GODDARD NEWS
GODDARD SPACE FLIGHT CENTER / GREENBELT, MARYLAND
VOLUME IV NUMBER [illegible] NATIONAL AERONAUTICS AND SPACE ADMINISTRATION MARCH 15, 1963

Left to right are, William R. Schindler, T. B. Norris, Dr. Richard Morrison, Charles Able, Colonel Ralph Swanson, Dr. Homer Newell, