GODDARD NEWS

GODDARD SPACE FLIGHT CENTER / GREENBELT, MARYLAND

VOLUME VII, NUMBER 11 | THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION | OCTOBER 19, 1964

Explorer XXII—A Success

The Goddard managed Beacon Explorer-B satellite was launched on October 9. The satellite was designated Explorer XXII.

Orbital elements are:

Apogee: 669 miles
Perigee: 549 miles
Period: 104 minutes
Inclination: 80 degrees

The experiments on the Beacon Explorer-B are designed to help scientists learn more about the ionosphere, a layer of electrically charged gases beginning about 35 miles above the surface of the earth. This is the region which makes long-distance radio communication possible, since the layer of charged particles reflects radio waves back toward the earth.

The 116-pound satellite will transmit a continuous series of radio signals to a network of more than 80 ground stations in 32 countries, making it the most extensive international scientific effort yet in a U. S. space project.

Scientists around the world have accepted invitations to participate in the program. The satellite's signals can be received by simple do-it-yourself ground stations costing less than $5,000 and consisting of an antenna, two radio receivers, a timing device and a recorder.

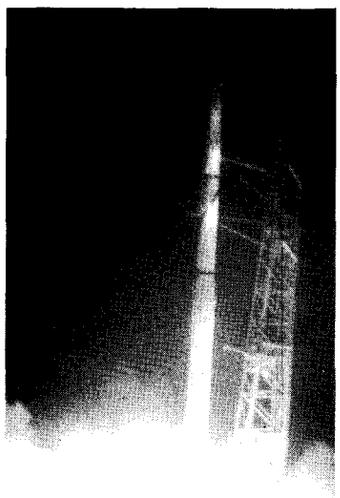
Explorer XXII also carried a number of specially designed reflectors which will be used by NASA scientists to try to bounce LASER beams (very narrow beams of intense light) from the satellite. These experiments, the first use of LASER in space, could lead to very precise methods of determining a satellite's exact position in space.

The Goddard team for this project included:

- Frank T. Martin, project manager
- Robert E. Bourdeau, project scientist
- John T. Shea, project coordinator
- Larry H. Brace, electron density experiment
- Dr. Henry H. Plotkin, LASER project scientist
- Robert H. Gray, manager, Goddard Launch Operations
- Joseph B. Schwartz, associate manager, Goddard Launch Operations (PMR)

(See photographs p. 3)

First LASER Reflectors ever used in space are indicated on Beacon Explorer-B model by Frank T. Martin, Goddard Project Manager, in discussion with Joseph B. Schwartz (center), Associate Manager, Goddard Launch Operations, and Eugene D. Schult, Scout Project Manager, Langley Research Center.



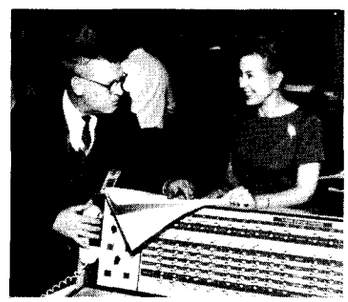
Liftoff of Beacon Explorer-B at fog-shrouded Vandenberg AFB, (formerly the U. S. Navy's Pt. Arguello launch site).

FIRST WORLD-WIDE REHEARSAL

The first major test of the NASA worldwide tracking network began October 9th in preparation for the manned orbital flights in the Gemini program. Simulated flight missions were carried out over a nine-day period involving Goddard Space Flight Center, the Mission Control Center at Cape Kennedy and eight remote sites in the worldwide network to test tracking and communications equipment, as well as flight control procedures and equipment.

This month Goddard completed the updating of its Manned Space Flight Tracking Network to support the Gemini flights scheduled for early 1965.

This climaxed a two-year and $50-million effort which converted the Mercury Network to serve the next phase of America's man-in-space program. NASA's new tracking station at Carnarvon, Australia, participated in the rehearsal along with others at Corpus Christi, Texas, the Canary Islands, Hawaii, Guaymas, Mexico; Wallops Island, Va., and two tracking ships, the Coastal Sentry in the Indian Ocean and the Rose Knot in the Pacific.



At the network status console are Walter I. Adams, CADFIST test director, and Betty Jane Stephanides, computer programmer, during the Gemini simulation.

The tracking duties formerly handled by the station in Zanzibar were performed by the ship, Coastal Sentry.

