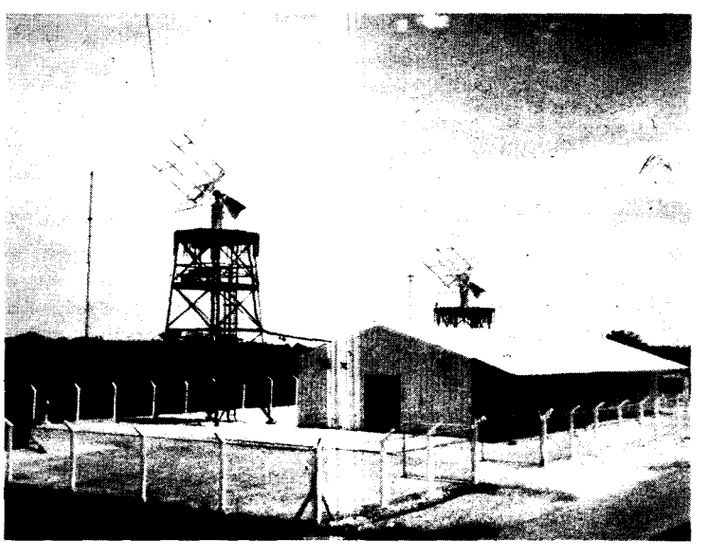
Life is What You Make It

"Life at our tracking station can be only what the station personnel make it," says Goddard station director Spencer. "We attribute our high morale and enthusiasm to the fact that the men and their families are here because they want to be.

"It is essential to marry the American way of life with many of the local customs," he continued. "Network duties require that we adhere to American working hours and professional efficiency; yet we must live in Arabic homes, and shop and recreate in accordance with local custom.

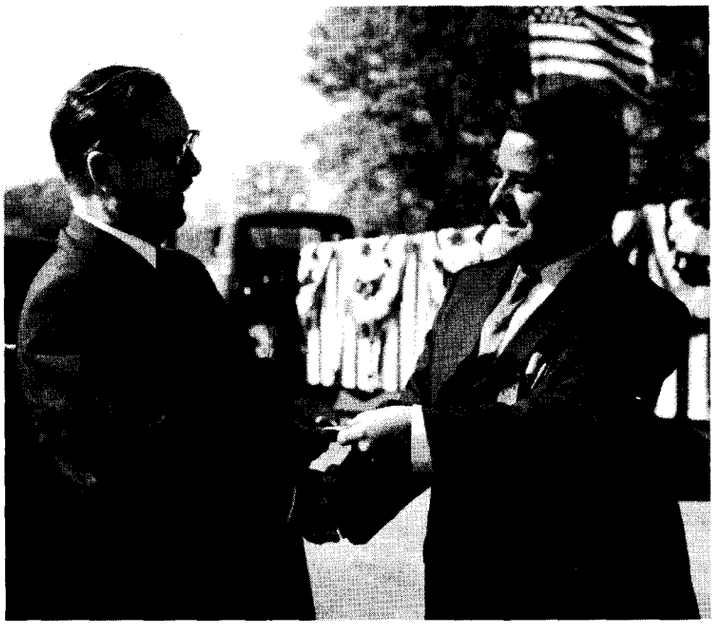
"There is much to be said for local customs well adapted to a warm, humid climate when

(Cont'd. on p. 5)



The telemetry and control building at Tungee stands in front of the Acquisition Aid and Telemetry antennas.

Goddard—Local Officials—Cooperate In Dedication



Frank J. Lastner, chairman of the board, Prince Georges County Commission, presents the ceremonial scissors to Dr. Michael J. Vaccaro, assistant director for administration at formal ceremonies dedicating the improved Glenn Dale road. Dr. Vaccaro was the honored guest and cut the red, white and blue ribbon at 2:04 p.m. on October 11 while the DuVal High School band played "God Bless America."

In his remarks Dr. Vaccaro stressed Goddard's gratification for the county's cooperation not only in the Glenn Dale road project but in many other areas of mutual interest. He cited Goddard's growth and further growth potential; and emphasized Goddard's willingness to "pay its way" in the community intellectually, and financially.

