January 13, 1969 Vol. 16, No. 10

GODDARD NEWS

THE EARTH and Moon as seen by Apollo 8 from lunar orbit.

See caption at the top of Page 2.

PAGE 1 CAPTION

APOLLO 8 EARTH VIEW. This view of the rising earth greeted the Apollo 8 astronauts as they came from behind the moon after the lunar orbit insertion burn. Earth is about five degrees above the horizon in this photograph. The unnamed surface features in the foreground are near the eastern limb of the moon as viewed from earth. The lunar horizon is approximately 780 kilometers from the spacecraft. On the earth 240,000 statute miles away the sunset terminator bisects Africa.

Detailed Portrait of the Stars Coming from Goddard's OAO

Goddard's OAO Project Office and the OAO Control Center in Building 14 are slowly getting back to normal following the record-breaking launch of the second Orbiting Astronomical Observatory on December 7, 1968. Project Manager Joseph Purcell says, "During its first month of operation, all systems aboard the spacecraft have been operating smoothly. The two OAO experiments are giving us our first detailed glimpse of the stars in the ultraviolet region of the spectrum."

OAO was officially declared a success by NASA after its first 30 days of operation and the collection of 65 hours of scientific information. During this 30 days, the spacecraft collected more ultraviolet information from stars than 15 years of sounding rocket launchings.

OAO II, NASA's heaviest (4,400 pounds) and most complex scientific spacecraft, was launched from Cape Kennedy. A two-stage Atlas Centuar rocket placed the observatory into a 485 by 478 statute mile orbit.

Carrying 11 telescopes, OAO's primary mission is to investigate young hot stars in the ultraviolet-blue region of the spectrum not visible to the human eye. Of the two experiments on board, the celescope or celestial telescope provided by the Smithsonian Astrophysical Observatory (SAO) is designed to survey seven hundred stars daily in four spectral bands between 1,000 and 3,000 angstroms. The second experiment, the Wisconsin Experiment Package (WEP) provided by the University of Wisconsin, is designed to study individual stars and nebulae in the 1,000 to 3,300 angstrom region of the spectrum. In addition, WEP may be used to gather ultraviolet information on intersteller gas or dust.

Dr. James Kupperian, OAO Project Scientist, reports that, "OAO operates around-the-clock. It is not hampered by clouds or bad weather like earth-based observatories."

A complex attitude control system containing six startrackers is keeping the experiments pointed to within one minute of arc. OAO's computer system can store 256 commands, a record for an unmanned spacecraft.

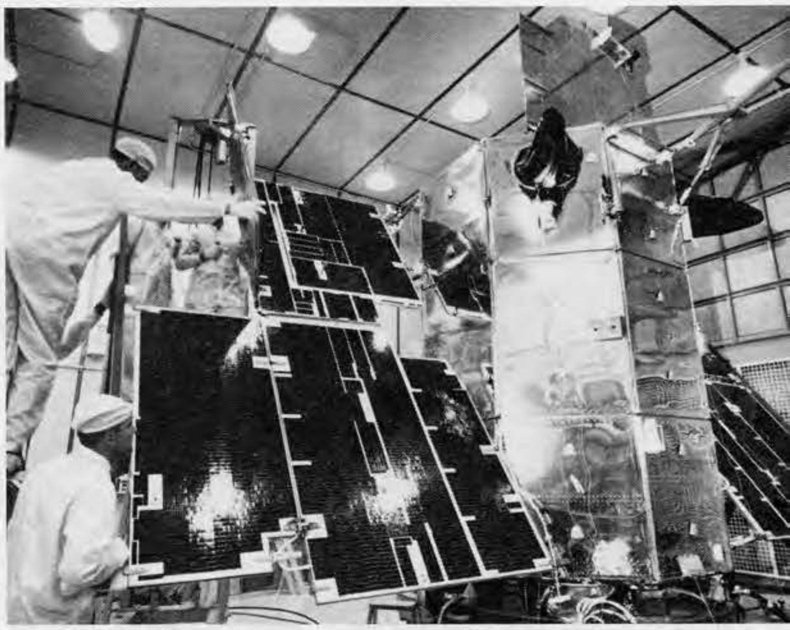
OAO II is the second in a series of four observatories planned by NASA. OAO I was launched into an almost perfect orbit April 8, 1966, but failed due to a malfunction in the power supply system and probable high voltage arcing in the star tracker.

OAO-B and C, scheduled for flights in late 1969 and late 1970, will carry new experiments and, because of the experiment requirements, will have pointing systems accurate to within 0.1 arc second. OAO-B will carry the Goddard 38-inch aperture telescope. OAO-C will have the Princeton University 32-inch aperture reflecting telescope.

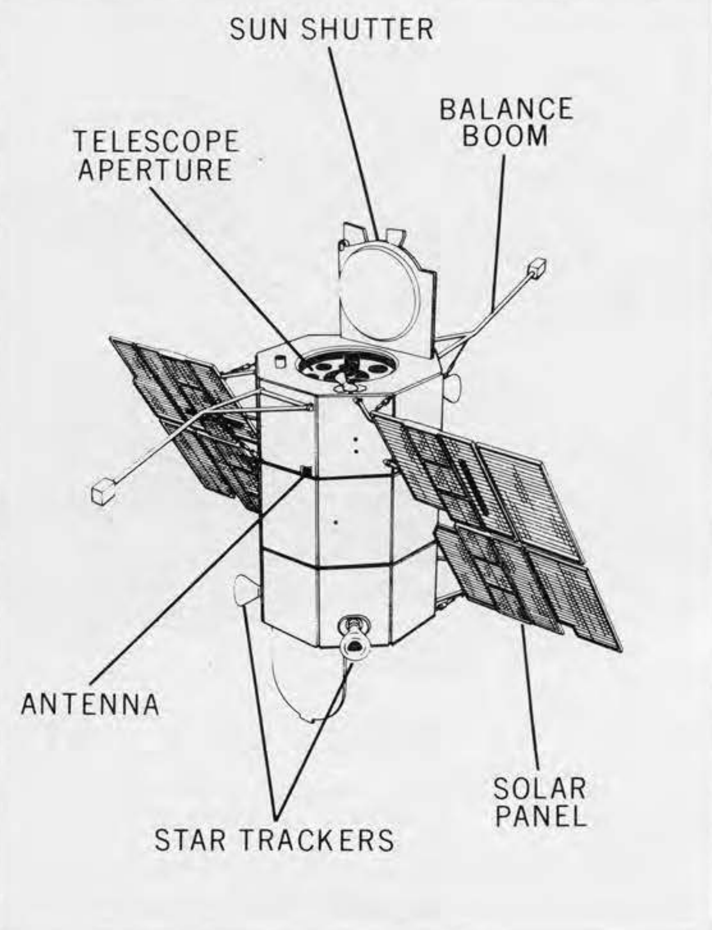
Goddard's OAO A-2 project team includes Mr. Purcell, Dr. Kupperian, Robert W. Stroup, Assistant Project Manager; Norman L. Martin, Project Coordinator; Jack Sargent, Observatory Systems Manager; Donald A. Krueger, Deputy Test and Integration Manager; H. Robert Lynn, Mission Operations Manager; and W. A. White, Experiment Manager.