An additional tracking station is being assembled in the Malagasy Republic, which will be used to receive and relay information from orbiting spacecraft during later Gemini flights.

All tracking stations are equipped with in-flight displays that will monitor every action and environment of the Gemini astronauts. Goddard officials describe this equipment as forty

(Cont'd on p. 4)

PARTNERS IN SPACE

Hon. Allen Fairhall, Minister of Supply for the Commonwealth of Australia, and Mr. John Knott, Secretary, Department of Supply recently visited the U. S. to confer with NASA officials including Administrator Webb. A visit to the Rosman, N. C., data acquisition facility followed. Here, they observed the operation of the 85-foot antenna and complex electronic equipment similar to facilities to be installed "down-under."

In Australia, Goddard's stations for manned and scientific missions are built and operated by the Ministry of Supply.

A technical briefing on tracking operations by Harold L. Hoff (right), Associate Chief for Network Engineering and Operations. Shown left to right are Desmond Barnsley, Defense R&D Attache of the Australian Embassy, and Australian officials, Supply Minister Fairhall and Department of Supply Secretary Knott.

NASA Administrator Webb (left) discusses cooperative space projects with Minister Fairhall. Webb and Fairhall also recorded a special film sequence for use in an Australian motion picture, "Partners in Space."

En route to the Rosman N. C. Tracking and Data Acquisition Station are Edmond C. Buckley (left), NASA Director of the Office of Tracking and Data Acquisition, and John T. Mengel (center) GSFC Assistant Director for Tracking and Data Systems. They are discussing joint problems with Australian Minister Fairhall.

Dr. Goett Delivers Address At Worcester Tech's Centennial

Dr. Harry J. Goett, Director of Goddard, spoke on the "Scientific Exploration of Space and Its Challenges to Education" at the Centennial Luncheon held October 8th at Worcester Polytechnic Institute.

In his opening remarks, Dr. Goett saluted Worcester Tech as ". . . these halls which sparked the mind of the father of the space age, Dr. Robert H. Goddard. Those of us engaged in the space program have a very special respect for Dr. Goddard. We see in him the embodiment of the curious and far-seeing scholar who best exemplified the theme of this convocation—the partnership of engineering and science in progress."

Dr. Goett pointed out: "The physicist, the astronomer, the geodesist, the mathematician, the geologist and the astrophysicist, all have new frontiers open to them. Their job as scientists is to bridge the gap between the known and the unknown. Are they being educated in such a manner as to prepare them to do this job in that new laboratory of space that has been opened up to them?

"The job of the engineer," Dr. Goett continued, "in contrast to the scientist, is to use the resources of nature for social ends—to bridge the gap between the known and the desired. The laboratory of space has already opened up a new 'known' to the engineer in the field of communications and meteorology. The experimental communication satellites—Syncom, Relay, Telstar and Echo—have answered many of the questions that used to exist relative to the use of satellites for communication. The job of the engineer now is to translate this knowledge into a system that will be better than the under ocean cables."

Dr. Goett spoke of meteorological satellites—Tiros and Nimbus and the scientific exploration of space and told of the many challenges facing engineers and scientists today. He concluded his talk with a suggestion for ". . . a re-examination of the educational process and its curriculum by those competent in the field of education to see whether they think it has been properly adjusted to meet these new challenges of the space age."

Lockheed's President Wins NASA Post

Dr. George E. Mueller, associate administrator for manned space flight programs, National Aeronautics and Space Administration Headquarters, recently named as his deputy William B. Rieke, president of Lockheed Aircraft International, Inc.

Rieke will assume his new duties at NASA headquarters, Washington, D.C., Nov. 2. He succeeds George M. Low, now deputy director of NASA's Manned Spacecraft Center in Houston.

As deputy associate administrator for manned space flight, Rieke will be principally concerned with institutional and program management pertaining to NASA's manned space flight centers: the Marshall Space Flight Center, Manned Spacecraft Center and the John F. Kennedy Space Center.

Since joining Lockheed in 1941, Rieke's aviation career embraced assignments of increasing complexity and responsibility. He became chief of procurement activities of the Lockheed-California Co. in Burbank before 1952. He then helped establish the Lockheed operation in Marietta, Ga. There he worked as director of materiel and subsequently in various project and manufacturing positions before becoming a vice president of the Lockheed-Georgia Co. in 1961.

