GODDARD NEWS

THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

GODDARD SPACE FLIGHT CENTER/GREENBELT, MARYLAND

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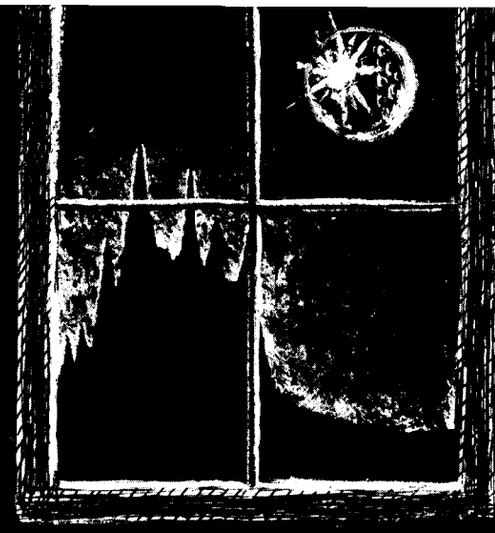
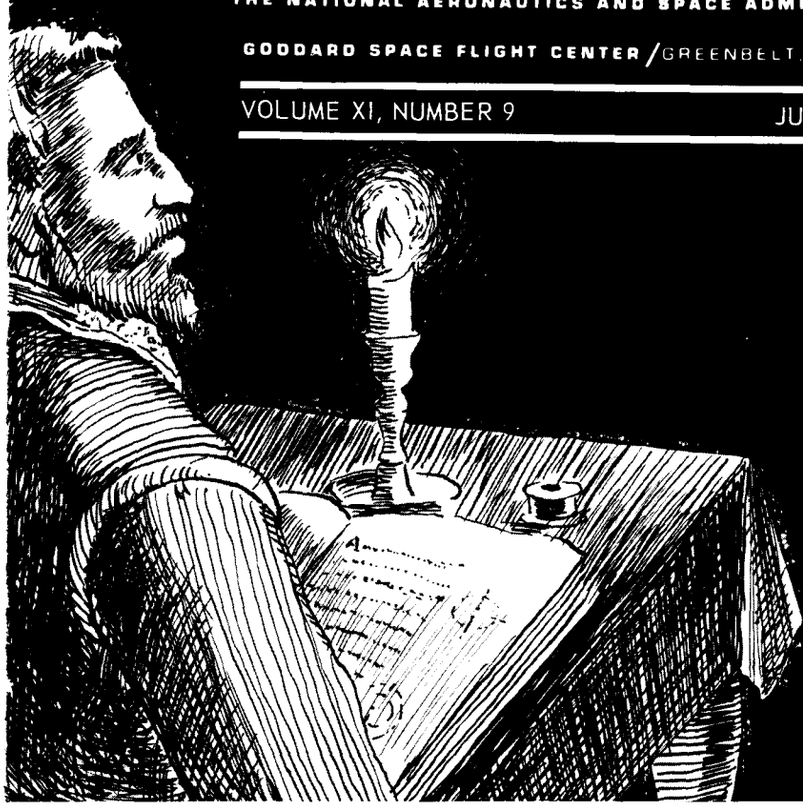




Sterre Sene on the Mone

March 5, 1587, England . . . . "A sterre is sene in the bodie of the mone upon the fifth of Marche, whereat many men merureiled & not without cause, for it strode directly betwene the pointes of her hornes, the mone being chaunged, not passing 5 or 6 daies before."

[See Pages 4 & 5]

AIMP's Orbit is Really Way Out

The first Anchored Interplanetary Monitoring Platform (AIMP)—officially called Explorer XXXIII—was successfully launched on July 1 into the highest earth orbit ever achieved for any satellite.

At apogee, this orbit carries it out more than a quarter of a million miles from earth.

The primary orbital plan for AIMP was for it to be "captured" by the moon's weak gravitational field and to conduct scientific investigations from its "anchored" lunar orbit.

However, because of a higher-than-planned velocity attained by the Delta rocket, the alternate, highly elliptical orbit was decided upon by project officials about four hours after liftoff.

All systems and the seven active experiments on the first AIMP are operating as planned. The retromotor firing, which occurred on the evening of July 1, also went well. The purpose of firing this small motor located in the top of the AIMP was to prevent the satellite from escaping the earth's gravitational field and going into orbit around the sun.

Although project officials expressed disappointment that the lunar orbit was not achieved by AIMP, they are looking forward to significant scientific results possible from the way-out orbit in which it is now operating.

Photos on Page 2

GODDARD STUDY AIMED AT GAINING FURTHER USE FROM NEW TECHNOLOGY DATA

Goddard has initiated a unique study to further increase the already highly expectant yield of new technological information from its Applications Technology Satellite (ATS) project.

Managed by Goddard, the ATS project was conceived as a research and development effort to flight test promising technology experiments which could have a number of spacecraft applications.

According to Robert J. Darcey, Goddard's ATS Project Manager, "the study is intended to establish the requirements for correlating and comparing the information obtained from the numerous technology experiments to be flown on the five spacecraft presently scheduled in the project."

"With an eye towards getting the most value out of every dollar spent on the ATS program, we hope to gain further use from the collected information beyond the basic requirements of the individual experiments. Conceivably, the new data could result in new experiments for future ATS flights," Darcey said.

"The primary result of the study will be the development of a methodology for programming data which will be common to investigations between two or more technology experiments. The detailed programming, however, will not be a part of this study," Darcey added.

