GODDARD NEWS

GODDARD SPACE FLIGHT CENTER / GREENBELT, MARYLAND

VOLUME X, NUMBER 4 THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION NOVEMBER 15, 1965

NEW APOLLO COMPUTER, the 642B Modified, is being demonstrated by Goddard's Ed Willis (center) to Don Meger (left) and Ed Brunker. Story on Pages 4 & 5.

Goddard's New 2-Channel Monopulse Antenna Provides Big Advances

A new concept in antenna feeds, called the 2-channel monopulse antenna system, which provides greatly improved illumination efficiency and cost-savings by eliminating one receiver channel, has been developed after nearly three years work by Goddard's Advanced Development Division (ADD).

The new antenna, designed and fabricated by Radiation Systems, Inc. in Alexandria, Virginia, specifically for the TOS (TIROS Operational Satellite) 85-foot dish at Wallops Island, passed its final tests October 20, 21 and 22 during a "fly-by" at the contractor's site.

This feed provides benefits never before possible. It covers a 4:1 frequency band and thereby replaces three sets of 4 crossed dipoles presently used to operate 85-foot dishes at 136, 235, and 400 mc. It's a 2-channel monopulse tracking feed replacing the conventional three channel feeds. Hence it's cheaper and more reliable, with fewer receiving components and less parts to require trouble-shooting.

See Page 2

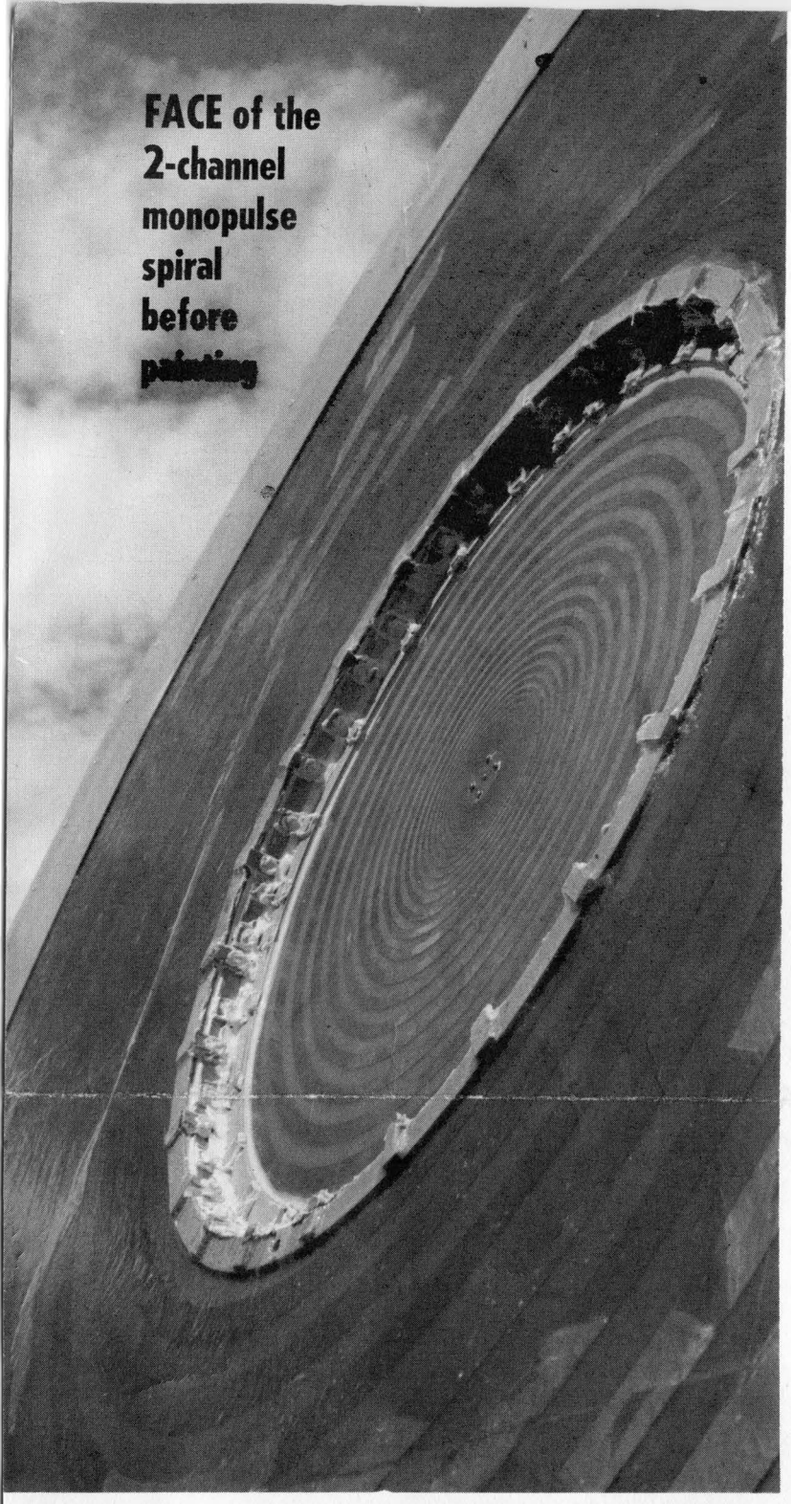
IMPROVED DELTA PROVES SUCCESSFUL ON MAIDEN FLIGHT

Delta No. 34, the first of the new improved Deltas, got its feet wet in the literal sense as the 92-foot-tall rocket blasted off on its maiden flight in a driving rain storm from Cape Kennedy at 1:39 p.m. EST November 6.

It took just a few seconds for Delta to disappear in the dark, rain-filled Florida sky and some 19 minutes later project officials received word from a down-range ship that Delta had hurled the 385-pound Geos spacecraft into orbit.