Joseph Purcell
OAO Project Manager

Dr. James Kupperian
OAO Project Scientist



ENGINEERS at Goddard conduct final tests on OAO II shortly before it was shipped to Cape Kennedy.



Major NASA Launches in 1968*

Jan. 7 — SURVEYOR VII. Lunar photography and surface analysis of the moon. Success.
Jan. 11 — EXPLORER XXXVI. Geodetic Earth Orbiting Satellite. Success.
Jan. 22 — **APOLLO 5.** Lunar Module test. Success.
March 4 — **OGO-V.** Orbiting Solar Observatory. Success.
March 5 — EXPLORER XXXVII. Solar radiation studies. Success.
April 4 — **APOLLO 6.** Launch vehicle test. Unrated.
May 16 — **ESRO II-B.** Radiation Investigation satellite for the European Space Research Organization. Success.
May 18 — **NIMBUS B.** Meteorology satellite. Launch vehicle failure.
July 4 — **EXPLORER XXXVIII.** Radio Astronomy Explorer. Success.
July 8 — EXPLORER XXXIX. Atmospheric Density studies. Success.
EXPLORER XL. Charged particle studies. Success.
Aug. 10 — **ATS IV.** Applications Technology Satellite. Launch vehicle failure.
Aug. 16 — **ESSA 7.** Operational weather satellite for the Environmental Science Services Administration. Success.
Sept. 18 — **INTELSAT III.** Communications satellite for the COMSAT Corp. Launch vehicle failure.
Oct. 3 — **ESRO I.** Aurora studying satellite for the European Space Research Organization. Success.
Oct. 11 — **APOLLO 7.** First manned Apollo mission. Success.
Nov. 8 — **PIONEER IX.** Solar radiation studies. Success
TETR 2. Test and Training Satellite. Success.
Dec. 5 — **HEOS I.** Highly Eccentric Orbit Satellite launched for the European Space Research Organization. Success.
Dec. 7 — **OAO II.** Orbiting Astronomical Observatory. Success.
Dec. 15 — **ESSA 8.** Operational weather satellite for the Environmental Science Services Administration. Success.
Dec. 18 — **INTELSAT III.** Communications satellite for the COMSAT Corp. Successful launch, mission unrated.
Dec. 21 — **APOLLO 8.** First manned spacecraft to orbit the moon. Success.

*Boldface indicates major Goddard involvement.

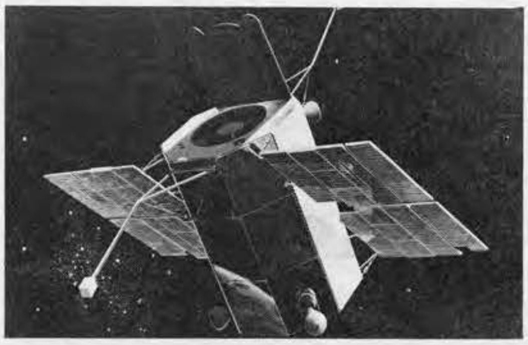
NASA Major Launch Record

October 1959 – December 1968

Year	No. Launches	Vehicle Results		Mission Results	
		Success	Failure	Success	Failure
1958	4	0	4	0	4
1959	14	8	6	8	6
1960	17	10	7	9	8
1961	23	16	7	15	8
1962	27	23	4	20	7
1963	13	12	1	11	2
1964	30	26	4	25	5
1965	31	27	4	26	5
1966	36	33	3	26	10
1967	27	25	2	25	2
1968	21	16**	3**	**17*	3**
10-Year Totals	243	196	45	182	60

*Includes two satellites launched on one vehicle
**Figures do not include "unrated" items.

LAUNCH VEHICLES. The launch of the HEOS I spacecraft aboard Delta 61 on December 5, 1968 touched off a busy month for Goddard's Delta Project Office. In December alone, Goddard's workhorse Delta launched three satellites, bringing its launch record up to 59 successes out of 63 launch attempts. The year 1968 was also a busy one for Goddard's Sounding Rocket Branch. Karl Medrow's team launched some 174 rockets.



SCIENTIFIC SATELLITES. The success of the Orbiting Astronomical Observatory (OAO II), launched December 7, 1968, won Goddard the distinction of managing NASA's largest, smallest and longest unmanned spacecraft. The largest is OAO weighing in at 4,400 pounds. The smallest is the 40-pound Test and Training Satellite (TETR 2). The longest is the Radio Astronomy Explorer (Explorer XXXVIII) that reached a length of 1500 feet with its booms fully extended. To keep tabs on the years satellite activity, Goddard's STADAN network supported some 99,645 telemetry passes in 1968 and recorded 4,407,155 minutes of data.

MANNED FLIGHT. This TV picture of astronaut William Anders taken aboard Apollo 8 at 120,653 nautical miles from earth was one of many received by three key MSFN stations (See Page 6) during the historic lunar voyage. The year 1968 saw Goddard and the world-wide network giving around-the-clock tracking, communications and data processing coverage for four Apollo missions.

RANDY BARTH, of the System Programming Section (CD), is a Co-operative Education Student from the University of South Florida who is majoring in mathematics and computer science. He has worked four training periods at Goddard beginning in the fall of 1966.

TADPOLE Catches FORTRAN Bugs

By C. W. "Randy" Barth

The shortest distance between two points is still a straight line. The programmer of a few years back who needed to debug his second-generation program usually found this "straight line" to be sitting down at his computer's console and working out his problems on-line. Faster machines and higher costs, however ultimately made this unfeasible. Until recently, the programmer was forced to debug off-line, requiring him either to learn the language of storage dumps or to pepper his program with statements to print out partial results.

Two additions to large-scale systems have brought about the return of on-line debugging: the two-way conversational unit (such as the typewriter terminal or the graphic display unit) which made it possible, and multiprogramming, which made it feasible. FORTRAN programmers at Goddard now have the capability for on-line debugging through a new system which I have recently added to Operating System/360.

The Test and Debug Procedure for On-Line Execution (TADPOLE) is an extention of the FORTRAN Debugging Facility. It allows the FORTRAN programmer to debug his program on-line via the IBM 2250 Display Unit. Information about the progress of the problem program is displayed on the tube as events occur. As variables are assigned new values, they are displayed on the screen. Subroutine entry and exit are shown. Any attempt to reference an array with a subscript outside its DIMENSIONed bounds is flagged. All of these functions which are performed by the conventional FORTRAN Debugging Facility are now displayed as they occur on the 2250 via TADPOLE.

In addition, many new facilities have been added which are unique to TADPOLE. The programmer can control the speed at which his program progresses. He may, for example, run it at a pace slow enough that each line may be read as it is added to the screen. He may allow the program to run at its normal rate and cause TADPOLE to automatically hold when the screen becomes full of debugging information. Various "traps" may be set which will suspend processing when certain criteria are met (such as when a particular variable exceeds a given value; or when a particular statement number is reached). At any time the programmer can look at the current value of any of the variables that have appeared on the screen and alter them if he so desires. Hardcopy of the debugging session can be requested.

The programmer can exit from TADPOLE at any time and may cause his program to end either normally or abnormally (giving an ABEND dump). In addition, he may restart his "GO" step which will start his program executing again from the beginning. This is particularly useful if it is discovered that earlier debug information whose importance was discounted is the key to the problem.

TADPOLE provides a simple but quite flexible means to debug a FORTRAN program on-line. It is already available on the 360/75 in Building 21. It is hoped that it will soon be available on all of the major 360's at Goddard. A manual completely describing TADPOLE, the "TADPOLE User's Guide," is available from Pat Barnes, Code 543, Building 3, Extension 6796.

DATA TOPICS

JOHN C. RODGERS, Head of the Analysis and Computer Techniques Section of the Space Data Control Branch (ADD), came to Goddard in 1964 and is responsible for the development of automated ground station computer hardware and software. He received his BEE degree from Georgia Tech and his MSEE from the Drexel Institute of Technology, and currently is working on his MS in engineering management.

By John C. Rodgers

Generating an Operating System for the Automated Ground Station

An operating system contains a monitor and a number of processing programs. The monitor's function is to govern the order in which the programs are executed and provide time shared service to all of them. The number, types and versions of processing programs in an operating system vary, depending upon the exact requirements of the particular installation. Each operating system then consists of a selection of monitor routines and processing programs that are closely integrated for a particular application. Therefore, new operating systems must be generated whenever new equipments and real time software packages are integrated into the Automated Ground Station (AGS). As an example, programs to control the forty-foot antenna are being developed on the computer in the background mode. Once these are developed, a systems realignment called SYS GEN (System Generation) will be performed to connect the necessary interrupts and to include the antenna handler and foreground programs in the operating system. These SYS GENS will be performed periodically throughout the development of the AGS to enable the multiprocessing computer system to evolve to meet system requirements.

A SYS GEN to develop a software operating system adapted to the existing AGS configuration at NTTF has been performed. The SYS GEN comprises two computer operations each of which is run on the computer like any other program with data inputs and resulting in data output. For SYS GEN the desired output is an operating system on magnetic tape which can later be loaded partially into core and partially on the disc to become the executive routine which controls the operation of the computer system.

The first SYS GEN pass utilizing programmer written control command cards takes the old master tape and update programs via the card reader and generates either a new master tape or, as was used at NTTF, a new master file on the disc. This new master file contains all of the program pieces needed for the new operating system. Pass 2, utilizing control command cards, creates files of installation dependent information such as core size, physical device assignments, device handler requirements and adds them to the files created in pass 1. Also as part of pass 2, the files now on the disc are loaded, some unsegmented and some in an overlay or tree form as dictated by overlay command cards. After the specific operating system is so defined in pass 2, a program named the DEF processor is called and is responsible for generating a tape containing the new operating system.

In terms of magnitude, for the latest SYS GEN performed at NTTF, approximately 150 program segments were placed in the master file during pass 1. As a result of pass 2 where the monitor

(See Page 5)

DATA TOPICS from Page 4

overlay structure was defined, the monitor root, i.e. the portion which is always resident in core, now occupies the first 8470 core locations and the monitor overlay area utilizes the next 2282 core locations. In addition, 19,732 core locations were reserved for background programs and 2,284 locations for resident foreground programs. Because of the amount of internal table formation, interpretation and other reordering processes, a SYS GEN requires approximately two hours of computer running time on this particular Sigma 5 system.

As more real time programs are integrated into the system, requiring new SYS GEN's, the core area reserved for background will decrease and the resident foreground area will increase. In addition the root will become larger because of the inclusion of additional equipment handlers. It should be recognized that a system cannot operate without an operating system created by SYS GEN. The day has past when a computer is programmed. It is now necessary to program a combination of the computer hardware and the operating system.