The ATS data correlation study is being conducted under a $68,262 Goddard contract by the Franklin Institute Research Laboratory, Philadelphia, Pa. It was awarded in mid-April of this year.

In essence, the ATS project will extend the scope of technology in spacecraft orientation, communications, meteorology and scientific observation at the medium (6,750 miles) and the synchronous (22,300 miles) altitude orbits.

An important goal of the project is to investigate and flight test technology common to a number of spacecraft applications for the synchronous orbit. This includes such areas as materials research, thruster technology, attitude determination and spacecraft stabilization.

See Page 6

AIMP—the crucial hours . . . from Page 1

DATA TOPICS

John Y. Sos, author of this article, is Section Head of the Information Processing Division's Advanced Equipment Design Section. Prior to coming to Goddard in 1962, Mr. Sos was involved in automation check-out and telemetry equipment design with RCA. He received his BS from Penn State and MSEE from the University of Pennsylvania.

Coherent PFM Data Processing

by
John Y. Sos

Pulse Frequency Modulation telemetry, known as PFM, is one of several types of telemetry used on Goddard spacecraft. It was developed by Goddard's Dr. Robert W. Rochelle and his associates during the early Vanguard days. Since then it has been successfully employed on many of the Explorer spacecraft and all of the IMP and UK satellites.

In the past, PFM has been analog, or continuous, in nature; i.e., analog information was conveyed by a frequency burst transmitted during the channel period. The frequency of these bursts occupies a continuous band, typically in the range of 5-15 kHz.

More recently a new type of PFM has been developed by Dr. Rochelle's group. It is known as discrete-frequency, coherent PFM, and is scheduled to be first used on the IMP-F satellite in the IMP series. In this system four bits of telemetry information are coded into one of 16 discrete frequencies, generated from a common spacecraft oscillator. In addition, since each frequency burst starts with and maintains a known phase relationship, the term "coherent" is applied. The main advantage of coherent PFM over analog PFM or uncoded PCM is its capability to combat the effects of noise obscuring a weak telemetry signal and therefore to minimize the errors in the telemetered data.

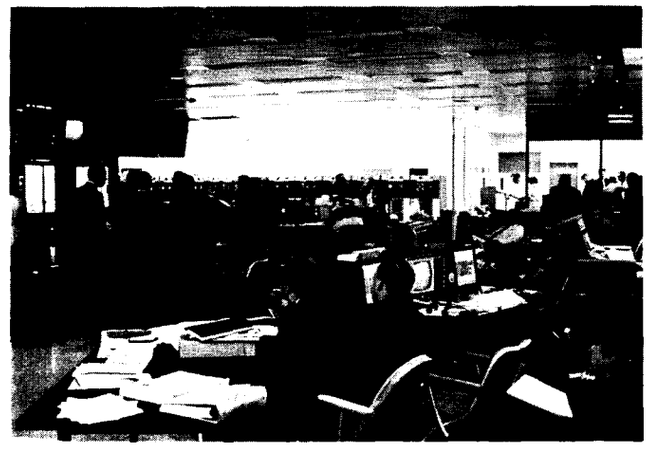
The introduction of coherent PFM required re-evaluation of existing signal detection and synchronization techniques that were developed primarily for analog PFM. It was found that different techniques were required to realize the potential improvements in performance for the entire processing system.

A system that uses crosscorrelation for data detection and autocorrelation for synchronization has been developed in the Processor Development Branch. It will be used operationally in the processing of the IMP-F data. It takes full advantage of the phase-coherent and the discrete-frequency properties of the telemetry signal.

The data signal detector consists of a bank of 16 crosscorrelators, one for each frequency contained in the PFM format. The incoming PFM signal is crosscorrelated with 16 reference frequencies and at the end of each channel period, the correlator with the largest output is selected. This method very closely approximates the theoretically optimum signal detection scheme.

The heart of the signal synchronization subsystem is a hybrid (digital/analog) circulating delay line connected as an autocorrelation loop. This loop exploits a peculiar property of the coherent format used; namely that each of the bursts, irrespective of which frequency it may be, invariably has zero crossings at 4 equally spaced points within the burst. This form of coherence is detected throughout the telemetry frame and is used to obtain synchronization. Because of the large number of predictable zero crossings, a synchronization at a signal-to-noise ratio threshold substantially below that for data can be obtained.

The crosscorrelation detector requires the generation of 16 reference signals, one for each of the frequencies in the PFM burst.



GODDARD'S REALTIME COMPUTING COMPLEX during the crucial hours after launching of AIMP teemed with activity.

THE DECISION TO FLY THE ALTERNATE ORBIT on the first AIMP mission was not an easy one. Discussing the problem (left to right) are Clarence A. Schroeder, Tracking and Data Systems, Deputy Assistant for Projects; Paul Marcotte, AIMP Project Manager; Dr. Norman Ness, AIMP Project Scientist; and Dr. Friedrich O. Vonbun, Tracking and Data Systems Mission Analysis.

The requirements on the generator of these frequencies are such that a frequency and phase match between the input and the reference signals must be maintained in the presence of spacecraft oscillator drift and, most troublesome of all, ground tape recorder wow and flutter. In this system, the reference frequencies are generated from a pilot tone which is recorded on tape along with the telemetry signal at the recording STADAN stations, and is used through frequency synthesis techniques, as the source of all timing during the detection process. Use of the tape recorder signal in the generation of all reference and timing frequencies enables the system to achieve complete tape recorded wow and flutter compensation.