The ceremony was attended by members of the Maryland House of Delegates, County Commission, Maryland State Park and Planning Commission, and other State, County and Greenbelt officials.

The old two-lane Glenn Dale road is now a dual highway approximately three miles long. It consists of a two-lane road from the overpass at the Parkway for a distance of 1,300 feet and a dual highway from that point to 1,700 feet beyond Telegraph road.

You Are A Member . . .

GEWA

(Goddard Employees Welfare Association)

Did you know that . . .

As a Goddard employee you are entitled to share in all of its social activities, for instance:

Nov. 16.....Ship Wreck Dance
Dec.....Christmas Party
May...Spring Dance and Selection of Miss Goddard

Did you know that . . .

We have nearly completed a recreation center on Telegraph Road. This center includes a large shelter with fireplace, 4 barbecue pits, rest rooms, picnic area, ball diamond and parking lot.

INSIDE GODDARD

GODDARD SPACE FLIGHT CENTER / GREENBELT MARYLAND

October 21, 1963

Goddard Wives Club Plans Harvest Party

An added attraction this month for the Goddard Wives Club will be a Harvest Party on October 25. The program will be square and round dancing in the new auditorium of building 8 from 8:30 p.m. 'til midnight. All members are invited and admission will be by membership cards.

First Aid Course Is Rescheduled

An advanced first aid training course, originally scheduled to begin October 7, will start next Monday, October 28.

All individuals who currently have a standard certificate issued by the American Red Cross or a Medical Self-Help Training certificate are eligible to take the advanced course provided they are willing to serve as part of Goddard's Civil Defense Organization. Supervisors must approve all applications for those employees interested.

The Civil Defense Planning Office and the Safety & Health Office have jointly established the requirement for five first aid teams composed of six regulars and two alternates.

Persons completing the Advanced First Aid Training or who have previously had comparable training will form the nucleus of these Civil Defense teams. Additional training and emergency hospital training are also scheduled to start early in 1964.

All interested personnel should contact the Civil Defense Planning Office, extension 5420 or 5421.

TOKYO PROSE

Dr. Robert J. Coates, chief, advanced development division, recently attended two conferences held in Tokyo, Japan. While there he sent an interesting post card to his division—written in Japanese. When translated by Dr. Kaichi Maeda, theoretical division, the card read: "With Greetings! Attending the 14th General Assembly of URSI, we are visiting the Space Communication Experimental Station which is owned by the International Telegraph and Telephone (Kokusai Denshin Denwa) Company, Ltd., Japan. I wish you could be here with us. R. J. Coates." Amused because they knew that Dr. Coates knew they did not know Japanese are, from left: Chesley Looney, Ivona Hunt, Betty Ann Brennesholtz and Eula Paseur.

Debut At Adelaide, Australia

INSIDE GODDARD received a letter from NASA Communications Centre in Adelaide, Australia, one of Goddard's tracking facilities, announcing the debut of their secretary Miss Judy Markwick. Judy, along with five other debutantes, made her debut recently at a Ranger Ball held in North Adelaide. (The girls are all Rangers of the senior branch of the Girl Guides' Association.) She joined the NASA Staff in September 1962 and is secretary to the communications traffic officer.

FROM "LIL ASTERNERTS"...

Larry
84 N. Broad St
West Hazleton Pa.

Dear Sirs,
Please send me information on the Weather on Hurricanes, dust storms, sand storms, snow storms, and a cloudchart with it telling what the clouds are to do.) Weather satellites, Astronauts flights, Astronauts pictures, All satellite pictures, Space picture, the new astronauts pictures, rockets and missiles, Mars, Projects Mercury, Apollo, Gemini, Dyna-Soar, and the pictures of capsules the Astronauts rode in, and any other information you may have. (Send as soon as possible)

Yours Truly,
Larry

DOWN THE ALLEY

At 7:00 p.m. every Monday at the University Fairlane bowling alleys a team of five Goddard employees rrr-e-a-lly hit those duckpins. They are Lee Murphy, captain, Ben Simmons, Joe Berkan, Bill Forlifer and Bob Keefe. Sponsored by the Goddard Welfare Association, the team competes with 17 other teams in the Interagency Major Duckpin League, which is made up of all government employees.