Fabrication Teamwork Pays Off

Teamwork has been the key to the method the Experimental Fabrication and Engineering Division uses to get a job done effectively, quickly, and economically while still meeting the exacting requirements of the Center's experimenters.

The Division's Prototype Development-Value Analysis Teams draw on the skills and abilities of people throughout the Division, from other areas at Goddard, and from other government or industrial research centers. A team may include engineers, technician-artisans, and design personnel—each team is organized to fit the requirements of the project.

Division Chief, Maurice Levinsohn says, "The design, manufacturing, and assembly problems of space flight experiments and components can effectively be solved by a team approach. Our Division is fortunate in having a group of specialists with a wide range of capabilities, who not only have available excellent facilities, but more important have access to the latest technical knowledge bearing on the subject.

"Our approach is: become involved with the problem, analyze it from a variety of backgrounds, and apply the team's creativity at an early stage. Team morale is high because each member is personally concerned and has the opportunity to work with experimenters on worthwhile projects, some of which will inevitably become historical land marks. Each member of the team has an understanding of the overall problem; he is afforded a chance at original thinking on problems of design and fabrication technology. The Division achieves total cooperation among the individual team members because everyone is afforded the opportunity to think and to do. This service is available to experimenters for their in-house developmental projects."

ANALYSIS Team discusses refurbishment of OAO Inertia Model. From left are Elmer Mountain, EF&ED; John Cepollina, OAO; R. Cheshire, OAO; H. E. Ernst and Charles Bayle, EF&ED.

IMP TEAM. Members discuss their spacecraft's Apollo 8 support. From left are (standing) Stephen J. Paddack, Assistant Project Manager; Dr. Donald Williams, Experimenter; Charles F. Fuechsel, Ground Systems Equipment Engineer; (seated) Paul Butler, Project Manager; and William Limberis, Assistant Project Manager. Not shown is experimenter Dr. Carl Bostrom.

IMP Project Supports Apollo 8 in Real-Time

During the flight of Apollo 8, data from radiation detectors on IMP-4 (Explorer 34) were relayed to the Manned Spacecraft Center (MSC) on a real-time basis from the Goddard Space Flight Center to help to monitor the solar radiation to which the Apollo 8 spacecraft was subjected. This support began during the final stages of the countdown of the Apollo 8 mission and continued through splashdown.

Dr. Carl Bostrom of the John Hopkins University Applied Physics Laboratory and Dr. Donald Williams from Goddard have an experiment package on IMP-4 with three solar proton detectors. These highly reliable devices constantly monitor the proton flux in cislunar space. The IMP-4 has an apogee distance of about half of the distance to the moon. The result is that IMP-4 spends most of its time at an altitude where it can sense solar radiation without interference from the Van Allen radiation belts.

In the event of a solar flare the detectors would have sensed the increase in radiation. During Apollo 8, however, there were no significant flares and solar radiation was relayed to MSC on a 24 hour schedule. Had there been any flare activity, the solar flare monitoring rate would have increased in order to keep MSC and the astronauts abreast of the situation.

Also on watch during Apollo 8 were NASA's Pioneers 7 and 8, and the Air Force's VELA satellite. However, IMP 4 was in the best position to gather data. The IMP Project will gather solar radiation data during future manned Apollo missions.

IMP-4 was launched from the Western Test Range on May 24, 1967 into a highly eccentric orbit with an orbital period of about 4-1/3 days. Initially IMP-4 was intended to have a one year useful life but this time has been about doubled due to the stability of the orbit and the excellent performance of the experiments. The IMP Project is managed by Paul Butler. Project personnel involved in this support: Assistant Managers, William Limberis and Stephen Paddack. Robert Martin and Charles Fuechsel from the Electronic Systems Branch provided software modifications. Thomas Moore, the Tracking and Data Systems Manager was coordinating the effort in T&DS along with Richard Schumacher, the Control Center Operations Manager.

SPOCC. Tracking personnel in the Space Physics Operation Control Center (SPOCC) in Building 14 monitor data from the IMP 4 spacecraft. From left are Richard Schumacher, Control Center Operation Manager; Thomas Moore, Tracking and Data Systems Manager; and Soloman Levine, Tracking and Telemetry Engineer.

The Pictures Seen Around the World

Three Goddard-managed manned space flight tracking stations brought back to earth first man-held camera views of the moon. During Apollo 8, the astronauts' first views of the lunar surface were received on earth by the 85-foot tracking dishes at Goldstone, California; the prime site at Fresnedillas and the JPL "wing" site at Robledo, near Madrid, Spain; and Honeysuckle Creek, supported by JPL's Deep Space Network Station at Tidbinbilla both near Canberra, Australia. The six TV passes received at these tracking stations gave earthlings an immediate look at one of history's most dramatic explorations.

Goldstone, California

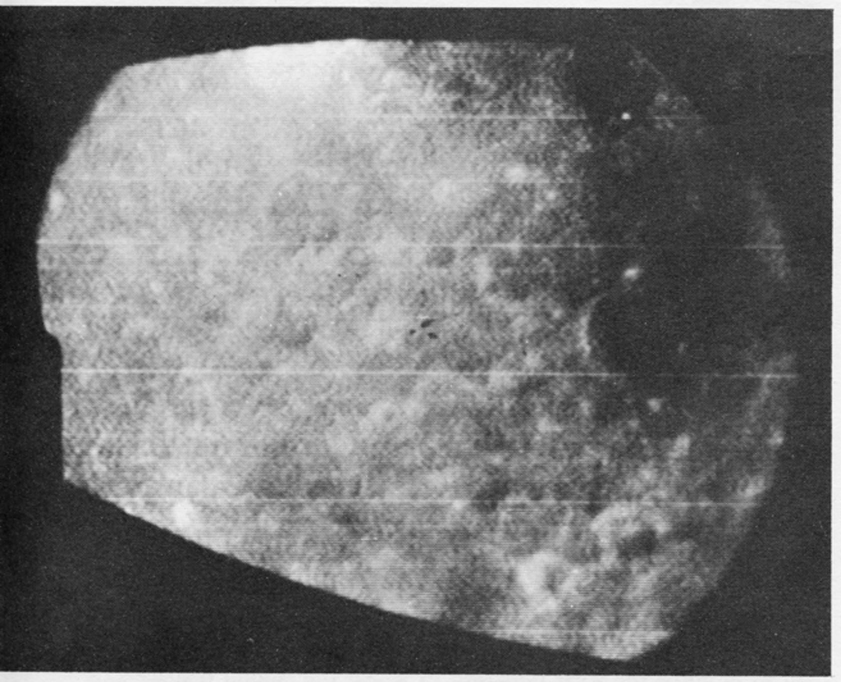
As the world waited for the first photographs ever taken by man of the lunar surface, a group of men stationed at the Goldstone MSFN station in the Mojave Desert went about the business of providing a vital link between the Apollo Spacecraft and Earth. The team, under the direction of George Fariss, were faced with the task of obtaining the first live television signals from a manned spacecraft whose destination was the Moon.