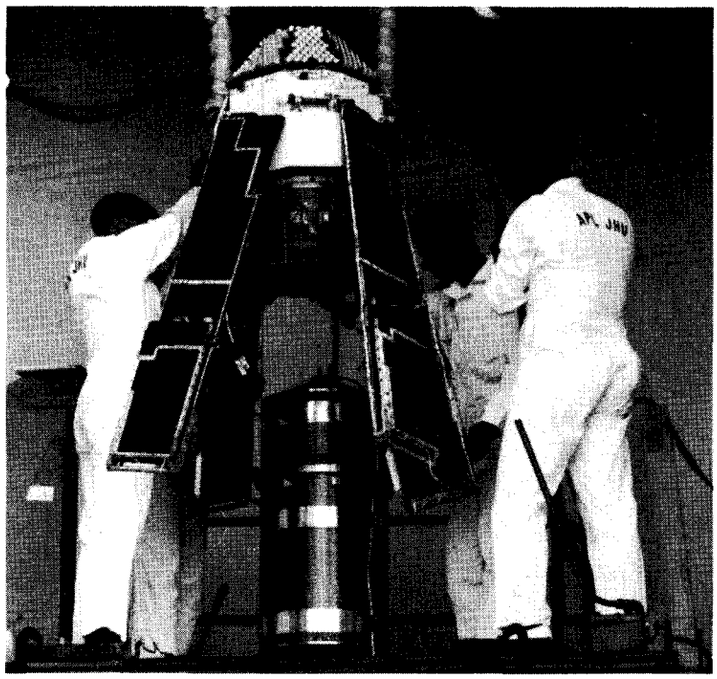
For the past two years he has been president of Lockheed Aircraft International which conducts various manufacturing and licensing operations throughout the world. He is also an officer and director of affiliated companies in the international area.

Before joining Lockheed, Rieke was a department manager for Dun and Bradstreet in Los Angeles and Oklahoma City. He attended the University of Oklahoma and is a native of Onawa, Iowa.

Rieke is married to the former Violet Lindsay of Utica, N.Y. They have two daughters, Joann, 12 and Marilyn, 13.

(Photographs cont'd from p. 1)

EXPLORER XXII—FIRST SATELLITE TO TEST LASER

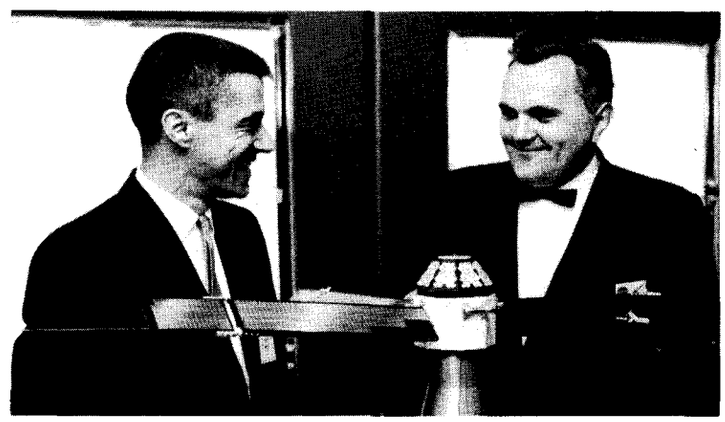


Mating Beacon Explorer-B to Scout. Engineers and technicians mate the satellite to the upper stage of the Scout launch vehicle in a test before moving to the launch complex.

At a reception held September 29 by the National Space Club in the Statler Hilton Hotel, Washington, D.C. are (left to right): Larry G. Hastings, Chairman, Goddard Stamp Committee; Mrs. Esther C. Goddard, wife of the "father of American rocketry"; Frederick C. Belen, U.S. Deputy Postmaster General; Mrs. Alberta Moran, Administrative Assistant to the Director, GSFC, and member of the National Space Club's Goddard Stamp Committee; and Eugene W. Wasielewski, Associate Director, GSFC.
The reception featured the unveiling of the Dr. Goddard stamp's artwork prior to the commemorative stamp's initial release October 5, when sixty million went on sale in U. S. Post Offices across the country. In attendance were officials of the U. S. Post Office and the Goddard Space Flight Center, along with National Space Club members and their guests.

Dr. Henry H. Plotkin (with back to blackboard) briefs the press before the Beacon Explorer-B launch at the Vandenberg AFB. Dr. Plotkin, Chief, Optical Systems, is the Project Scientist for the LASER experiment.