In the system under discussion, such special purpose equipment as the correlator bank, the frequency synthesizer and synchronization subsystems are combined with a CDC 3200 computer connected on-line. There are advantages of using the system with an on-line computer. Even though the data rate is relatively low, the computer can be effectively used to perform such functions as frame and sequence synchronization and thus assure recovery of more data. In addition, it will minimize re-processing of data, since hardware and telemetry malfunctions can be more readily detected by the computer in real time. The computer performs an additional function: the estimation of the signal-to-noise ratio of the input signal, thus giving the user a good indication of the overall quality of data.

The programs for this system have been written by Data Systems Division personnel. At this time the performance of the system is being evaluated. The evaluation will be completed in the early fall at which time the line will be prepared for operational processing of IMP-F data.

Goddard Sponsored Workshop

SPACE AGE TEACHING. These educators met at Goddard recently to develop a space-oriented mathematics supplement: Archie Pollock, Glen Ridge, New Jersey; John Wells, St. Louis Park, Minnesota; John Soroka, Akron, Ohio; Robert Duke, Rocklin, California; Miss Joyce Halsey, Lexington, Kentucky; Earl Zetterholm, Okemos, Michigan; and Jerrold William Maben, University of Akron.

"The Miracle of Measurement"

"The Miracle of Measurement" is the topic of a six-week summer workshop being held at the University of Akron, Ohio, under sponsorship of the Goddard Space Flight Center and in cooperation with the U.S. Office of Education.

The purpose of the project is to develop a space-oriented mathematics supplement for grades 6 through 9.

This project is the fourth in a series of such Goddard-sponsored workshops and is designed to relate mathematics applications to the subjects usually taught at the elementary and secondary levels.

Workshop participants are experienced classroom teachers who visited the Center recently and met with many of its scientists and engineers.

Their discussions and briefings included: EARLY HISTORY OF SMALL, SCIENTIFIC SATELLITES by Frank T. Martin, ORBIT DESIGN AND MISSION ANALYSIS by Stephen Paddock, USE OF COMPUTERS FOR STRUCTURAL ANALYSIS by Thomas Butler, THE ROLE OF THE COMPUTER IN A RESEARCH & DEVELOPMENT ORGANIZATION by William Cahill, DYNAMICS OF ROCKET FLIGHT AND MODEL ROCKETRY by Howard Galloway, Cathy Maxen, and John Nowakowski, EXPERIMENTAL FABRICATION AND ENGINEERING by Maurice Levinsohn, STRUCTURE OF THE MOON by Dr. Bevin French, MARS: PAST, PRESENT, AND FUTURE INVESTIGATION by Jaylee Burley, THE SPACE SCIENCES by Dr. Leslie H. Meredith, SPACE BIOLOGY by Norman H. Macleod and Anne Marie Yech, and THE GODDARD LIBRARY by Michael Kubisiak.

Against the background of the NASA/Goddard mission the material will include the following topics: History and Development of Measurement, Units of Measurements, Standardization of Physical Measurement, Algorithms, Macro and Micro Measurements of Space.

Project participants are: Professor Jerrold W. Maben, Project Director, College of Education, University of Akron; Robert H. Duke, Planetarium Director, Rocklin, California; Joyce O. Halsey, Leestown Junior High School, Lexington, Kentucky; Archie W. Pallock, High School, Glen Ridge, New Jersey; John Saroka, Firestone High School, Akron, Ohio; John Wells, 20025 Texas Avenue, St. Louis Park, Minnesota; Earl E. Zetterholm, Okemos High School, Okemos, Michigan.

Dr. Patricia Spross, U.S. Office of Education, serves as technical director for this series.

The program is directed by a Goddard committee on space-oriented mathematics, chaired by Dr. Michael J. Vaccaro, Assistant Director for Administration and Technical Services.

Earlier publications produced by this committee are: "What's Up There," "From Here, Where," and "The Shapes of Tomorrow" (to be available this fall). The books are sold by the Superintendent of Documents.

Cost Reduction of the Month

Among the first Goddard divisions to participate in the Cost Reduction program and one of the program's constant contributors, according to Cost Reduction Officer Stanley P. Kovell, has found three additional areas to cut cost.

The Technical Information Division has recently submitted Cost Reduction savings of over $60,895 from three of its branches: Library, Photographic, and Graphic Services.

The Library Branch, under a program initiated by Branch Head John M. Weaver, will save nearly $23,000 and approximately 1,365 man hours, by taking advantage of multiple year subscription savings on all journal subscriptions. The Goddard Library maintains about 2,850 individual subscriptions.

John M. Weaver

The Photographic Branch reassessed the requirements for the printing of certain color Gemini 7/6 pictures, as well as securing a lower quantity rate for printing, which, according to Photographic Branch Head James R. Burton, saves over $28,000.

James R. Burton

The Graphic Services Branch increased its printing capacity resulting in a yearly manpower savings of 2,340 hours, or nearly $10,000. Graphic Services Branch Head Vincent R. Capitello and Charles V. Hardesty, instituted a method to increase the speed of their operations by 1,500 copies per hour. Graphic Services was printing 24,864 impressions per day. By installing a larger pulley they increased production to 36,000 impressions a day, resulting in an extra hour production per operator.