"We were really happy about this one," said William R. Schindler, Delta Project Manager for Goddard. "We had never flown the larger second stage before and, except for a guidance problem which took us into a higher than planned orbit, the entire system worked like we had hoped it would. The entire Delta crew at Goddard," added Schindler, "worked hard on this mission and they deserve a lot of credit."

See Page 3



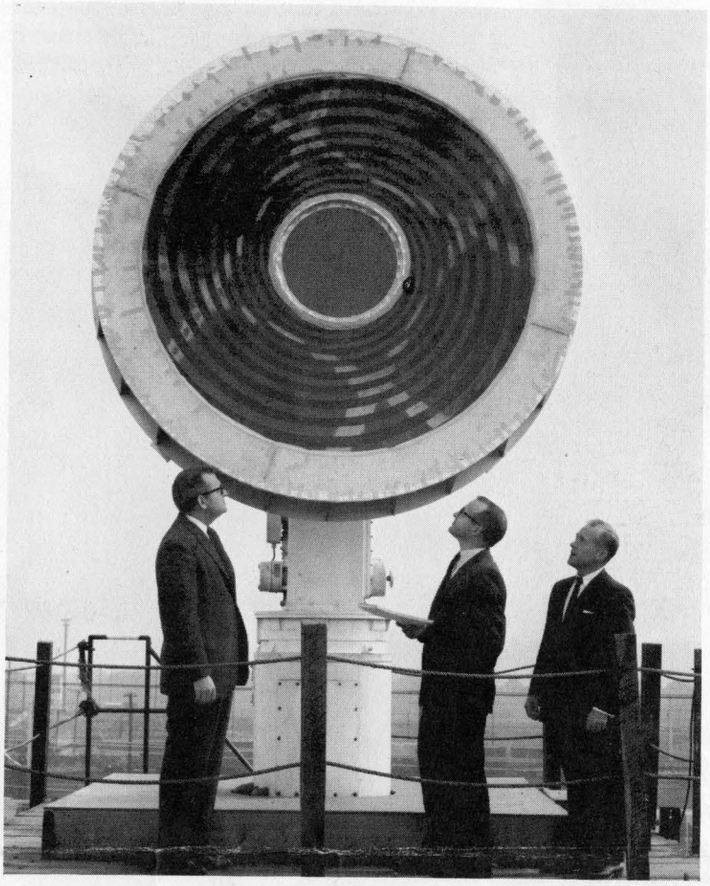
MONOPULSE ANTENNA, *From Page 1*

The new feed, with the world's largest planar spiral of 8-foot diameter, is unique in many respects. It receives both senses of circular polarization simultaneously. No RF switches are required. It's done by feeding the outer rim as well as the center of the spiral, providing a circularly symmetric illumination of the circular 85-foot dish. Tracking accuracy is improved because the feed is precisely boresighted. And the fabrication technique is simply that of printing the copper spiral areas on the fiberglass sheet.

The 2-channel monopulse antenna is the result of a three-year effort by the Antenna Systems Branch, headed by Thomas S. Golden, to develop a single feed to replace all tracking and data acquisition feeds of the 40 and 85-foot dishes in the 17:1 frequency band 136-2300 mc. used in STADAN (Satellite Tracking and Data Acquisition Network).

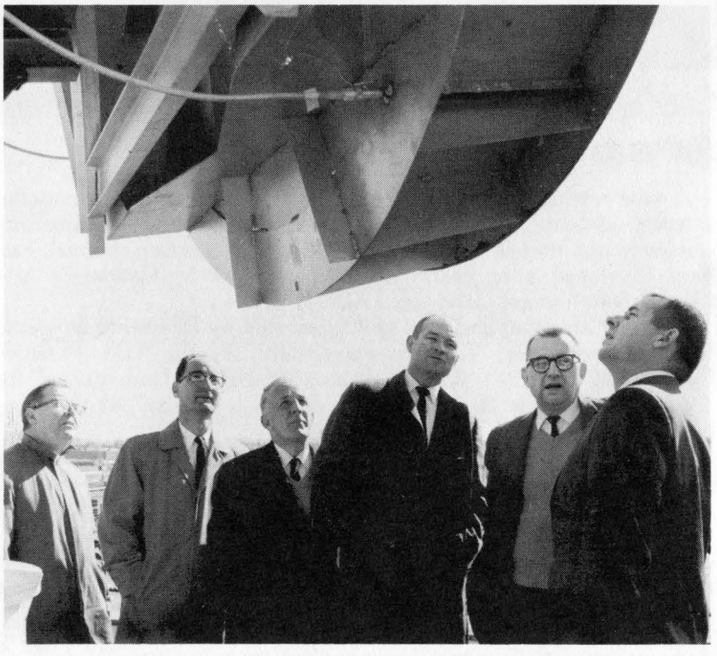
Mr. Golden said that the present system can easily be extended to cover the additional frequency requirements of the STADAN network.