Robert Boudeau (below left), Project Scientist and Frank T. Martin, Project Manager, discuss the Beacon Explorer Satellite at the Mission Control Center of the Goddard Launch Operations facility before the successful launch Friday night, October 9th.



Goddard People Win Official NASA Citations

Center Director Dr. Harry J. Goett, Dr. Frank B. McDonald, Head of the Energetic Particles Branch and Mr. Dan Mazur, Chief of the Spacecraft Systems and Projects Division, this month won official NASA recognition for outstanding leadership and exceptional scientific achievement.

Dr. Goett received NASA's outstanding leadership award; Dr. McDonald and Mr. Mazur were recognized for exceptional scientific achievement.

The awards were presented at the annual NASA awards ceremony held in Washington.

Dr. Goett won recognition for "his outstanding service as the director of a complex scientific organization whose many achievements have contributed to the prominent position of this country in the pursuit of scientific knowledge, the development of space technology, and the application of such research and development to the benefit of mankind."

Mr. Mazur was recognized "for exceptional technical achievement in the development of communications satellites and associated ground-systems which has placed the United States in a position of leadership in the practical use of satellites for world communications."

Dr. McDonald was singled out "for his major scientific contributions to the study of solar proton events, the interplanetary medium and the galactic cosmic radiation as project scientist and principal experimenter on Explorer XII, XIV and IMP-A and for significant technological progress in understanding the radiation environment in space."

Opening session of Goddard's first Summer Workshop on Measurement and Simulation of the Space Environments.

Dr. Gerhard H. Beyer, a Workshop team captain, adjusts the Thermal Vacuum Facility while liquid nitrogen issues at the top. Dr. Beyer is Chairman of the Chemical Engineering Department, University of Missouri.

Goddard's Summer Workshop Scores Third Successful Year

The Goddard Summer Workshop, which started out as an experimental venture in 1962, completed its third successful year of operation this Fall.

Directed by Dr. Elias Klein, the workshop is a unique in-house effort designed to help solve selected space program problems which are of immediate interest to Goddard and NASA.

The work of this annual 12-week effort is carried out by teams composed of university faculty from various disciplines, graduate students, and Goddard's permanent staff.

Each academic-Goddard team investigates a specific technical area to provide definitive answers to particular questions. A comprehensive report is the end product.

At least 12 articles in high grade professional journals have resulted from the three summers during which the Workshop has been in operation. Of these, four were produced by the 1964 session.

During the 1964 Workshop, three teams attacked scientific and technical problems in space sensors and simulation methods. Dr. M. P. Thekaekara of Georgetown University headed the team working in the area titled "Space Optics, Radiation Sensors and Solar Simulation." Another team, headed by Dr. G. H. Beyer of the University of Missouri, investigated "Heat Transfer and Cryogenic Pumping in Vacuum Technology." The third team, led by Dr. D. L. Waidelich, studied "Magnetic Environment Simulation."

In addition to the obvious scientific and technical benefits from the Workshop, several significant side benefits can be seen. For one, the collaborative academic-Goddard effort is mutually beneficial since all participants have the opportunity to learn from one another. Such an interchange of ideas helps regarding different aspects of the problem under study and helps to upgrade their competence. At the same time, the academic people are made aware of Goddard's various problems in application.

A further side benefit from the Workshop is the knowledge the academic members obtain on Goddard's requirements for manpower qualifications and skills. This information assists the universities in better understanding what is considered adequate and suitable training for students interested in the space effort. During their summer stay with Goddard, the professors are made aware of the exceptional capabilities that will be demanded of future graduates in science and engineering in order to conquer outer space.

Dr. Elias Klein, Workshop Director, receives congratulations from Dr. Harry J. Goett, Director of Goddard, on being elected Honorary Fellow by the Institute of Environmental Sciences.