V. R. Capitello C. V. Hardesty

GODDARD NEWS

JULY 11, 1966

"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

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APPARENT ACTIVITY ON MOON'S SURF

A Glint in th
Operation Moon
Which may b

March of 1783 was generally considered a bad month for King George III of England. His cabinet had recently decided to grant the American colonies their independence after a disastrous war, the last of the British troops were preparing to withdraw from New York, and his mind was fading rapidly. It seemed a poor time for Sir William Herschel, the Royal Astronomer, to rouse the king out of bed to look at a light on the moon.

But roused he was, and King George became one of the relatively few people ever to have seen what is now termed a "lunar event," a bright glow or obscuration of the moon's surface that may last anywhere from a few minutes to more than a day.

Since the first "sterre sene on the mone" in 1587, whose discoverer was probably considered either a magician or a witch, lunar events have been seen with increasing frequency and treated with growing interest.

JAYLEE BURLEY, Goddard astronomer, boosted study of lunar events by co-authoring a list of all dated sightings over the last four centuries.

Last year, two astronomers, Goddard's Jaylee Burley and the University of Arizona's Barbara M. Middlehurst, assembled a chronological listing of apparent sightings of lunar events. Out of some 200 references from the literature of almost four centuries, they analyzed 159 with precise dates which were considered reliable. Subjecting them to two major criteria, they found that solar activity as measured by sunspot numbers seemed to have no correlation, while times of maximum and minimum tidal stress, when the moon was closest and farthest from the earth, apparently coincided with a high frequency of sightings.

The theory of tidal stress, as advocated by Dr. Jack Green of Douglas Aircraft Corporation and others, hypothesizes the release of internal energy. Since the earth exerts a pull on the moon some 81 times as strong as the lunar effect which causes our mighty ocean tides, tremendous stress is wrought on the moon's crust. When the earth and moon are closest during the moon's irregular orbit, fissures in the surface may be wrenched open, releasing trapped gases. Conversely, when the earth and moon are farthest apart, these fissures may relax, squeezing out half-escaped gases and molten basalt or ash.

While the most violent "outgassing" might be responsible for the bright spots observed in most sightings, lower energy outgassing might yield dense, dark clouds of volcanic dust and debris. Some observers have indeed recorded such obscurations.

An English group has theorized that lunar glows could be explained by the action of solar ultraviolet light on certain, perhaps meteoric, materials on the moon's surface, causing fluorescence and luminescence. Goddard's Dr. John O'Keefe, an expert on the physical properties of the moon's surface, backs the volcanic theory, arguing that it is physically impossible for solar radiation to cause lunar bright spots.

Early observations were largely made in the unilluminated portion of the moon, and especially during eclipses. Since about 1930, however, more refined instrumentation and more interest have brought about detection of events on the bright parts of the moon as well.

Very little useful photographic evidence is available, both because in the past lunar astronomers simply were not ready to take pictures when events occurred, and because the events themselves seem extraordinarily difficult to capture on film. One group took six rolls of film of an event that was visible through red and blue filters but obtained nothing.

One of the greatest stimuli of current interest in lunar events came in 1956 when Dinsmore Alter, of Griffith Observatory, who was photographing the moon regularly with ultraviolet and infrared filters, caught half of the crater Alphonsus as it normally appears while the other half seemed to be covered by a thin veiling. This is one of the reasons the crater was chosen as the landing point for Ranger IX.