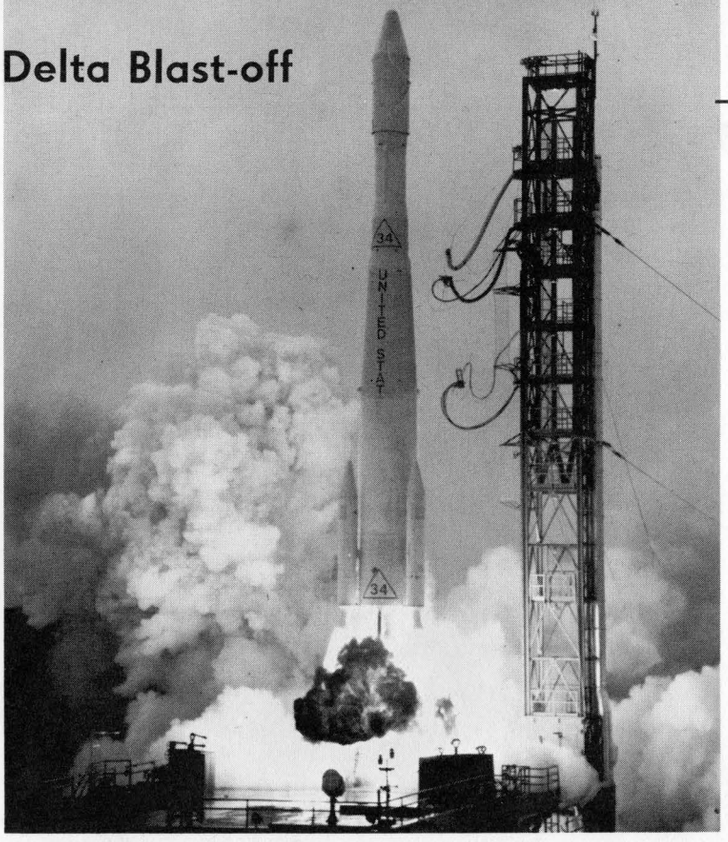
Goddard personnel involved in the new antenna system include: Paul A. Lantz, Technical Officer; and Charles R. Grant, Project Manager for the U. S. Weather Bureau TOS—Wallops Tracking Station.



***COMPLETE ANTENNA FEED.** From left are Thomas S. Golden, Head of Antenna Systems Branch (ADD); George R. Chadwick, Chief Engineer of Radiation Systems, Inc.; and Paul A. Lantz, Head of the Antenna Section.*

***BENEATH FEED.** From left are Orville Stanton, NASA Headquarters (OART); Daniel Serice, NASA Headquarters; Charles Grant, Goddard Project Manager; David Holmes, U.S. Weather Bureau; Thomas S. Golden, Head, Antenna Systems Branch; and Robert Hynes, NASA Headquarters.*





Delta Blast-off

SUCCESSFUL DELTA, *From Page 1*

The Delta second stage never received a command to shut down and the engines burned until fuel depletion. Geos-1, officially designated Explorer XXIX, is in an orbit ranging from 960 to 1414 statute miles, is inclined 59 degrees to the equator, with an orbital period of 120 minutes.

The improved Delta, built for NASA by Douglas, can hurl almost three times more weight into space than previous Deltas due to a second stage which is two feet larger in diameter.

Earlier Deltas carried enough propellants in the second stage to burn for approximately 150 seconds while the improved Delta second stage burns for approximately 400 seconds.

Five years of Delta launchings from Cape Kennedy have meant reliability, increased performance, and versatility.

On 34 occasions, Delta has roared into the sky and 31 times it has placed satellites into orbit for a better than 91 percent average.

Its 1960 lifting capability for a 300 mile earth orbit missions has increased from 525 pounds to 1,400 pounds. Delta's spacecraft passengers have varied in size from the 100-foot diameter Echo balloon to the 28-inch diameter Syncom I, and in weight from the 80-pound Explorer X to the 620-pound OSO-C.

The Delta 34 launch agency for Goddard was the Kennedy Space Center's Unmanned Launch Operations headed by Robert H. Gray, formerly Chief of Goddard Launch Operations.

Geos-1 contains five geodetic instrumentation systems to provide simultaneous measurements that scientists require to establish a more precise model of the earth's gravitational field and to map a world coordinate system relating points on or near the surface to the common center of mass.

GODDARD NEWS

NOVEMBER 15, 1965

"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 published biweekly by the Public Information Office of the Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.

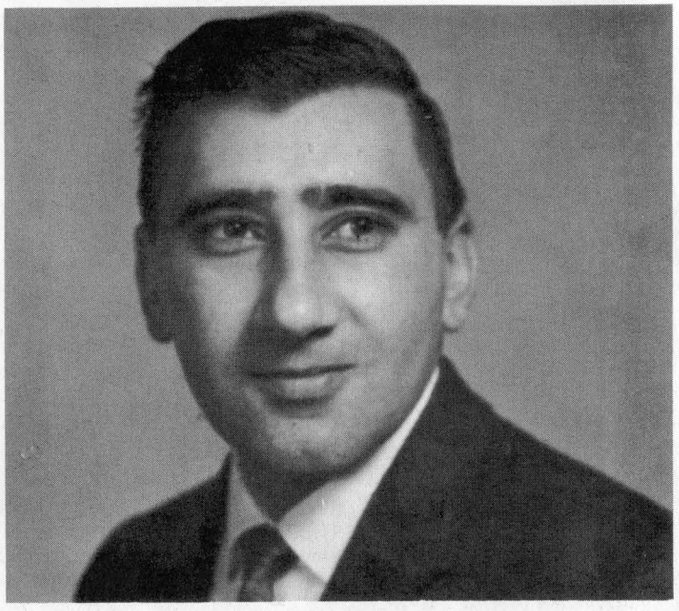
Jerry Stark, *Editor* Stephen Jacobs, *Assistant Editor*

Photography by Goddard's photographic branch

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

Meet Our People

This is another in a series of articles on Goddard personalities



Edmund J. Habib

Edmund J. Habib, Associate Chief of the recently formed Information Processing Division, has the distinction of being not only one of Goddard's earliest employees, but he also was a member of the original Project Vanguard team.

He came here in October 1958 after 8½ years in the Rocket Sonde Branch of the U.S. Naval Research Laboratory (NRL) where he held positions of progressive importance to the space effort and chalked up a number of outstanding achievements.