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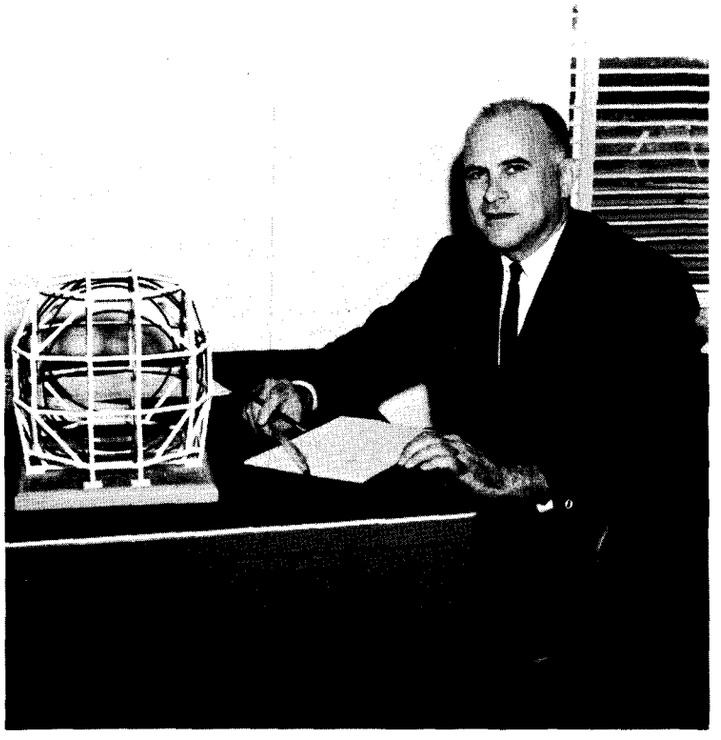
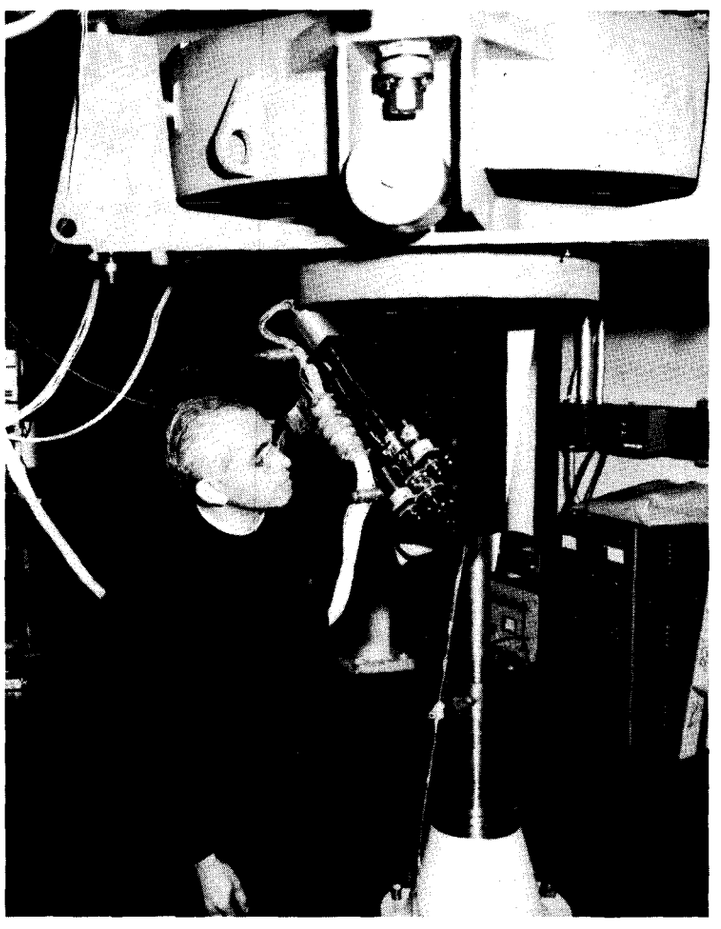


Dr. Donald Waidelich, a Workshop team captain, has a model of the Magnetic Simulation Facility on his desk. He is Professor of Electrical Engineering, University of Missouri.



Dr. Matthew P. Thekaekara, a Workshop team captain, examines the Vacuum Optical Bench. He is Associate Professor of Physics at Georgetown University.

Meet Our People

This is the second in a series of articles on Goddard personalities.

Dr. Friedrich O. Vonbun, Chief of Systems Analysis Office for Tracking and Data, has won considerable acclaim for accomplishments and scientific papers in the fields of physics and space sciences since coming to the Goddard Space Flight Center in May 1960.

A native of Reichenberg, Austria, Dr. Vonbun, 39, received his M.S. degree from Vienna's Institute of Technology in 1952, and earned his Ph.D. in physics at the Institute of Technology, Graz, Austria.