After four weeks of bowling the team is in sixth place, two games behind the league leaders, with a record of seven wins and five losses. Ben Simmons is among the individual leaders with a 124 average, 41 spares and a high set of 401.

GODDARD MIXED TENPIN LEAGUE STANDINGS

Tuesday (As of Oct. 10, 1963)

	W	L		W	L
Orbiting Elements	16	4	Alley-oops	10	10
Twiggits	16	4	Lucky Five	9	11
No Names	15	5	Fullhouse	9	11
Elites	13	7	Ichi-Bans	8	12
Apaches	13	7	Spouses +	8	12
Imps	13	7	Zooms	7	13
Mor-Wood	11	9	Scatterpins	5	15
8-Balls	11	9	Team No. 17	4	16
Alley Cats	10	10	Split-fits	3	17

GODDARD MEN'S TENPIN LEAGUE STANDINGS

Wednesday (As of Oct. 10, 1963)

	W	L
Quiet Ones	17	3
Bandits	14	6
Outcasts	12	7
Gubaths	10	10
The Junto	9	10
Snakeyes	9	11
Boxcars	9	11
Rackets	9	11
Once	8	12
Vibrators	8	12
El Supremos	8	12
Keglers	6	14

Thursday (As of Oct. 7, 1963)

	W	L
Team No. 3	13	3
Team No. 14	12	4
Team No. 15	11	5
Team No. 7	11	5
Team No. 16	11	5
Team No. 10	9	7
Team No. 12	8	8
Team No. 5	8	8
Team No. 1	7	9
Team No. 9	6½	9½
Team No. 4	6	10
Team No. 6	6	10
Team No. 8	6	10
Team No. 13	6	10
Team No. 2	5½	10½
Team No. 11	2	14

GODDARD MIXED DUCKPIN LEAGUE STANDINGS

Tuesday (As of Oct. 2, 1963)

	W	L
Bluffers	9	3
Cole's Coolies	9	3
Bob Cats	8	4
Ducklings	8	4
Comets	8	4
Alley Catz	7	5
Dukes & Duchesses	6	6
Alley Nauts	5	7
Possibilities	5	7
Stargazers	4	8
Toppers	4	8
Quicksilvers	4	8
Moonshiners	4	8
Vagabonds	3	9

Thursday (As of Oct. 4, 1963)

	W	L
Woodchoppers	12	3
Tick Tocks	11	4
Starliters	9	6
Wambats	9	6
Thor Heads	9	6
Safety Pins	8	7
Space Katz	7	8
Astronauts	7	8
Bobcats	7	8
Satellites	7	8
Moon Pilots	6	9
Syncoms	6	9
Meteorites	4	11
Strikers	3	12

The Goddard duckpin team—front row (from left) Lee Murphy and Bob Keefe. Back row (from left) Ben Simmons, Bill Forlifer and Joe Berkan.

Zanzibar—A Change and a Challenge

all business ceases during the heat of the day from noon until about 4 p.m.

"For the station personnel, working through is no hardship because of complete air conditioning. On the other hand, American families at home without air conditioning are urged to keep up their health and strength by following the local custom of a nice siesta or nap in the afternoon."

The town of Zanzibar is located on the westernmost tip of the island and appears as a typical Eastern city. Above the palace, a large white mansion on the waterfront, flies the solid red flag of His Honor, Seyyid Abdulla bin Khalifa bin Harub bin Thuwen bin Said bin Sultan Al-Said, the Sultan. Behind the palace and throughout the town the visitor can easily spend hours walking through the maze of narrow streets that twist and turn in every possible direction.

The countryside is always green with its thick grass and towering palm trees. Tropical flowers bloom for most of the year and add just the right amount of brilliant color to the scenic panorama. Everywhere there is a pervading aroma of clove; heavy but fragrant.

Spicy Atmosphere on Zanzibar

Zanzibar and Pemba, the sister island to the north, produce 80 percent of the world's supply of cloves. Copra and other coconut palm products are also major exports. Fruit of many varieties grows in abundance — bananas, oranges, limes, pawpaws, pineapples, mangoes, lemons, tangerines, breadfruit, jackfruit, and many others that seem to have no English names.