At NRL, Mr. Habib had worked on the Viking rocket instrumentation, helped design the Minitrack Tracking System, developed the Time Standard System as well as the Optical Calibration System. The techniques used today are based on some of his original work.

On arrival at Goddard, he was Head of the Systems Evaluation Branch (T&DS) and was responsible for the calibration techniques and accuracy of the Minitrack Tracking System. While also serving in this position, he originated Goddard's Range and Range Rate System which is fast becoming STADAN's principal and most accurate tracking system. The super-accuracy of this system was verified from its first application on Syncom when it provided the orbital position of the satellite at a height of 22,000 miles to an accuracy of less than 50 feet.

Mr. Habib's accomplishments as Branch Head precipitated his rise in October 1961 to Assistant Chief of the Space Data Acquisition Division. In this capacity, Mr. Habib's development of Goddard's telemetry data processing facilities led to his appointment in July 1963 as Assistant Chief of the Data Systems Division.

In discussing his job, Mr. Habib said: "We provide advanced planning for ways and means of tackling the billions of data points of information transmitted from the Goddard scientific satellites. The division is charged with the implementation and operation of data processing for the telemetered data from Goddard scientific satellites. It also constructs and plans advanced techniques for on-board data processing of the information gathered from the experiments."

Although born in Dover, New Hampshire, he considers New Bern, North Carolina, as his home, since he lived there most of his life. Mr. Habib earned his BSEE degree at Catholic University. He is a member of Sigma Xi and has a Third Degree in the Knights of Columbus. His hobbies are hi-fi and electronic design.

He and his wife, Mary Lou, have five children: David, 10; Judy, 8; Bonnie, 6; Lisa, 4; and Sharon, 1. They live at 7908 Lansdale Street, District Heights, Maryland.

Next issue: Daniel G. Mazur

New Computer System Now Being Installed in Apollo Network

A new computer system of vastly increased capabilities, designed expressly for the Apollo program, has arrived at Goddard from Univac Military Systems Division in St. Paul, Minnesota, and is being implemented into the Manned Space Flight Network, reports Dale W. Call, Head of the Manned Flight Engineering Branch.

The Apollo computing system, consisting of two Univac 642B Mod. computers and peripheral equipment, are identical in every respect with exception to the mission requirements which are assigned to them.

One computer system will be assigned the task of processing all telemetry data for display at the Flight Control Consoles to be presented on cathode ray tubes, transmission of data via high speed (2.4 kbs) data lines, and transmission of 60 wpm, 100 wpm teletype messages to the Mission Control Center in Houston, and other remote sites.

The second computer will be assigned the task of command data processing between the orbiting spacecraft and the Mission Control Center. The computer under program control will receive command information from the Mission Control Center via high speed data lines and store this data in memory until required for retransmission to the orbiting spacecraft at acquisition. This command can be changed manually by the Flight Controller located at the consoles, or can be changed in the computer by additional transmission of data from the Mission Control Center in Houston.

In addition to the functions previously described, each computer will have the capability of supporting the other by performing both tasks should a failure in either computer occur at any time during the mission.

Eventually a total of 39 computer systems will be installed throughout the Apollo network: Apollo ships; Carnarvon and Canberra, Australia; Bermuda; Guam; Guaymas, Mexico; Merritt Island, Florida; Ascension Island (in the Atlantic, off African coast); Kauai, Hawaii; Madrid, Spain; Goldstone, California; Corpus Christi, Texas; Antigua Island and Grand Bahama Island in British West Indies; and Grand Canary Island (off the African west coast). Manned Spacecraft Center, Houston, will also receive computer systems for simulation and checkout purposes.

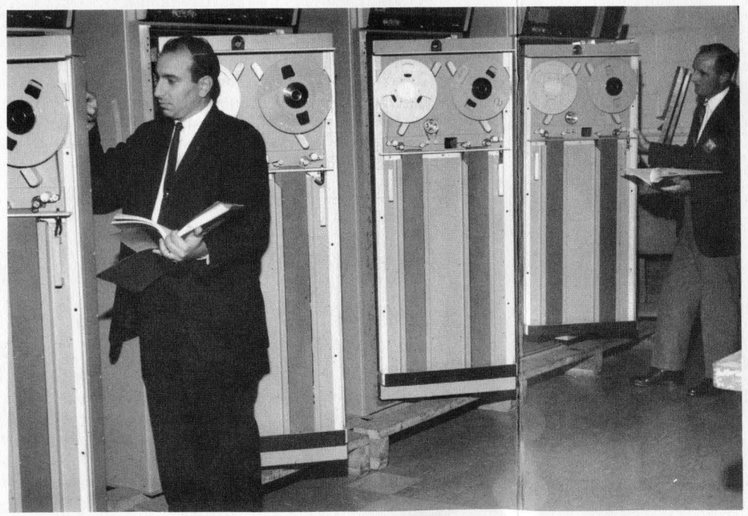
The peripheral devices within the system include:

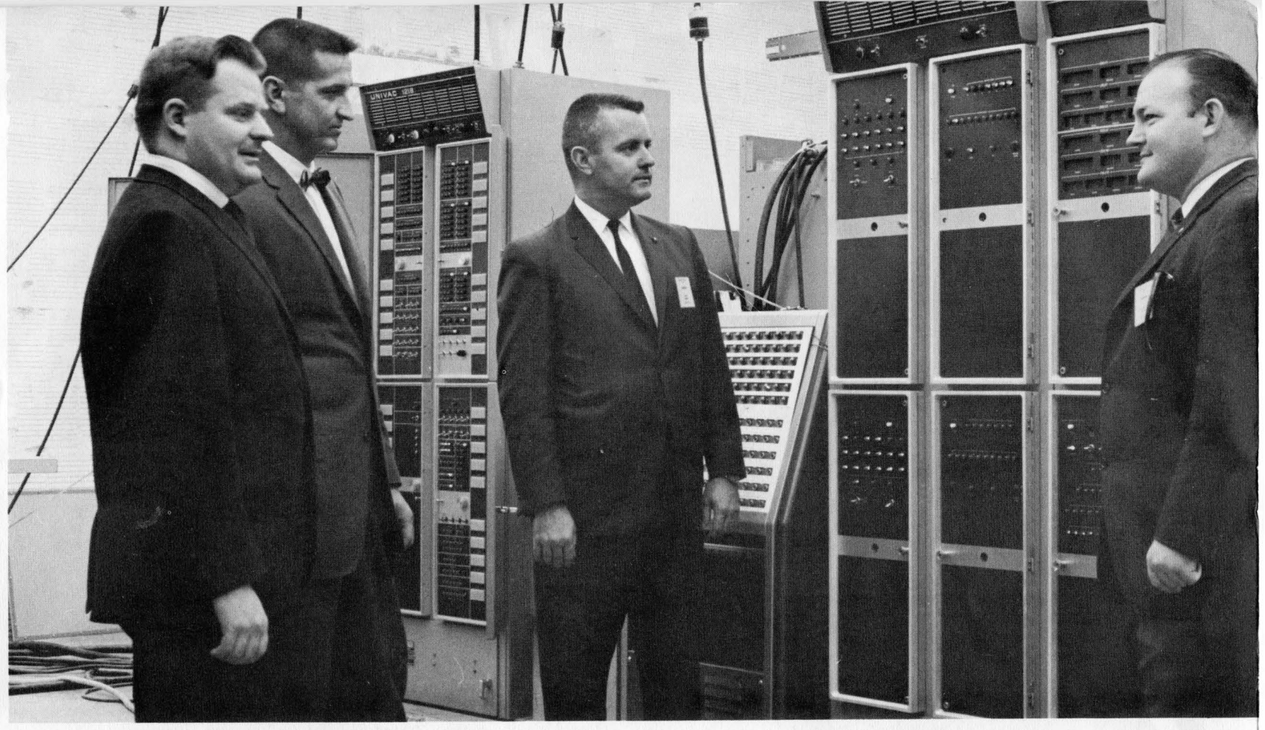
- **1540 Magnetic Tape Unit,** a storage device with a maximum writing and reading operation of 120 inches per second. Rewind operations can be 240 inches per second. Recording densities are 200, 556 or 800 frames per inch.
- **1232 Input/Output Console** communicates directly with the computer. It can read tape at 30 inches per second or 300 characters per second, and punch tape at 11 inches per second or 110 characters per second. The keyboard input/output capability is 10 characters per second, with 72 characters per line.
- **2010 Data Transmission Unit** provides the link between the remote site communication lines and the computer.
- **Model 1000 Interface System Adapter** provides the interface for the Greenwich Mean Time (GMT) input from the Unified S-Band System and the interface for the computer address matrix keyboards located on the operators consoles within the station.
- **1259 Teletype Adapter and Modified ASR–28 Set** provides for page print, reperforator and tape read capability. Teletypewriter adapter provides interface between the 1259 units and the computer.
- **Console/Computer Interface Adapter (CCIA)** provides the means of communication between seven flight control display consoles and both the telemetry and command computer.
- **High-Speed Buffer, Translator, and Printer** provides the interface between the high-speed printers and both telemetry and command computers.

DON MEGER and Ed Willis (foreground) inspect a chassis that has been removed from the 642B Modified Computer. In the background are Les Brunker, Program Manager, and Glen Johnson inspecting a partially removed chassis from the computer.

Computer System for Apollo

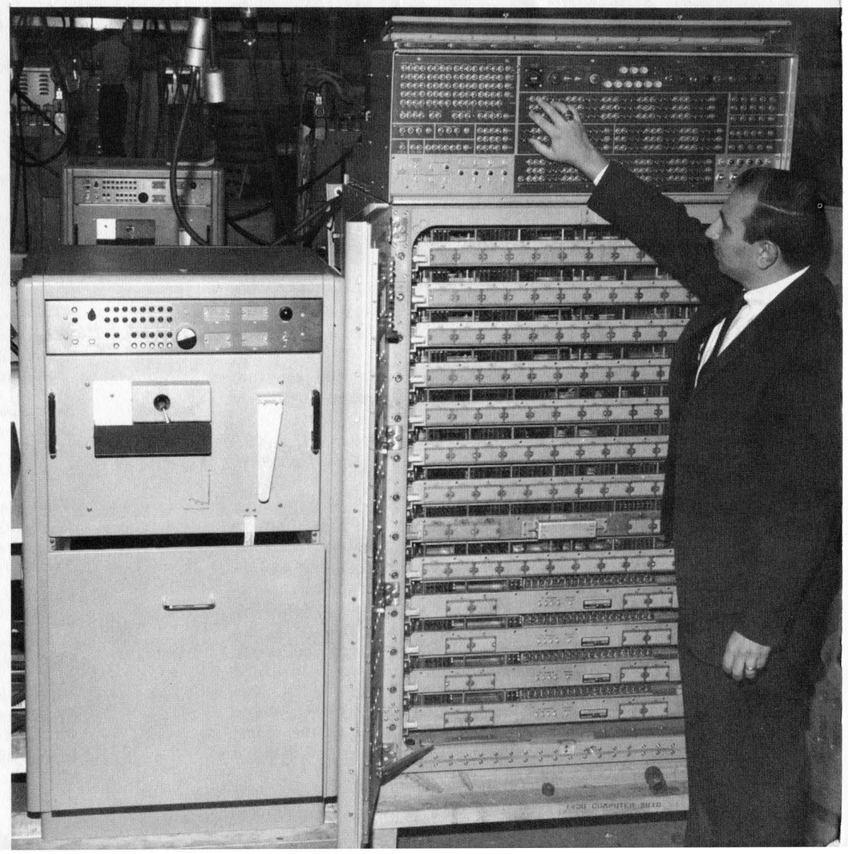
PHIL GATTO, Goddard Engineer, (left) and Ed Willis perform test on magnetic tape units.