After two years as a research physicist for the U. S. Army Signal Research and Development Laboratory (USARDL) at Fort Monmouth, New Jersey—where he worked from 1953 to 1955 in the field of microwave antennas—Dr. Vonbun joined the Frequency Control Division of USARDL and devoted five years to the field of atomic and molecular resonance devices.

His four and a half years at Goddard have been spent in multiple fields of endeavor: Analysis and planning of worldwide tracking networks for satellites and manned spaceflights, research and development work in the fields of radio tracking, propagation of electromagnetic waves through the ionosphere, radio telemetry and geophysics. He is also engaged in research and development in the fields of tracking and trajectory determination and associated error analysis.

Dr. Vonbun is a member of the American Physical Society and the Institute of Electrical and Electronic Engineers. His scientific papers include "Analysis of the Range and Range Rate Tracking System," "Correction for Atmospheric Refraction at NASA Minitrack Stations," "Tracking Systems, Their Mathematical Models and Their Errors," "Parking Orbits and Tracking for Lunar Transfers," "Preliminary Ship Support and Tracking Error Study —Apollo Mission," and "Reentry Tracking for Apollo."

Dr. Friedrich O. Vonbun, Chief, Systems Analysis Office.

New Vapor Cloud Studies

Early this month two experiments to measure winds in the upper atmosphere were conducted from Wallops Island, Va.

They were launched with Nike-Apache sounding rockets.

The first payload ejected a trimethylaluminum vapor trail up to an altitude of 107 statute miles. The payload also contained devices for measuring electron temperature and density.

The second payload ejected sodium vapor to form a cloud. Both clouds were visible for several hundred miles from the launch site.

The vapor cloud experiments are the forerunners of a series beginning the last part of October at Fort Churchill, Canada, and other sites around the world, using similar techniques for measuring winds in the upper atmosphere. The late October experiments are aimed at the investigation of auroral phenomena.

Recent Technical Publications Authored by Goddard Staff

W. N. Hess, "The Effects of High Altitude Explosions," NASA Technical Note D-2402, September 1964.

S. Huang, "A Series Solution for Some Periodic Orbits in the Restricted Three-Body Problem According to the Perturbation Method," NASA Technical Note D-2488, September 1964.

C. C. Johnson, "A Rutile Traveling Wave Maser," NASA Technical Note D-2490, September 1964.

L. S. Walter, and M. K. Carron, "Vapor Pressure and Vapor Fractionation of Tektite Melts," NASA Technical Note D-1084, September 1964.

T. L. Felsentreger, "On The Second-Order Solution of Artificial Satellite Theory Without Air Drag," NASA Technical Note D-1752, September 1964.

News About Space & Aeronautics

● Syncom III, the world's first stationary satellite, is in such a precise orbit that its rotational speed matches that of the Earth almost perfectly.

The Earth revolves at the rate of 1436.068 minutes each day, while Syncom revolves at 1436.158. This means Syncom is only five seconds off a perfect match with the Earth's rotational speed. The Earth does not rotate completely each 24 hours, but each 23 hours, 56 minutes, 4.09 seconds.

The spacecraft is "on-station" at 180 degrees. It's position over the Equator is relatively motionless at the 22,300 mile altitude. It drifts less than a mile and a half a day or 1/100th of a degree. At the same time its position over the Equator, inclined .095 degrees means it drifts north and south less than six miles a day.

Apogee is 22,640 miles and the perigee is 21,816 miles.

Syncom III was launched by the Thrust-Augmented Delta (TAD) from Cape Kennedy on August 19.

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● In the photograph on the right, a full-scale model of the Saturn V rocket booster, that will one day launch American astronauts on flights to the Moon, dwarfs an employee at NASA's Michoud Operations in New Orleans. The engineering prototype, measuring 33 feet in diameter and 138 feet in height, will aid in the manufacture of future Saturn V test and flight boosters. One of the booster's five F-1 engines, which will generate a total of 7.5 million pounds of thrust, is shown in position on the aft end of the vehicle. Ten Saturn V first stages will be built for NASA at Michoud by the Boeing Co.

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● A supplemental list of Technology Utilization publications dated August 1964 designed to acquaint the public with useful innovations from space research has been made available by headquarters.

The list catalogs 63 Tech Briefs plus a variety of more detailed technology reports, surveys and handbooks published by NASA's Technology Utilization Division.