The natural bounty of the island has created a unique way of life for its 307,000 people. Although the majority are of African origin (Bantu), Arabs, Indians, Persians, Comorians and many others have been living here for centuries.

The Arabs were the early rulers and their influence is reflected in the island's architecture. All along the streets of town the huge, ornately carved brass studded doors lend a majestic air to the tall white-washed buildings.

American personnel have integrated into and have been accepted by the local community which in many ways is foreign to our way of life. Contacts between them have many forms which are both different and interesting; for example, at an Indian fire worshipper's wedding (a sight long to be remembered).

The personnel take pride in showing their station to the many visitors from the local community, and from all over the world.

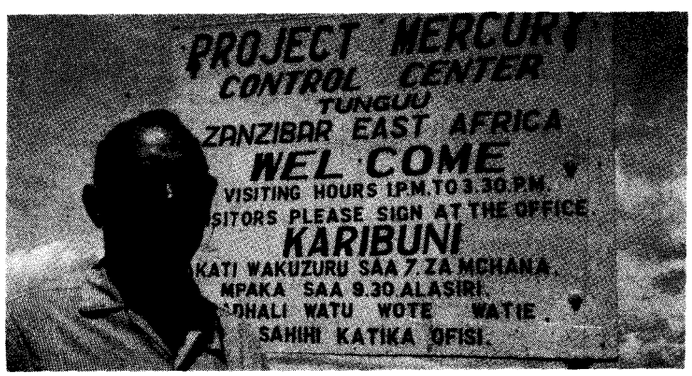
The sultan of Zanzibar, Sir George Mooring, British Resident to Zanzibar, the Zanzibar Chief Minister, Generals of Her Majesty's Forces, writers, reporters, political leaders, U.N. officials, and many others have been made to feel that this station and its information belongs to the world.

A normal tour consists of an explanation of the manned space program and some of its benefits to mankind, description and function of each subsystem and a movie "Friendship Seven" or "Exploring Space." Over 175 people visit the Zanzibar station each month.

Some station personnel have, on their own initiative, taught skills to include elementary practical (bench type) electronics to apt and interested indigenous personnel.

Recreation in Zanzibar is plentiful. The warm, tropical island is surrounded by some of the clearest and warmest water in the world. Many water sports, including skindiving, skiing, sailing and just plain swimming are very popular.

The M & O Supervisor goes through a preflight check-list during the count down: (left to right—seated) Roger B. Locke, M&O supervisor; Joseph J. Miller, site engineer and Thomas C. Hardesty acquisition aid supervisor.



The NASA Station Director by the sign at the site entrance.

The majority of station personnel have been elected to membership in at least one of the local private clubs which offer both sports and social activities: English Club, Sailing Club or Karimjee Club.

Travel in East Africa can be easily accomplished at a reasonable price, either by one of the many ships that call in or by East African Airways. To the south one may take a ship to ports like Durban and Lourenco Marques or to the islands of Mauritius and Madagascar. To the north, the cities of Mombasa and Nairobi are starting points for touring the many game parks in Kenya and Uganda.

"In this presentation, we do not wish to point up Zanzibar as only a 'tropical paradise'," the station director stresses. "It simply isn't. There are the heat, the humidity and insects to deal with.

"But the hearty souls who make up the station complement come with their eyes open. They know that before too many months have elapsed they will depart with a very broadening experience under their belts. But they'll never regret having served in Zanzibar."

(Cont'd. on p. 6)

Zanzibar Tracking Station (from p. 5)

Test equipment operation is checked by Herbert Hoover, Timing and Test Equipment Engineer B.F.E.C.

Goddard Speech and Paper Presentations

(Technical presentations approved as of October 14, for period of October 21 through November 3. Requests for copies of speeches and papers should be made directly to the author.)