Another spur to current investigations occurred in 1961 when

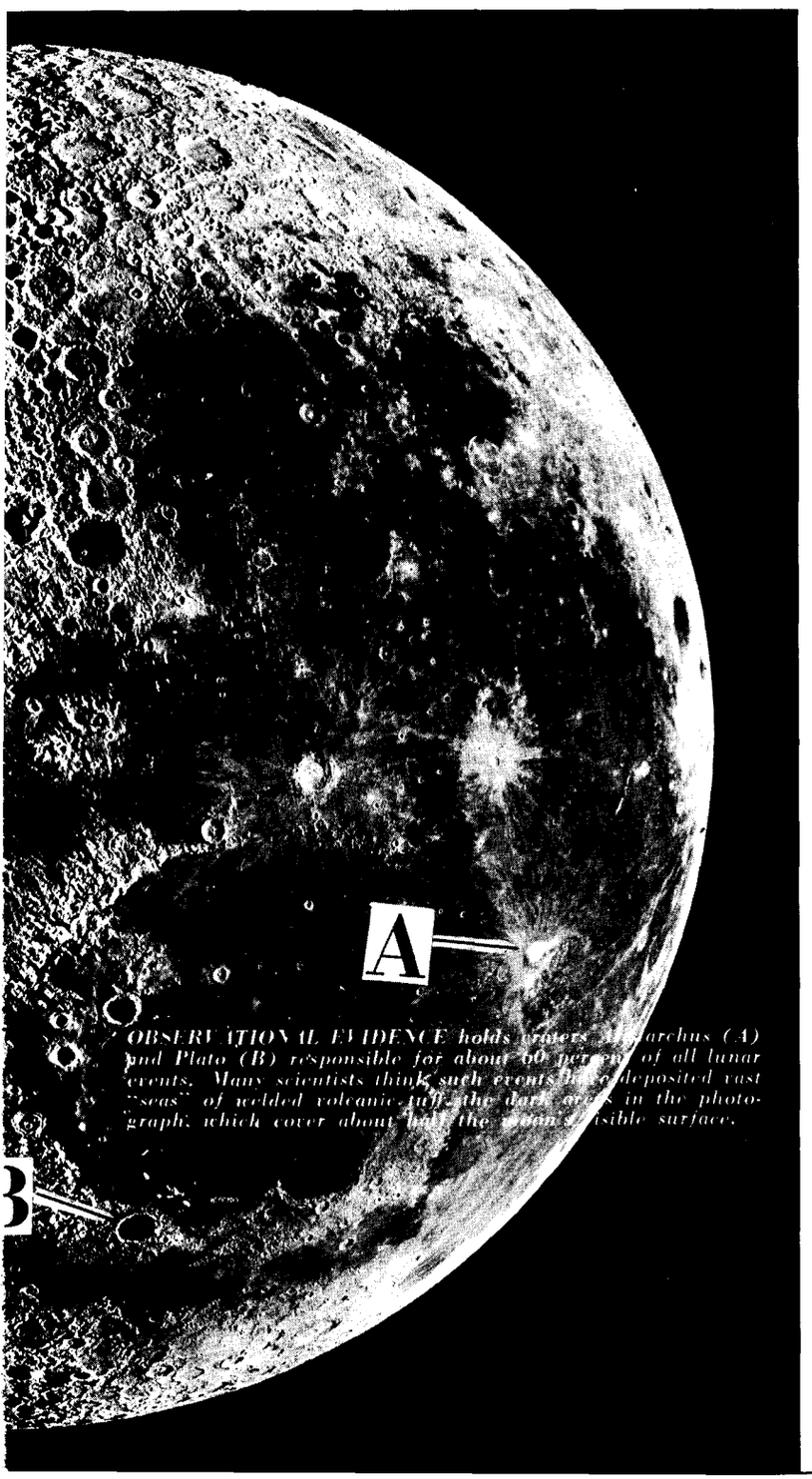
CE DRAWS RISING SCIENTIFIC INTEREST

)ld Man's Eye? ink Monitors Lights Volcanic Action

By Alan H. Anderson, Jr.

Russian astronomer Dr. N. A. Kosyrev obtained spectrograms in red and blue of events on the central peak of Aristarchus.

Perhaps the greatest inspirations came in 1963 when James Greenacre and Edward Barr of the Aeronautical Chart Information Center, two previously skeptical investigators who, as lunar mappers, were intimately familiar with the moon's surface features, observed patches in the Aristarchus region which changed from reddish-orange to ruby-red, and later in Aristarchus and Schroter's Valley red spots which changed slowly to a blue haze over a period of an hour and a quarter. These sightings were especially credible since the scientists were using Lowell Observatory's 24-inch refractor. The conversion of Greenacre and Barr carried many others with it and the number of sightings has since increased to one or two a month.



OBSERVATIONAL EVIDENCE holds craters Aristarchus (A) and Plato (B) responsible for about 60 percent of all lunar events. Many scientists think such events have deposited vast "seas" of welded volcanic tuff, the dark areas in the photograph, which cover about half the moon's visible surface.

Another Goddard astronomer, Mrs. Winifred Cameron, is a leader in the current wave of interest, acting as coordinator and technical representative of Operation Moonblink. Organized about two years ago, Moonblink coordinates some 15 stations in the United States and England in an attempt to monitor lunar events from widely separated stations.

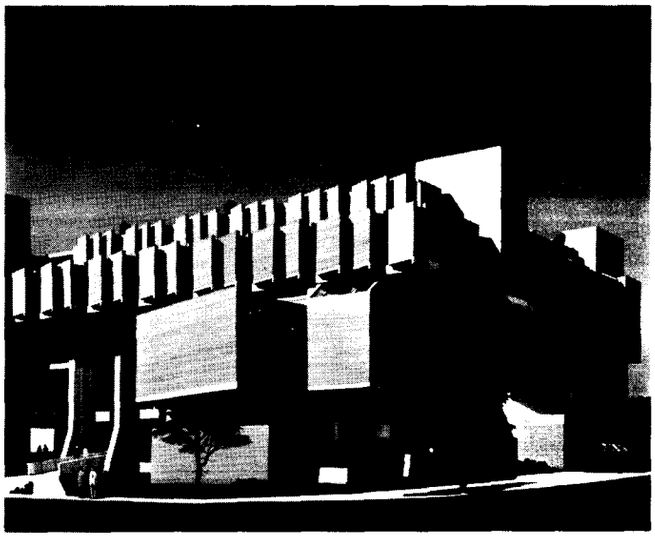
A moonblinker, which gives the operation its name, consists of a rotating blue and red filter wheel which focuses light on an image converter tube. This tube acts essentially as a black and white emulsion. The moonblinker instrument is mounted on a telescope which is trained on the moon. If a color enhancement of two per cent or more occurs on the moon, it will appear as a blinking gray or black spot in the telescope obvious enough to attract the eye of the observer. A confirmation network has been established, and any sighting is immediately reported to the other members of the Operation for verification. In the U.S., this network is limited to 16 members for a reason having nothing to do with astronomy: the Bell Telephone system cannot guarantee clear reception on a conference call network with more than 16 telephones.

***WINIFRED CAMERON** of Goddard coordinates Operation Moonblink, a nationwide project to monitor lunar events. Her husband, Dr. Robert Cameron, is also a Goddard scientist.*

Ten moonblinkers have been made for NASA by the Trident company of Annapolis. They are manned continuously from an hour after sunset to an hour before sunrise during optimal observation periods. Because James Greenacre, observing the lunar event of 29 October 1963 at Lowell Observatory, said that he could see it with a 24-inch refractor but not with a 12-inch refractor finder, all telescopes in the Operation are at least 15 inches in diameter. Furthermore, refracting types are not used because of their tendency to distort light of varying lengths.