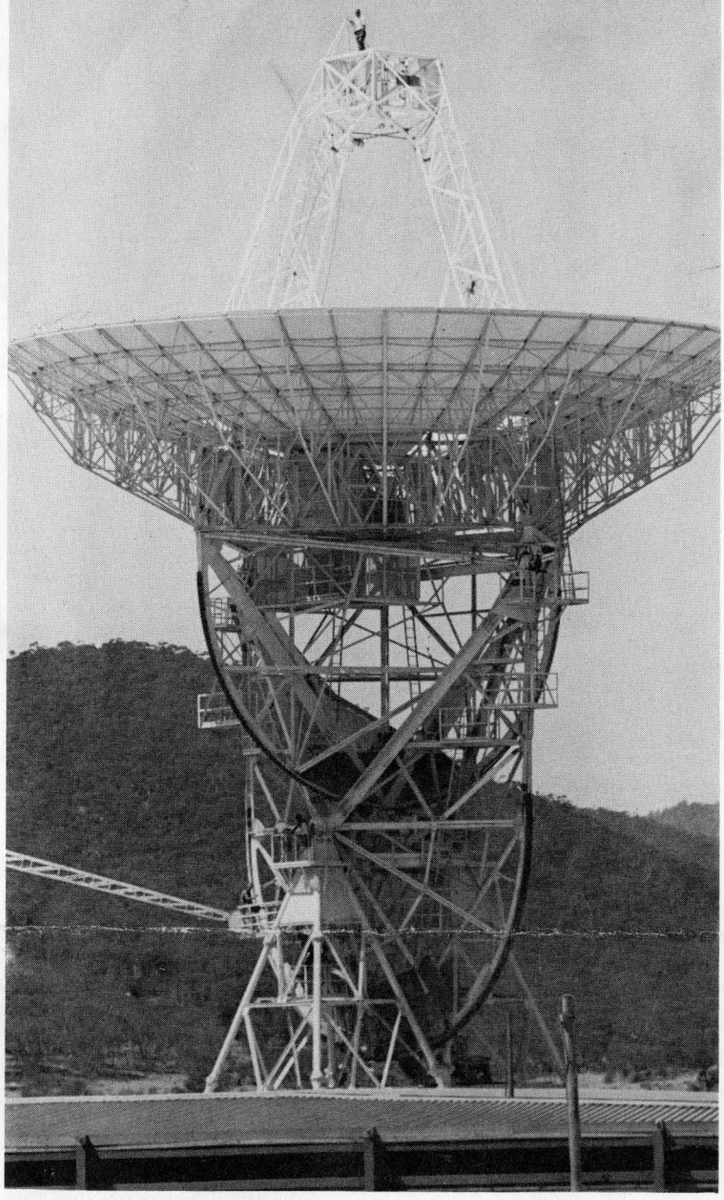


ROBERT MASSEY (left) points out features of the CC1A to Goddard engineers (from left) Charles Trevathan, Robert Owen, and Carl Roberts, Head of Manned Systems Engineering Section.

PHIL GATTO, Goddard engineer, checks out the 642B Modified Computer. Next to the computer is a 1232 Input/Output Console.



New STADAN Station . . .



New STADAN Station Near Canberra

A new STADAN station, with the most advanced equipment yet developed, has just become operational near Canberra, Australia, reports Harold L. Hoff, Chief of the Network Engineering and Operations Division.

The new DAF (Data Acquisition Facility) is a vital new link in STADAN (Satellite Tracking and Data Acquisition Network). The new station has been named "Orroral."

The station, which began data acquisition on October 4, is situated in the Orroral Valley, about thirty-five miles from Canberra, the capital city of Australia.

According to John C. Goff, the Goddard Project Manager, the new six-million-dollar facility will be equipped with four complete data acquisition systems which will permit the receiving of telemetry data from four spacecraft simultaneously. The station will also have three command systems for interrogating satellites.

The primary telemetry receiving link employs an eighty-five foot X-Y mounted parabolic antenna which was fabricated and erected by the Rohr Aircraft Company of Chula Vista, California. The control system and electronics equipment were provided and installed by the Collins Radio Company of Dallas, Texas. The antenna electronics system includes an automatic tracking system for following the orbiting spacecraft. Interrogation of the spacecraft is performed by a separate transmitting system using a small command antenna mounted on the rim of the main dish.

For spacecraft interrogation and telemetry reception on the VHF frequencies, two Satellite Tracking Antennas (SATAN) for command and two for receive are provided at the station. In addition to these three complete systems, a YAGI antenna array, capable only of telemetry reception, has been moved from the Woomera STADAN station to the Orroral site. Additional support equipment has been provided by Goddard and installed and checked out by Goddard and Australian technicians.

Equipped with the most modern instrumentation in the STADAN network, the station is semi-automated, thereby permitting rapid equipment set-up when converting from one satellite pass to another. A new type switching system, using master plug-in boards, provides for instantaneous change-over for the complete command and telemetry receiving functions. The system further provides for rapid switching of system components for ready replacement of equipment in event of difficulty, thereby eliminating the possible loss of valuable data.