PAPERS

E. C. Whipple, Jr., Conference on Direct Aeronomic Measurements in the Lower Ionosphere, University of Illinois, Urbana, Ill., October 21-23, ***"Direct Measurements of the Electrical Conductivity of the Atmosphere."***

R. A. Hoffman, IEEE Meeting, Baltimore, Md., October 21-23, ***"The Trapped Radiation."***

T. L. Cline, IEEE Meeting, Baltimore, Md., October 21-23, ***"Radiation from the Sun."***

Clarence Cantor, East Coast Conference on Aerospace and Navigational Electronics, Baltimore, Md., October 21-23, ***"Fine Sun Tracker for Advanced Orbiting Solar Observatory."***

Barbara Lunde, East Coast Conference on Aerospace and Navigational Electronics, October 21-23, Baltimore, Md., ***"A Reliable Earth Sensor for Attitude Sensing."***

P. Fahlstrom, East Coast Conference on Aerospace and Navigational Electronics, Baltimore, Md., October 21-23, ***"An Attitude Control System for the Advanced Orbiting Solar Observatory."***

Gordon Graham, East Coast Conference on Aerospace and Navigational Electronics, Baltimore, Md., October 21-23, ***"Fine Point Control for the Orbiting Astronomical Observatory."***

E. W. Hymowitz, East Coast Conference on Aerospace and Navigational Electronics, Baltimore, Md., October 21-23, ***"UK 2/S-52 International Satellite Program."***

J. J. Madden & E. R. Watkins, East Coast Conference on Aerospace and Navigational Electronics, Baltimore, Md., October 21-23, ***"Minitrack—Still the Prime System of Tracking Earth."***

J. A. Kaiser & K. L. Hamlin, East Coast Conference on Aerospace and Navigational Electronics, Baltimore, Md., October 21-23, ***"Instantaneous Measurements of Spacecraft Attitude Using Automatic Polarization Analysis."***

Dr. William W. Wolman, U.S. Army Research Office—Ninth Conference on the Design of Experiments in Army Research, Development and Testing, Redstone Arsenal, Huntsville, Ala., October 23-25, ***"Organization & Operation of Statistics Groups at Government Installations."***

A. G. W. Cameron, University of British Columbia, Vancouver, Canada, October 25-26, ***"A Broad Survey of Space and Its Problems."***

William E. Price, Annual Meeting of the Professional Technical Group on Nuclear Sciences—IEEE, San Diego, Calif., October 28-31, ***"Electron Irradiation of Semiconductor Devices."***

SPEECH

F. J. Stevens, Florida Electrical Contractors Association, Orlando, Florida, October 21, ***"NASA Unmanned Spacecraft Program at AMR."***

Goddard Awards 21 Contracts During September

Goddard awarded 21 major contracts totaling approximately $4 million during September. The contracts all support this center's space research program.

All contracts over $100,000 are listed below in their order of monetary value:

$1,300,000 — *Hughes Aircraft Co.,* (Culver City, California)—Provide launch and orbital support for the Syncom project plus operation and maintenance of three ground stations. The ground stations are located at Lakehurst, New Jersey; Johannesburg, South Africa; and aboard the USNS Kingsport.

$766,132 — *Rantec Corp.,* (Calabasas, California)—Provide a cassegrain feed system for Goddard's new 85-foot parabolic antenna at Rosman, North Carolina. This system is designed to collect signals received by the antenna and feed them into the recording equipment at the antenna site.

$421,000 — *Adler Electronics, Inc.,* (New Rochelle, New York)—Furnish two mobile radio vans suitable for road and/or air transport. These high frequency systems will provide point-to-point communications between Goddard and remote tracking stations located in countries without adequate commercial relay facilities.

$283,772—*J. H. Lawrence Co.,* (Baltimore, Maryland)—Install additional refrigeration and boiler equipment in Goddard's central power plant.

$155,500 — *Dynatronics, Inc.,* (Orlando, Florida)—Develop three signal-conditioning consoles for installation at several of Goddard's Satellite Tracking and Data Acquisition Network stations. Designed to handle Pulse Code Modulation data, these consoles regenerate noisy data telemetered from satellites as noise-free signals which are phase-locked with the original incoming data.

$109,115 — *Diecraft, Inc., Raytronics Division,* (Sparks, Maryland)—Provide a universal TV test camera for testing various types of pickup tubes which hold promise for application in weather satellites. This type of test camera is needed to obtain information on the operation of slow-scan pickup tubes required for satellite operations.