According to Mrs. Cameron and others, the obvious topographical features of the moon are excellent evidence of a long history of volcanic activity. We are familiar with three results of volcanic action in general: ash falls, such as that which buried Pompei; lava flows, which travel at only a few miles per hour and deposit a rough terrain of basaltic rock; and ash flow, or pulverized lava, which may travel as fast as a hundred miles per hour and leaves a hot, level slick of white-hot tuff which becomes welded to form a flat crust. The vast maria, or seas, of the moon seem to fit the characteristics of ash flows. The tuff layer may be about a hundred meters thick, while the basalt beneath it may be more than a mile thick.

Only two people at Goddard have seen lunar events, and these by accident. While checking out a new 16″ telescope at the Optical Systems Division, Edwin Reid and Sol Genatt noticed at about 10 p.m. one night several colored bands of light in the region of Aristarchus. Not knowing what sort of phenomenon it might be, the men panned to other features of the moon, then quickly surveyed the entire sky, and finally even tried other eyepieces. The bands appeared only in Aristarchus. Mr. Genatt attempted to gain confirmation of the sighting with help from another observatory, but before this could be done the bands had grown too weak to ascertain. By 11 p.m. they had disappeared.



ARCHITECT JOHN M. JOHANSEN'S FINAL DESIGN OF the Dr. Robert Hutchings Goddard Library at Clark University, Worcester, Massachusetts.

To serve the Clark academic community, the new facility will have an initial capacity of 600,000 volumes and individual study spaces for 821 students and faculty. To serve recorded history, it will be the permanent repository for Dr. Goddard's priceless scientific and personal papers, patents and other memorabilia, a gift to the University from Mrs. Robert H. Goddard.

The Goddard Library, by Act of Congress signed into law by President Lyndon B. Johnson on November 4, 1965, also will be the site of the national memorial to the Father of the Space Age. To consist of a non-representational sculpture, this symbol of the country's appreciation of Dr. Goddard's lifetime efforts will be located on a prominent site within the library complex.

Conceived as a central "box of books" around which the library's activities and services take place, the four-story structure has been carefully designed to provide maximum individual study areas for students and faculty. It will also have the most modern library service facilities available to aid students and faculty in their scholarly pursuits.

GIVE BLOOD

Tuesday, July 12

Auditorium, Bldg. 8

A pint starts your most valuable "bank" account.

GODDARD STUDY, *from page 1*

Of the five spacecraft presently planned in the ATS project, one will be orbited at the medium altitude of 6,750 miles and the remaining four will be lofted to the synchronous orbit at 22,300 miles.

Two of the synchronous orbit ATS spacecraft will be spin-stabilized and two will employ the gravity gradient stabilization technique which uses the earth's gravitational pull to keep the spacecraft always facing the earth. This concept is similar to the principle which causes the moon to rotate once during each orbit around the globe and thereby keep its "face" constantly toward the earth.

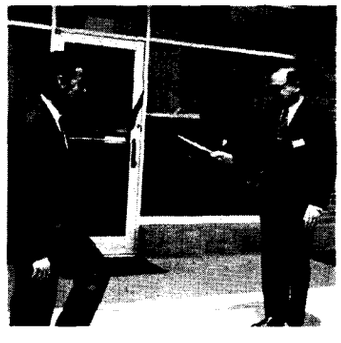
The first spacecraft to be launched by the ATS project is the ATS-B. Scheduled for a December, 1966, flight, ATS-B is a spin-stabilized spacecraft planned for a synchronous orbit.

HAPPINESS IS COST REDUCTION:

GODDARD'S ASSOCIATE DIRECTOR, Eugene W. Wasielewski, presents a check to Charles V. Anderson, Procurement Division, as a Certificate of Award primarily based upon the implementation of a $16,634 Cost Reduction action.

New Weather Station Turned Over To Essa

Herbert I. Butler, Chief of Goddard's Operational Satellites Office, officially turned a new Command & Data Acquisition (CDA) Station over to the Environmental Science Services Administration. The construction of the station was contracted for and managed by the Goddard Space Flight Center.



DR. ROBERT M. WHITE cuts the ribbon opening the ESSA CDA Facility formally as Goddard's Herbert I. Butler assists.

The new CDA station—which controls the spacecraft and receives stored data gathered by the United States' operational weather satellite system—was dedicated on June 22 in ceremonies at Wallops Station, Virginia.

Construction of the $4.4 million ESSA CDA station began on March 18, 1965. The station includes an 85-foot parabolic antenna and its associated electronics equipment through which signals are sent to and received from the spacecraft.

With a staff of 52 people, the Wallops CDA station operates 24 hours a day throughout the year.

The operational weather satellite system is composed of two spacecraft—ESSA-1 and ESSA-2, both launched in February 1966—which provide almost total coverage of the earth's weather every day. ESSA-1 stores its photographs for readout by large CDA stations, while ESSA-2 sends local pictures directly to simple receiving stations around the world. Both of these satellites were built, launched, and checked-out by Goddard.

The Wallops Station facility and a second ESSA CDA station near Fairbanks, Alaska, receive stored data from ESSA–1 and transmit it to the National Environmental Satellite Center at Suitland, Md. Within two hours, the information is processed for operational use by the Weather Bureau's National Meteorological Center. Analyses of the cloud pictures are sent to weather stations all over the United States and are broadcast throughout the world.