The Orroral station comes under the direction of Goddard's Network Engineering and Operations Division. Details involving relationships with the Australian government are handled by the GSFC representative Christos L. Maskaleris, who is stationed in Adelaide. Among the Division personnel who participated in station check-out and calibration are Charles L. Padgett of the Network Engineering Branch, John P. Bellamey of the Integration & Maintenance Branch, Norbert Bender, Morton D. Frank, Eugene C. Humphrey, Paul F. McCaul, Michael L. Spafford, and Donald F. Tinari of the Control Equipment Branch. Antenna calibration was performed by William O. Macoughtry of the Operations Evaluation Branch of the Project Operations Support Division.

The Orroral DAF was constructed under the direction of the Australian government with Goddard funds. The station is fully manned by Australian personnel under the direction of Thomas Reid.

Command and telemetry operations formerly performed by the STADAN station at Woomera have been transferred to this Orroral station. Upon completion of additional facilities in mid-1966, the MINITRACK interferometry tracking system at Woomera also will be moved to the Canberra site.

Any shutdown of a permament site is bound to evoke nostalgic feelings from the personnel. Here is a poem from an anonymous writer at Woomera expressing his feelings in regard to the move:

The Last Post Pass Calibration

Silent, deserted, no longer alive,
With the bustle of former days:
Standing listless in the sun
The intruders have gone their ways.

Nearby, the stands for antennae rise
In testimony of the time,
When metal fingers probed the sky
At the satellites in their climb

Kangaroos gaze with soft brown eye
At the station that used to be,
And the salt lake stretches dazzling white
Like a shimmering timeless sea

Within the building silent stands
The equipment deadly mute:
Tape recorders spin no more,
The silence is acute

No more to hear the SCAMA call,
Nor the "birds" unearthly note,
"That's station 18, finished now"
You'll hear the knowing quote

But across the country to the east
There grows a like creation
Within it holds the traditions of
Old number eighteen station.

Dr. Goldstein Wins 2 Awards

Dr. Joseph I. Goldstein, Geochemistry Laboratory, won the Nininger Meteorite Award, 1964-1965, given annually to students or recent graduates presenting the best papers describing their original research on meteorites. The winning paper was entitled "The Growth of Widmanstatten Pattern in Metallic Meteorites" and included parts of the author's doctoral thesis in the metallurgy department of the Massachusetts Institute of Technology. Dr. Goldstein received his doctorate from MIT in 1964.

The award is given annually by Dr. and Mrs. H. H. Nininger for the purpose of stimulating interest in research in meteorites as an important phase of the current investigations in space exploration.

Dr. Goldstein also received honorable mention award in the color print classification of the 20th Metallographic Exhibit, sponsored by the American Society for Metals. The color photograph was taken with H. Yakowitz of the National Bureau of Standards. The entry was a photomicrograph of the Widmanstatten pattern in the Tazewell iron meteorite. It was taken in polarized light using a full wave plate between polarizer and analyzer.

Both of the above awards were received by Dr. Goldstein in the same week.

SATELLITE PHOTOS CHANGE ANTARCTICA MAPS

Mahomet couldn't move a hill but a weather satellite called Nimbus moved a mountain.

Nimbus didn't move Mount Siple in the literal sense, but photographs taken by the 830-pound satellite show that present relief maps are in error.

Mount Siple, a 10,000-foot-high Antarctica mountain used by pilots as a navigational aid, will be repositioned 45 miles further west on future relief maps.

This is just one of three major changes planned by the U. S. Geological Survey as a result of studying approximately 300 pictures taken over the Antarctica by the Nimbus weather observer.

Another significant change involves the Kohler Range area. Nimbus I pictures indicate that a mountain group thought to be in the Kohler range area doesn't really exist.

It seems that two different expeditions sighted the mountain group and positioned them in two different locations. Both groups now appear on present maps but will be changed on future maps to show only one mountain group.

The third change planned for future maps is the updating of ice front information in the Filshner Ice Shelf, Weddell Sea and Princess Martha Coast areas. Nimbus pictures provided topographic engineers with a much better definition of the ice shelf.

Goddard and industry engineers designed Nimbus as a platform to study the earth's weather behavior from space.

Although future Nimbus satellites will primarily study meteorological phenomena, it now appears that Nimbus pictures can be used for other sciences, according to geologist Dr. Paul Lowman.

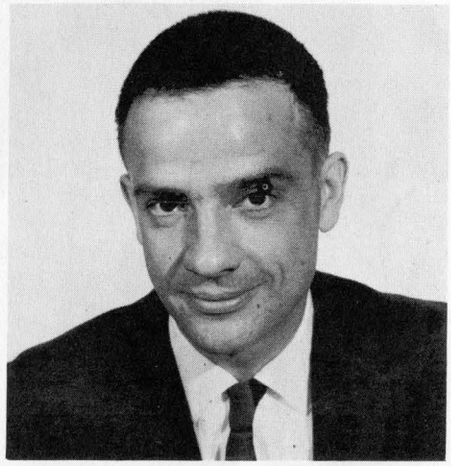
"Photos from a satellite like Nimbus," said Lowman, "can be used in geologic reconnaissance, topographic mapping, forestry, ice pack reconnaissance, hydrology and oceanography."

"Pictures of the earth from Nimbus are extremely useful to a geologist," added Lowman, "because they cover such a tremendous area. One Nimbus photo covers 1-million square miles. It would take teams of geologists years to cover that much territory. And Nimbus sees the entire 200-million square mile area of the earth every day," he said.

Nimbus I took some 27,000 day and night-time pictures before it stopped operating last September due to a power failure.