Taylor Receives Patent Award

Ralph E. Taylor, R-F systems branch, has received a cash award for the filing and subsequent issuance of a patent on his invention of a thyratron firing circuit.

The Army Incentive Award was issued earlier this month for the invention, which was patented in May of this year. Taylor submitted the invention for patent while he was an employee of the Army's Harry Diamond Laboratories before his employment by Goddard in July, 1960.

Ralph E. Taylor

The firing circuit was designed for use with electronic fuze systems in ordance missiles. Its special characteristics include compact design, light weight, and a high measure of reliability.

It produces a high energy firing pulse, and provides an improved switching action in a fuze firing circuit for more efficient coupling of its firing pulse to the detonator.

Recent Technical Publications Authored by Goddard Staff

William F. Bangs, "Sinusoidal Vibration Testing of Nonlinear Spacecraft Structures," NASA Technical Note D-1763, September 1963.

William R. Mentzer, "Analysis of the Dynamic Tests of the Stretch Yo-Yo De-Spin System," NASA Technical Note D-1902, September 1963.

Shinko Aoki, "A Contribution to the Theory of Critical Inclination of Close Earth Satellites," NASA Technical Note D-1858, September 1963.

NASA Follows Mandate for Peaceful Research During Years of Scientific and Physical Growth

When Congress established NASA in 1958, it did so with the mandate that the United States space program would benefit mankind.

NASA is following this directive with its research and development programs in the areas of communications and meteorological satellites.

Increasing Demands

Robert F. Garbarini, Director of NASA's Office of Applications, notes that satellites may be the best means to satisfying the ever increasing demands in world-wide communications and weather forecasting.

"Presently planned underseas cables and high-frequency radio facilities may not be adequate for future communications needs," Garbarini said. "We feel that the communications satellites will be used in addition to the new cables and other facilities."

Echo I and II

NASA's communications satellite program is being conducted in two areas—passive and active repeater satellites. Echo I, a passive satellite, was launched three years ago. This 100-foot sphere reflects signals between widely separated ground stations. Echo II, 135 feet in diameter, is scheduled for launch early in 1964.

In the active repeater area, NASA has launched two Telstar and one Relay satellites. These receive signals from a ground station, amplify the signal and retransmit it to another ground station.

Two Telstars

Both Telstars, launched for the American Telephone & Telegraph Co., which designed and built them, and Relay have demonstrated the soundness of the active-repeater concept by carrying television, voice and data signals over intercontinental distances. These satellites are in the intermediate altitude family of active repeater satellites.