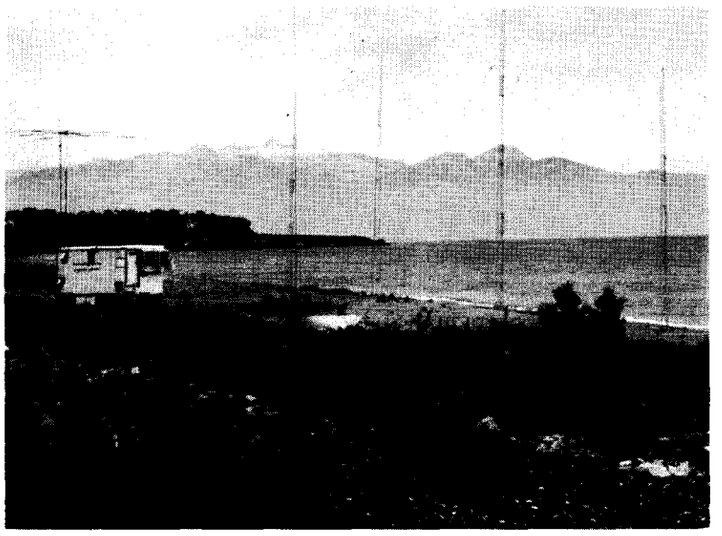
ESSA CDA stations transmit commands to the ESSA 1 and 2 spacecraft. These commands, which are prepared by the National Environmental Satellite Center, maintain the spacecraft in the proper attitude and provide operating instructions to the cameras.

Goddard Expedition to Greece Studies Effects of Solar Eclipse

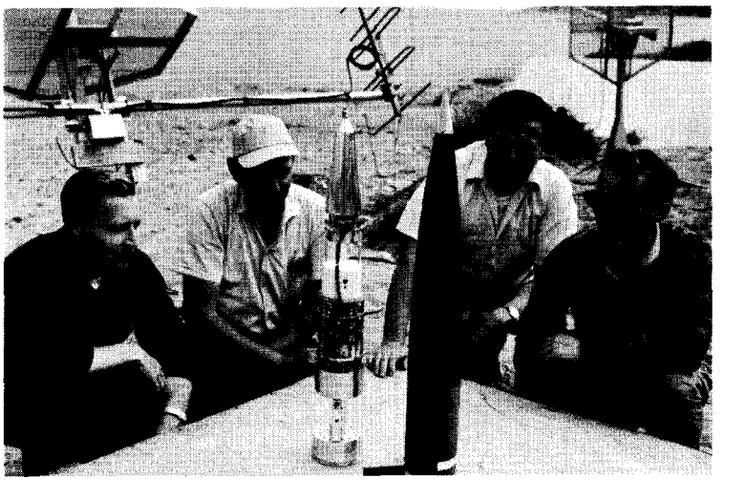
The effect of a solar eclipse upon the lower ionosphere was the subject of a recent Goddard expedition to Greece. To study this effect, a series of radio propagation experiments were conducted between a field site at Koroni Beach, Greece, and a small Arcas rocket 90 km overhead.

Suspended between five 70 ft. towers on Koroni beach were two high frequency antennas from which signals were transmitted to receivers in the rocket payload. In the Goddard trailer field site were two 1000 watt transmitters plus a complete telemetry receiving and recording system for the recovery of the experimental data. Associated with the trailer was a 55 kw diesel generator, a telemetry receiving antenna system, and a high frequency communications link between the trailer and the launch center located on the Wallops Island Range Recoverer Ship.

Preflight status of the rocket payload was monitored in the Goddard trailer while the rocket was in its launch tube aboard the ship several miles offshore. Practice runs were made preceeding the eclipse so that perfect coordination could be attained between the Goddard experimenters ashore and the Wallops launch personnel on the ship. During the eclipse five rockets were successfully launched, each within seconds of its scheduled time. In addition, a control shot was successfully launched the following day.



KORONI BEACH, GREECE, was the site of the Goddard eclipse expedition.



GODDARD TECHNICIANS EXAMINE ARCAS PAYLOAD. From left are Jim Haynes, Joe Modlin, Dick Young, and Wally Haynes.

The project was managed by Mr. E. Bissell of the Sounding Rocket Branch and was under the scientific direction of Dr. J. Kane of the Planetary Ionospheres Branch. Other Goddard personnel in Greece for the operation were the brothers James and Wallace Haynes, Joseph Modlin, Richard Young, James Wood and Dr. Arthur Aikin.

Among the many spectators of the eclipse at Koroni Beach were the United States Ambassador to Greece, the Chairman of the Greek Space Committee, and Goddard's Assistant Director Dr. George F. Pieper, Jr.

VRA-NASA TEAM TO AID HANDICAPPED

The rehabilitation of disabled people will get an assist from space technology as a direct result of an agreement signed today between the Vocational Rehabilitation Administration (VRA) and the National Aeronautics and Space Administration.

The agreement was signed by VRA Commissioner Mary E. Switzer and NASA's deputy Administrator, Dr. Robert C. Seamans, Jr.

NASA's Office of Technology Utilization will aid VRA by making available the results of aerospace research that also apply to the problems of the mentally and physically handicapped. This help could range from developing new aids for the blind, lame, and deaf, to information which may help free the handicapped who live in social isolation.

Vocational rehabilitation scientists at four VRA research centers will specify their unsolved problems in restoring the disabled to productive life.