A complex system of micro-wave relays, land line circuits and tracking antennas was in readiness to flash live television to the world. As the time grew near for the first transmission reception the entire system underwent another of countless checks and rechecks to insure that all was in readiness for the history-making occasion. And when the first pictures were received, reactions from the networks and nation were summed up in one word, "magnificent."

After the first flush of success, the station personnel settled down to the business of checking out the equipment and preparing to execute the next step in the long list of mission requirements for the "prime" site. Ahead was the second "mid-course" correction burn and television transmission, lunar orbit, transearth burn and injection, and transearth flight. Every schedule was met on target and the American people were provided man's first look at the lunar surface, Earth as seen from outer space and the spacecraft interior and daily routine of the lunar voyagers.

Another major effort taking place at this remote location was that of obtaining still photograph records of the historic flight. This was accomplished simultaneously with the television signal transmission. The photographs were obtained using a special 70mm camera mounted to the slow-scan television monitor at the site. The unprocessed film was then flown to Los Angeles where the NASA Still Photo Pool developed and printed them. Selected photographs were then released to the national wire services, and a variety of magazines.

Some of the key personnel at the Goldstone MSFN Tracking Station are George Fariss, Station Director, Dick Kephart, Assistant Station Director, Tom Turnbull, M&O Supervisor and Howard Matheson, Administrative Officer.



ASTRONAUTS first view of the Moon as received by the MSFN tracking station at Madrid, Spain on Christmas Eve 1968.

Madrid, Spain

Some 40 miles outside of Madrid, Spain, on December 24, Christmas Eve, at 1:26 PM local time, the first pictures of the moon ever taken by man from an orbiting spacecraft were received and released to the world. From the barren hills of Spain to downtown Madrid, the television signals were relayed by a microwave circuit. From Madrid, the pictures went by coax cable to London where BBC, representing Eurovision and Mundovision, distributed the dramatic and high quality views of the lunar surface, in realtime. A multitude of tongues translated the commentary accompanying the 15-minute transmission. On commercial television there was flashed the dramatic title, "Live from Apollo 8 – Madrid Tracking Station."

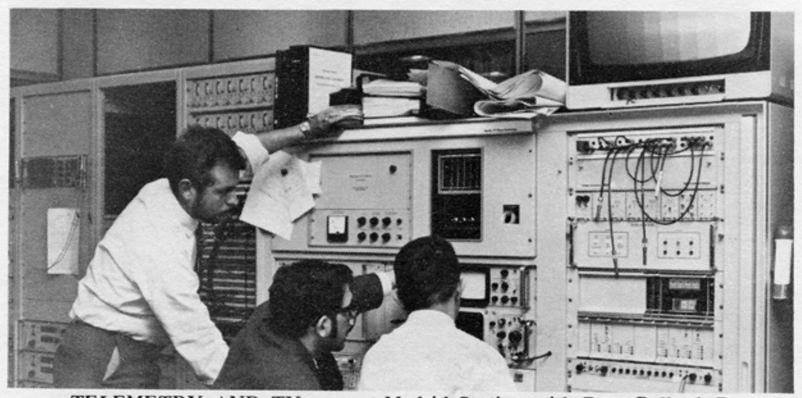
The Madrid operations were directed by station director Dan Hunter, and his assistant Steve Stompf. Dr. Manuel Bautiste and Luis Ruiz de Gopegui represented the Instituto Nacional de Tecnica Aerospacial (INTA), NASA's Spanish counterpart and coworkers. Vic Figeroa who heads the Madrid NASCOM operation and provided the delicate communication links to the world. The Bendix team was headed by M&O George Burawa.

Still photos of the TV transmission were released to a world-wide wire photo pool headed by the Associated Press and United Press International shortly after the telecast was concluded. A wire photo scanner at the tracking station, connected by four thin telephone lines, transmitted the dramatic pictures of lunar craters and moonscape to every news service and daily newspaper in the world, at once! The entire global wire photo net "was up" for the historic transmission. Some 35 minutes later, a "battle-seasoned" newspaper man in London reported, "Excellent transmission – a jolly good show."

The telephone switchboard of BBC London was flooded with calls and at downtown Madrid, a post office-sponsored telephone answering service provided a continuing commentary on the progress of the Apollo 8 mission.