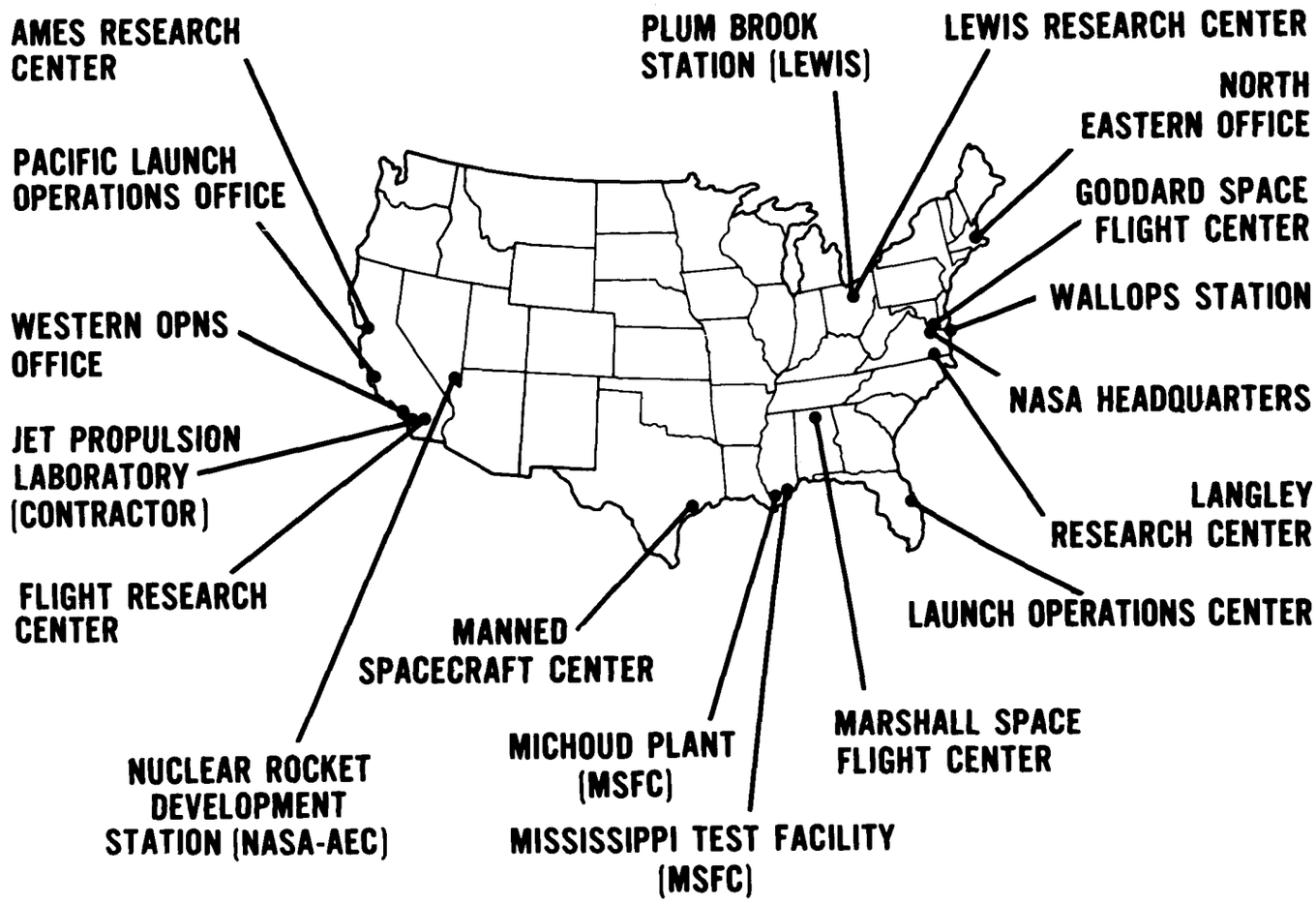
Syncom, also an active repeater, has handled voice and data over long distances. Syncom, in orbit at 22,300 miles altitude, remains relatively stable over an area of the earth as both the earth and satellite revolve around the earth's axis synchronized with each other.

Weather Satellites

"Our weather satellite programs include the highly successful TIROS satellites and the next generation Nimbus," Garbarini said. "We have had seven successful launches in seven tries with TIROS and have contributed greatly to the science of weather forecasting through the successful transmission of more than 200,000 useable cloud cover pictures taken by TIROS."

These photos have been used by the U.S. Weather Bureau in providing storm advisories and other data of value to weather scientists around the world.

NASA also is scheduling tests of an Automatic Picture Transmission system which will permit organizations to receive direct read-out pictures of cloud cover over their localities with relatively low cost ground equipment. The APT system will be flown on the next TIROS and all Nimbus satellites.



Goddard is one of ten NASA research centers among the 18 NASA installations currently in operation. Five years ago, the space administration started with four installations.

Explorer XIV Finishes Year in Orbit

Explorer XIV, which has ceased transmission (see *News About Space & Aeronautics* in this issue), completed a year in orbit on October 2. The satellite was a Goddard project and was launched by the Goddard-managed Delta vehicle from Cape Canaveral.

The primary objective of the satellite was to measure information on the nature of corpuscular radiation, solar particles, cosmic radiation and the solar winds and to correlate particle phenomena with magnetic field observations.

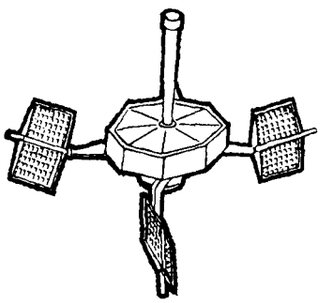
Most of its instruments, experiments and electronics are housed in an octagon-walled platform of nylon honeycomb and fiberglass. The transmitter is in the base. On a boom forward of the platform is a package containing magnetometers and calibration coils.