The list is free and may be obtained from NASA Headquarters, Code ATU, Washington, D. C. 25043.

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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 successful completion of the mission of Ranger 7 is one of the great accomplishments of our generation. It is evidence of the superiority of America in the field of science and more particularly in the area of space sciences. All of America should realize that through this effort mankind will benefit in many ways. Placing a man on the moon will, of course, be a great achievement; however, it will be insignificant as compared to the wealth of knowledge which will accumulate as a result of that effort.

"This most recent achievement is dramatic and exciting to the scientists and the layman alike. In knowledge there is great power and there is hope and fervent prayer that all of this might be used to benefit mankind and assure us of a world and universe where peace might prevail forever. The psalmist was mindful of the great power God had given to man when he said:

" ' What is man that Thou art mindful of him? . . . Thou madest him to have dominion over the works of Thy hands.'

"Truly this great power is realized more than ever as man has extended his explorations beyond the limits of the planet, earth, and seeks to unveil the mysteries of the universe."—*Representative J. Edward Roush, Congressional Record, August 3, 1964.*

GODDARD NEWS

OCTOBER 19, 1964*

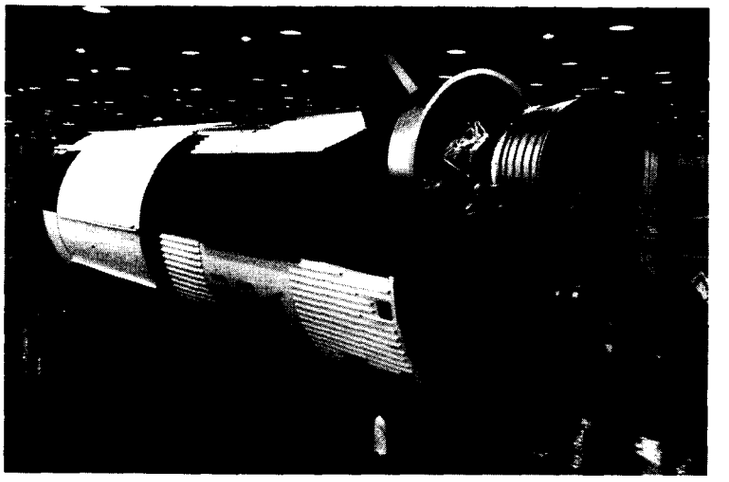
"It is difficult to say what is impossible, for the dream of yesterday is the hope of today and the reality of tomorrow."
—DR. ROBERT H. GODDARD

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

Photography by Goddard's photo branch

Jerry Stark, *Editor* Shirley Deremer, *Inside Goddard*

**Press date precedes publication date by approximately seven days.*



Goddard Speech and Paper Presentations

(Technical presentations approved as of October 19, 1964 for period through November 1. Requests for copies of speeches and papers should be made directly to the author.)

PAPERS

W. Hess, Engineering Aspects of Space Medicine Course—George Washington University, October 19-30, 1964, Washington, D.C., ***"Space Radiation and Magnetic Field Environment."***

A. G. W. Cameron, Physics Department, Washington University, October 21, St. Louis, Missouri, ***"Neutron Stars and Celestial X-ray Sources."***

William R. Cherry, IEEE 11th Annual East Coast Conference on Aerospace and Navigational Electronics, October 21, Baltimore, Maryland, ***"Radiation Effects on Solar Cell."***

Robert Estes and Walter Nagel, Eleventh Annual East Coast Conference on Aerospace & Navigational Electronics, October 21, 22, 23, Baltimore, Maryland, ***"Attitude Control System for a High Altitude Balloon."***

Norman F. Ness, Second Symposium on Protection Against Radiations in Space, October 12-14, Gatlinburg, Tennessee, ***"The Magnetosphere and Its Boundary."***

William R. Cherry, Boy Scout Troop of Adelphi, Md.—Father-Son Dinner Meeting, October 23, Adelphi, Maryland, ***"Solar Powered Spacecraft."***

D. S. Evans, Eleventh Nuclear Science Symposium, October, 28-30, Philadelphia, Pennsylvania, ***"Low Energy Charged Particle Detection Using the Continuous Channel Electron Multiplier."***

Keith W. Ogilvie, Eleventh Nuclear Science Symposium, October 28-30, Philadelphia, Pennsylvania, ***"Analysis of Ions in the Interplanetary Medium."***