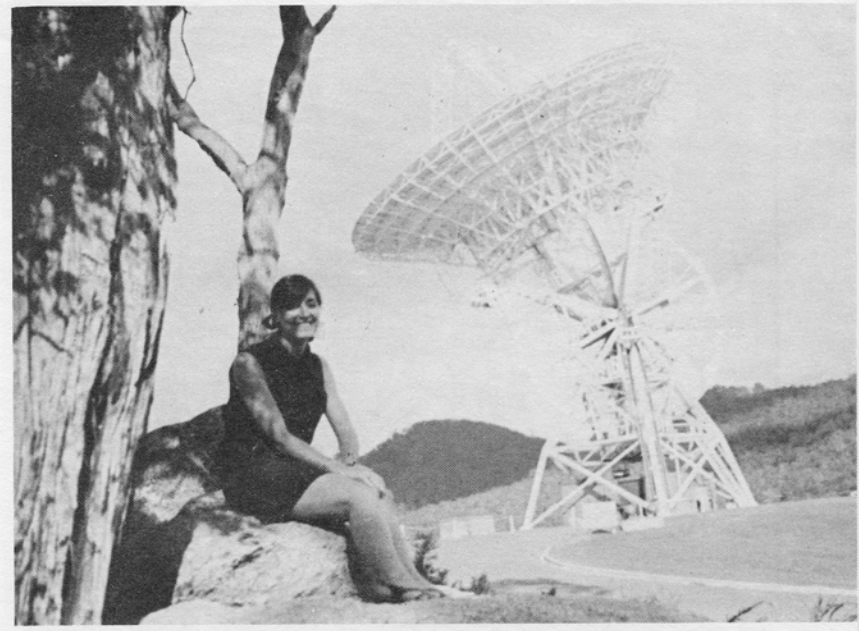
With every TV pass, this story was repeated and the drama heightened until splashdown December 27. And when it was all over, a handful of tired, but happy NASA representatives having a late dinner in a Madrid restaurant found themselves being toasted by their Spanish hosts. Somehow the world was aware of the drama of the moment.

DAN HUNTER, MSFN Tracking Station Director and Dr. Michael J. Vaccaro, Goddard Assistant Director for Administration and Management, discuss Apollo 8 mission. Al Rosenthal, Goddard PAO, who handled all press activities at Madrid in connection with this history making-flight looks on.



TELEMETRY AND TV area at Madrid Station with Dave Pollard, Dan Hock and Ted Altman at the controls. TV monitor shows test pattern shortly before receipt of first lunar pictures on Christmas eve.

GOLDSTONE, CALIFORNIA MSFN station sent this christmas message. The station was the prime site for Apollo 8 television reception.



JENNY HAME, a documentation clerk at the Honeysuckle Creek tracking station poses in front of the station's 85 foot antenna. This antenna and identical ones at Goldstone and Madrid were used to maintain contact with Apollo 8 to lunar distances and back.

Honeysuckle Creek, Australia

The quiet and proper look of the main floor of the majestic Parliament House in the Australian capital city of Canberra literally belied the buzzing informality of the second floor press room on Christmas Day, 1968. For representatives of the Australian press—wire services, newspapers, television and radio alike—were there waiting for the first manmade photos of the Moon to be received in Australia.

As the reporters were handed the photographs, they asked their final questions of Wilson Hunter, NASA's Senior Scientific Representative in Australia and broke for the door in a run. Within the hour, the photos began appearing on Australian television. By the next day, they had found their way into every newspaper across the continent.

Australia shared in the reception of these historic photos because it hosts one of the three prime tracking stations designed to support the Apollo mission.

Working around the clock, the Manned Space Flight Network Station at Honeysuckle Creek and its wing unit, the Deep Space Network station at nearby Tidbinbilla, tracked the Apollo-8 for about one-third of its flight. Honeysuckle Creek station Director is Tom Reid and Don Gray is director of the unit at Tidbinbilla.

Responsibility for the operation of these two stations, both of which are located about an hour's drive from Canberra, is vested in the Australian Department of Supply on behalf of NASA. M. Ian Homewood, Assistant Secretary (Projects) for the DOS manages this joint effort on behalf of Australia.

As the TV signals from the Apollo-8 were received by the two Australian stations, a picture was displayed on a slow-scan television monitor in Tom Reid's office. Still photos were recorded from the screen with a special 70 mm camera unit, attached to the monitor.

From the Honeysuckle Creek station, the exposed negatives were sped by car to the Australian News and Information Bureau for processing and ultimate delivery along with on-the-spot captions to the Parliament press room and the waiting reporters.

Some of the key people at the Honeysuckle Station assisting Tom Reid were Mike Dinn, deputy station director and operation assistants John Saxson and Ken Lee. Ian Grant, a new deputy station director there, was observing this mission. Bernard Scrivener, also new at the Honeysuckle station as an administrative officer, assisted Reid and acted as spokesman for the station.

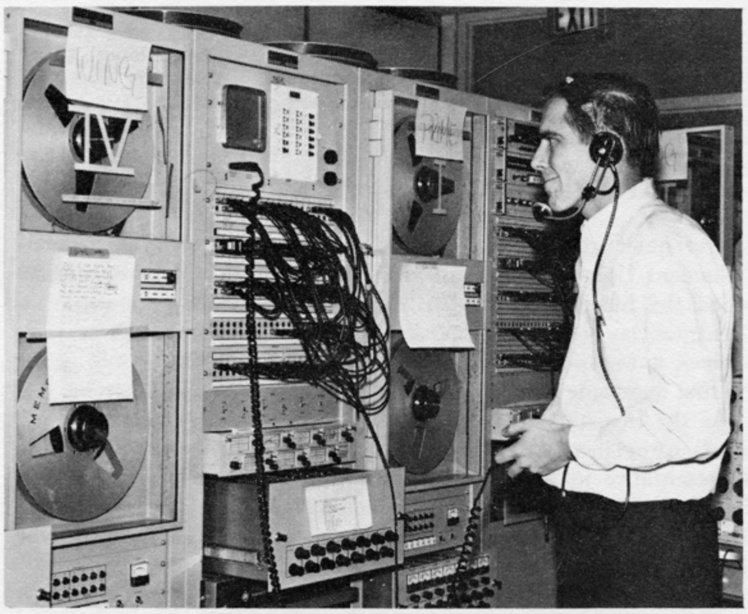
(See Page 8)

PICTURES from Page 7.

A B C. SABADO 28 DE DICIEMBRE DE 1968. EDICION DE LA MAÑANA.