Magnetometers measure the intensity and direction of magnetic forces. Extended "paddles" contain 6,000 solar cells for the power supply. There also is a silver cadmium battery.

Other instrumentation includes eight particle detection systems, shielded and unshielded solar cell experiments, and an optical aspect sensor.

Explorer XIV's original perigee (closest point to Earth of its elliptical orbit) was 175 miles. The apogee (farthest point) was 61,226 miles. Gravitational influences have reduced the apogee to 60,220 miles and increased the perigee to 1,280 miles.

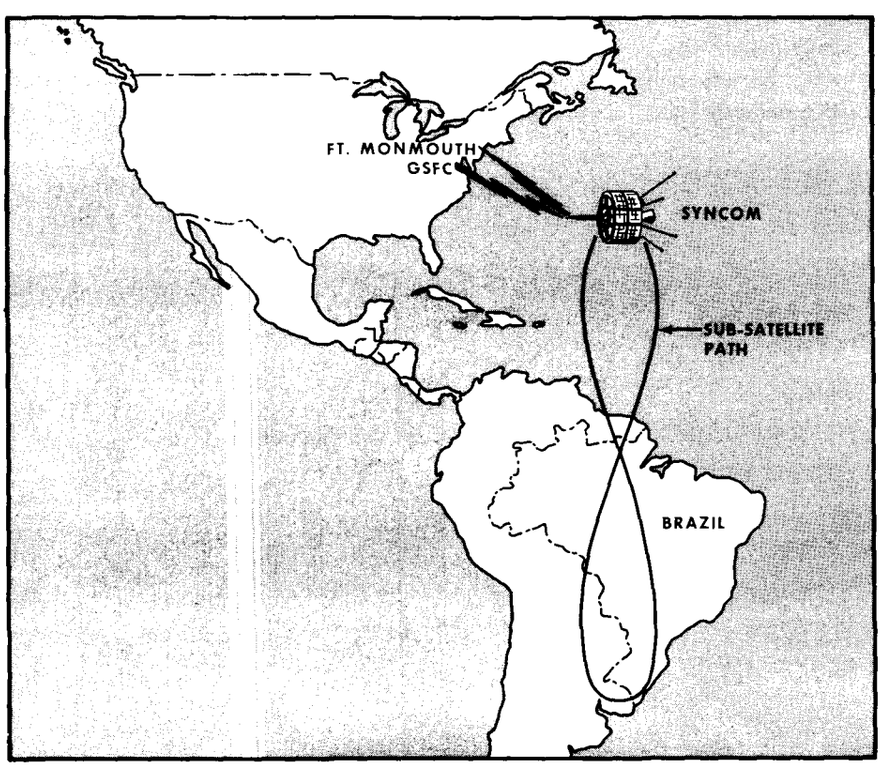
A partial listing of the accomplishments of the satellite are presented on page three of this issue.



Explorer XIV

The Aerobee in the background was fired from White Sands Oct. 1. The 235-pound payload contained instruments to measure ultra-violet radiation and cameras to record the sun and corona. It reached an altitude of 134 statute miles. Eleanor Pressly, head of the vehicles section of Goddard's sounding rocket division, is shown with the Aerobee prior to launch.

Industrialists Tour Goddard—Use Syncom



A group of the nation's leading industrialists visited Goddard on Sept. 27 at the special invitation of NASA Administrator James Webb. The men represented many of the major research and development firms in America. While at Goddard's COMSOC, the men (pictured during tour at right) talked to personnel at Fort Monmouth via Syncom (see diagram above). From Goddard's antenna on ARC property the signal was transmitted to Syncom and down to Fort Monmouth. Syncom's sub-satellite path is represented by the figure eight.

Goddard Coming Events

Goddard colloquim lecture:

- **October 22, 3 p.m., Auditorium, Bldg. 3—John W. Freeman, Jr., NASA Headquarters, "Morphology of the Low Energy Electron Distribution near the Magnetosphere Boundary."**

Misc:

- **Demonstration of Equipment (oscillographs, galvanometers and recording materials) by Consolidated Electrodynamics Corp., October 16, 9:00 a.m. to 4:00 p.m., Room 231, Building 7.**