NASA's Technology Utilization program will seek out information resulting from aerospace research and development that appears applicable to the solution of these problems. This information will be communicated to the VRA scientists for evaluation and application.

The agreement between the two Federal agencies will apply space research to rehabilitation on a continuing basis. Officials said the interagency cooperative effort is expected to produce a maximum return on the public investment in space research and development which can be adapted to rehabilitation, and point the way to similar joint efforts to apply new space technology in other areas.

There are approximately four million people of working age in the United States who have physical or mental disabilities. Until the pilot program is underway, scientists of the two agencies cannot estimate the value of aerospace research to the problems of the man in the wheelchair. However, the interagency program could revolutionize the approach taken in the 46-year-old program of vocational rehabilitation, the VRA pointed out.

The purpose of the interagency agreement is to accelerate the application of new technology to the problems of the disabled. This will involve an evaluation of NASA technology by VRA scientists; adaptive engineering to apply that technology to the needs of disabled persons; demonstration of the resulting devices, systems, and procedures; and the commercial introduction of new devices and services.

NASA noted, for example, that a proposal to NASA for a device to walk across the surface of the moon to gather data triggered a development project that resulted in a "walking wheelchair" that permits a paraplegic to navigate across difficult terrain. This is the type of innovation the agreement will foster.

Goddard Speaker Cites Changing World

"We live in a world of change, and, more than any other generation, have learned to accept it as a fact of life."

Milton F. Denault

Milton F. Denault, Head of the Management Information Systems Branch (Program Support Division), spoke on this topic, entitled "A Perspective for Today and Tomorrow," to the North Pocono High School, Moscow, Pennsylvania, on June 13.

Pointing out that the period of human development between King Solomon and George Washington covered almost 3,000 years, he reminded his youthful audience that both wore homespun clothing, both traveled by horse-drawn vehicles and both used oil for light, and wood for heat.

"The difference between Washington and ourselves," he said, "is hardly more than 150 years, but what a contrast in human progress."

Predicting that change and the rate of change will be the dominant feature of a settled existence, Mr. Denault declared, "To some, it means an uncomfortable uprooting of an existence, to others it may mean disillusionment and despair. To still others, it means progress and opportunity."

Reminding his audience of 137 graduates and their families that the extent to which they may benefit from the new science and technology of the spage age will depend largely upon the extent to which they prepare themselves. Whether continuing their education or venturing immediately into business or industrial activity, today's graduates will find opportunities in the space age. "You have space," he said, "in which to grow."

Remarking on how the more dramatic aspects of the space program tend to overshadow the fundamental purposes of the space effort, "just as the moon has influenced the course of young lovers for centuries," he said, "so has the excitement of lunar exploration blinded many to the more immediate and far-reaching benefits and influences which the conquest of space will provide."

"Today," Mr. Denault stated, "a premium has been placed on knowledge, for man's survival depends upon how rapidly he accumulates knowledge concerning both his environment and himself, and how effectively he learns to use that knowledge.

The quantity and quality of students from elementary schools through colleges, he said, will determine the excellence of our future space program. Paraphrasing an ancient Chinese philosopher, he reminded the graduates, "You live in interesting times. But more than this . . . you have the advantage of participating in these interesting times as Americans—a privilege which you must not underestimate or overlook."

Quoting the late President John F. Kennedy's assessment of the privilege, he said, "The American by nature is optimistic. He is experimental, an inventor, and a builder who builds his best when called upon to build greatly. Arouse his will to believe in himself, give him a great goal to believe in, and he will create the means to reach it. This trait of American character is our greatest national asset."

Rocket Engine Runs Steadily for Months

Can a rocket engine run continuously for six months?

Yes, and even longer, according to electric propulsion researchers at the Lewis Research Center who have been operating a single ion rocket engine continuously since Oct. 14, 1965.

Six months to one year is a reasonable operating time in which to propel unmanned scientific spacecraft to other planets.

Electronic rocket engines, while they produce little thrust in comparison to the gigantic chemical engines, can operate for long periods of time. Thus a spacecraft powered with electric engines would be under power all the way to Mars or Venus or, perhaps, even further.

The engine now being tested is a mercury bombardment rocket, a design originated at Lewis and successfully tested in space in a smaller model on the SERT-I (Space Electric Rocket Test) flight in 1964. It uses one kilowatt of electric power to ionize molecules of mercury and accelerate them in 6-inch-diameter exhaust beams at speeds up to 100,000 mph.

This tremendous jet velocity is the advantage of the ion engine since it requires so little propellant. Such engines will not operate except in a vacuum tank or in space.

Spacecraft using these engines would have to be hoisted into orbit by a chemical booster before the electric engines could start the spacecraft on its interplanetary voyage.

It's a Matter of Courtesy . . .

OBSERVE ALL PEDESTRIAN CROSSINGS

Pedestrians have the right-of-way—Drivers entering Goddard please be careful and on the lookout!

But be sure that as a pedestrian you look both ways before crossing the street.

Pedestrians should cross only where there is a PED-X indicator.

SR SCOREBOARD

GODDARD LAUNCHED SOUNDING ROCKETS

Rocket Type	Experiment	Proj. Scientist	Site	No. Launched
Nike Cajun	Synoptic Rocket Grenade	Wendell Smith	Pt. Barrow	1
Nike Cajun	Synoptic Rocket Grenade	Wendell Smith	Ft. Churchill	1

Goddard launchings this year. (Jan. 1-July 5): 74; Launched June 21-July 5; total 2.