LOS PROGRESOS DEL HOMBRE

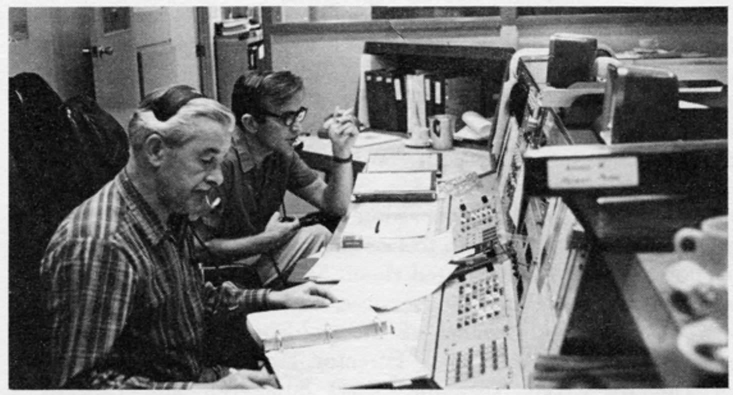
A MADRID newspaper comments on "The Progress of Man."



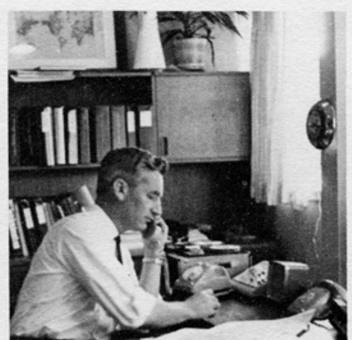
HANK BARNAS at Madrid Recorders.

GEORGE BURAWA, Madrid M&O, and Bob Highstone during Apollo 8.

AUSTRALIAN NEWSPAPERS looked like this during the Apollo 8 mission.



TOM REID (right), Honeysuckle Creek Station Manager, and Ken Lee take their turn at the master console during the Apollo 8 mission.

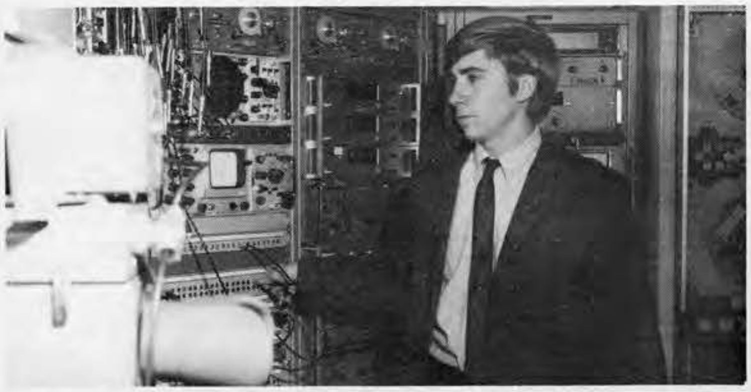


← BERNARD SCHRIVENER, Administrative Officer at Honeysuckle Creek, confers with Australian officials about the role of the tracking station during the mission.

→ DON WITTEN, of Goddard's Public Affairs Office, examines some of the Apollo 8 TV photos he made from the slow scan monitor (in back) and released to the Australian and Far East press from the Honeysuckle Creek station.

GODDARD QUEEN TROPHIES. Jody Shirlen, Miss Goddard for 1969; Tony Rossi (left), Chairman of the 1968 Goddard Queen Dance; and Al Franta, President of the Goddard Employees Welfare Association, display the trophies received by Goddard Queen contestants at the dance held last November. The platter held by Mr. Franta was presented to each candidate at that dance. Miss Shirlen, who was elected Goddard Queen, received the small loving cup which she will keep. The large cup is inscribed each year with the name of the reigning Queen and kept in her area here at Goddard.

Goddard's Co-op Work-Study Program, in progress since 1961, provides students with the opportunity to gain valuable work experience in the aerospace field.



Jack Demsey: Co-op Student

Co-op Student John Demsey has just completed his first six months at Goddard as a member of the Operational Engineering Section of the Data Processing Branch (IPD). He is a pre-junior at Drexel Institute of Technology where he is majoring in electrical engineering.

John came to Goddard after spending his first Co-op work period at Warwick Electronics in Zion, Illinois. There he was a technician in the Test Instruments Department of the Color Television Division.

At Goddard he helped construct a PFM and PCM converter for the ATS satellites. He had the opportunity to help Jack Morris, who was here on a Fellowship from the University of Missouri, experiment with amplitude analysis of telemetry signals. He also designed, built, and installed a time annotator for the filming equipment in the Signal Analysis Laboratory.

At school, John is a member of Phi Sigma Kappa fraternity. His hobbies include hi-fi, travel, electronic art, and swimming. His parents presently live in Zion, Illinois where his father is an experimental chemist at Midland Paint Company. He has one brother, who is in high school, and one sister, who is married and living in Philadelphia.

John says he has enjoyed his first six months at Goddard and is looking forward to returning next June.

SANTA'S HELPERS pose with Mr. and Mrs. Claus after the two annual Goddard Children's Christmas Parties. From left are (front) Amy Kelley, daughter of Visual Arts Head Pat Kelley; Judy Boggs, Santa, Mrs. Santa, and Susan Smith, daughter of Laura Smith of the Director's Office. In the back row are Bobby Dunn, Evelyn Vaughn, Reba Jones, Alberta Moran, Bob Baumann, Eloise Tartar, Jody Shirlen, Miss Goddard; Shirley Deremer, Lucy Loche, Val Bettendorf, and Doris Fleming. Nearly 1,000 children were on hand for the GEWA sponsored parties held December 22, 1968.

COST REDUCTION

COST REDUCTION originators (from left) Gilbert B. Sheare, Eugene I. Grunby, and Frank A. Keipert are shown with Dr. George Ludwig, Chief of the Information Processing Division.

Three Men in IPD Save Goddard $94,325

Three men in the Information Processing Division submitted two separate cost reduction actions and saved Goddard $94,325.

The men are Eugene I. Grunby of the Programming Systems Section whose action is saving Goddard $50,000 per year, and Frank A. Keipert of the Technical Support Office and Gilbert B. Shearer of the Telemetry Computations Branch who put their heads together and came up with a scheme that netted Goddard $44,325.