GODDARD SCIENTIFIC COLLOQUIUM

November 19, 1965
4:00 p.m. *
Auditorium, Building 3



Professor Paul J. Kellogg
School of Physics and Astronomy
University of Minnesota
Minneapolis

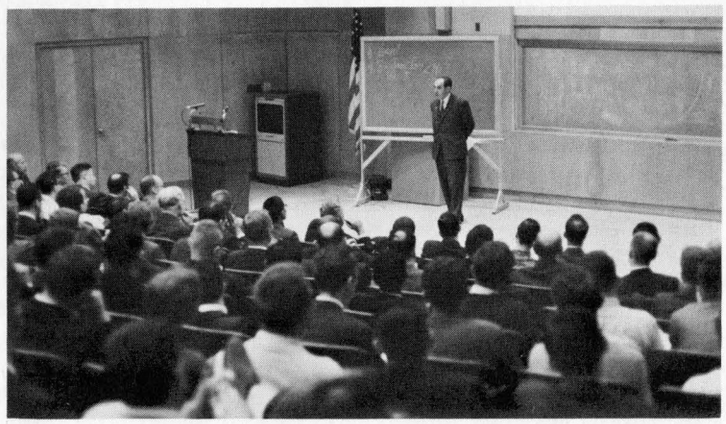
THE NATURE OF THE MAGNETOSPHERIC BOUNDARY AND SHOCK TRANSITION

The existence of a shock wave beyond the magnetospheric boundary is now well established. Its properties will be reviewed, and one possible mechanism for producing the shock wave and heating the electrons will be discussed.

NOTE: Professor Kellogg will also give a specialized SEMINAR on "The Structure of Collisionless Shocks" at 11:00 a.m., Friday, November 19, in room 103 of Building I.

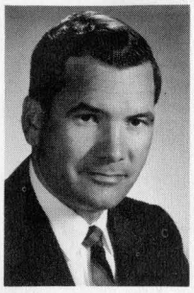
*** Coffee will be served from 3:30 p.m.**

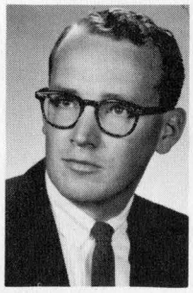
There will be no colloquium on Friday, November 26 (day after Thanksgiving).



PROFESSOR V. L. GINZBURG, from the P. N. Lebedev Institute of Physics in Moscow, spoke to several hundred Goddard scientists on the topic of* The Origin of Cosmic Rays. *Professor Ginzburg is co-author of the book having this same title, published in 1963 and translated in 1964. This Special Scientific Colloquium was held on Friday, October 22.

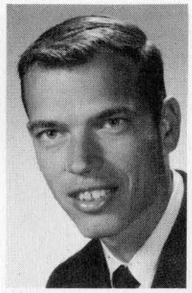
Goddard Men Present Papers at IEEE Symposium


Richard G. Holmes

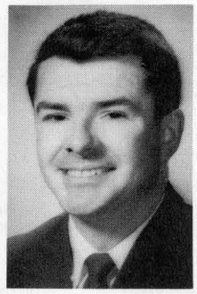

Howard R. Stagner


Cyrus J. Creveling


Louis J. Ippolito


James P. Strong


Thomas V. Saliga


Kenneth E. Peltzer

Papers were presented by seven Goddard men at the 1965 IEEE International Space Electronics Symposium, held at Miami Beach, Florida, November 2, 3 and 4.

Kenneth E. Peltzer, of the Manned Flight Support Office, addressed an audience of about 300 people on the "Apollo Unified S-Band System." *Cyrus J. Creveling* spoke on "Comparison of the Performance of PCM and PFM Telemetry Systems." *J. P. Strong* and *T. V. Saliga* gave a paper on "Comparison of Phase Coherent and Non-Phase Coherent Coded Communications." *Louis J. Ippolito* presented "System Requirements for Direct RF to RF Re-Entrant Traveling Wave, Tube Communications Satellite Transponder." The paper by *R. G. Holmes* and *H. R. Stagner* was titled: "An Automatic, On-Line Telemetry Processing System."

GODDARD WAS THE SCENE for the production of a one hour TV special for national release explaining the Center's role in space sciences and tracking. Spokesmen included Goddard's Dr. George Pieper, Robert Bourdeau, and Dr. Wilmont Hess. Youngsters were local school children serving as "actors" along with instructor Locke Stuart, ESPO.

Sounding Rocket Project Extended

Four sounding rocket payloads will be launched into the ionosphere under a cooperative Argentine/United States agreement, NASA announced.

The agreement extends a previous NASA/Argentine program and provides for the joint study of an ionospheric phenomenon known as "Sporadic E." The project will be conducted by the Argentine Comifilin Nacional de Investigaciones Expaciales (CNIE) and NASA.

Two daytime and two night-time launches of Nike Apache sounding rockets are planned from Chamical, Argentina, to measure electron densities, temperature, and ion densities.

CNIE will provide the personnel for payload. Fabrication at Goddard will procure the rockets and operate the range at Chamical. NASA will provide the equipment and facilities for construction of the payloads, and Nike Apache launcher on loan. CNIE will be responsible for the reduction and analysis of the data obtained.

No exchange of funds between CNIE and NASA is contemplated and the results of the experiments will be made available to the world scientific community.

SR SCOREBOARD

All Goddard-Managed —

EIGHT SOUNDING ROCKETS LAUNCHED IN TWO WEEKS

Rocket Type	Experiment	Proj. Scientist	Site	No. Launched
Nike Cajun	Grenade	Wendell Smith	Wallops Island	2
Nike Cajun	Grenade	Wendell Smith	Ft. Churchill	2
Nike Cajun	Grenade	Wendell Smith	Pt. Barrow	2
Nike Apache	Atmospheric Structure	J. J. Horvath	Ft. Churchill	1
Nike Tomahawk	Thermosphere Probe	Larry Brace	Ft. Churchill	1

Goddard launchings this year. (Jan.1-Nov.9): 178; Launched Oct.27-Nov. 9; total 8.