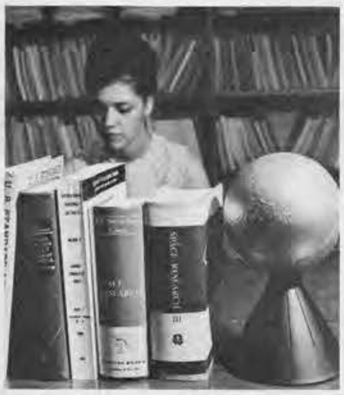
In the first action, Mr. Grunby found that under our old computer program for OGO-D, users had to wait for a pre-assigned core buffer before they could request magnetic tape output. He suggested that core buffers be assigned from an available core buffer pool so that waiting is usually unnecessary and computer time is consequently reduced.

To come up with the second saving, Mr. Keipert and Mr. Shearer took a sharp look at the assignment of tape units for OGO edit runs. They found that the assignment of prepunched cards would reduce the duration of every edit run by ten minutes and netted a great saving for the Center.

National and World Data Centers Now at Goddard

On January 2, 1969, Goddard assumed operation of World Data Center (WDC) A, Rockets and Satellites, under the auspices of the Geophysics Research Board of the U. S. National Academy of Sciences. It is co-located with the National Space Science Data Center (NSSDC) in Building 26. Dr. James I. Vette is serving as director of both data centers. Prior to the move, WDC-A, Rockets and Satellites, was operated by the National Academy of Sciences in Washington, D. C.

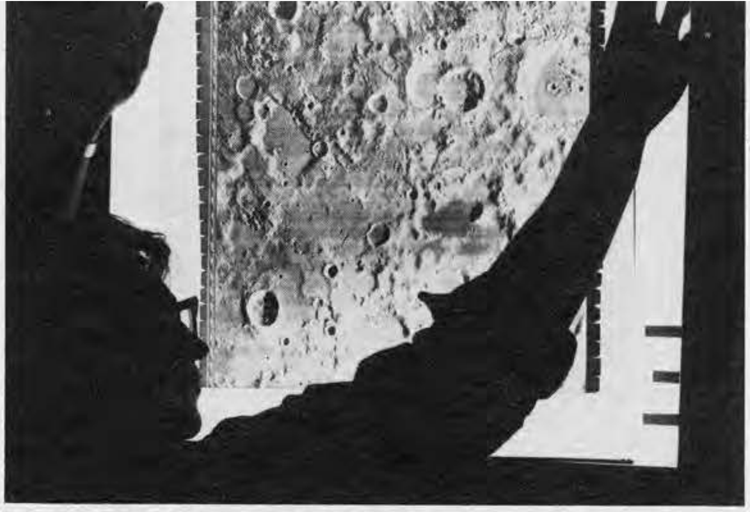
According to Dr. Vette, the two data centers are separate and distinct entities, each of which has its own mission to perform. The concept of WDC's dates back to an international agreement in 1955 which authorized at least three International Geophysical Year (IGY) data centers to collect data from the IGY observational programs and make such data readily accessible to the scientific community. World Data Center A was established in the United States; World Data Center B in the USSR; and World Data Center C in various other nations. (WDC-A has nine discipline-oriented subcenters in the U.S.) Basically, the WDC's continue to collect, interchange, and make available to the scientific community, data from the various geophysical disciplines. Each WDC is open to visitors from any nation participating in the program, and all data in the WDC's are accessible to such visitors. Specifically, WDC-A, Rockets and Satellites, furnishes flight summaries of sounding rockets successfully launched by the U.S. and reports on rocket, satellite, and space probe experiments *received* by WDC-A in the form of reprints or unpublished reports. Originally all reports of this nature were collected. Present emphasis is on collecting only reports which are not published in journals readily accessible throughout the international scientific community. Dr. Vette points out that space science data stored at NSSDC are not deposited in the WDC-A subcenter. However, part of the subcenter's function is to assist users in obtaining pertinent data from experimenters or national archives such as NSSDC.



FIRST DAY of business at World Data Center A, Rockets and Satellites, which was transferred to Goddard on January 2, 1969. Shown is Documentation Specialist Carolyn Williford.

FILM EDITING and inspection at the National Space Science Data Center. Shown is Microfilm Technician Leo Macon.

↓ COMPUTER COMPLEX at the National Space Science Data Center.



PROCESSING LUNAR PHOTOGRAPHY at the National Space Science Data Center. Shown is Mike Canyes, Photographic Technician.

TAPE STORAGE and retrieval at the National Space Science Data Center. Shown is Data Technician Betty Miller.

NSSDC is charged with providing the means for dissemination and analysis of space science data beyond that provided by the original experimenter and his co-workers. As such, the Data Center is responsible for the active collection, organization, storage, announcement, retrieval, dissemination, and exchange of space science data at a national level. As outlined by Dr. Vette, NSSDC is concerned with serving the needs of the following user groups: space scientists, scientists in related fields, engineers and systems planners, management, and educational activities. To provide for an independent analysis of the experimental data in the future by other scientists, the data must be collected and preserved in the proper form, and supporting information must be obtained. Often, additional analysis or reformatting of the data is required to put this data into an optimum form for future usage. This task involves people who are familiar with the instruments, calibration techniques, and interpretation of data. It is often advantageous to study the data from many experiments in order to obtain a fairly comprehensive description of the space environment. This synthesis into useful data summaries, compilations, or environments is a natural professional activity of Data Center scientists. In short, the total job requirements establish a vital need for specialists in the various space science disciplines, systems analysis, computer programming, data processing, photographic technology, technical writing, publication, and reproduction. The Data Center facilities for these total job requirements include office space, work areas, visitor rooms, and special-purpose areas such as computer complex, photo lab, microfilm area, document storage, auditorium and classrooms, and tape storage areas.

The data stored at NSSDC can be obtained by U. S. investigators through a direct request to the Data Center. On the other hand, requests by foreign investigators should be directed to the Subcenter for Rockets and Satellites since it is NASA's policy to make space science data available to the international scientific community through the World Data Center network.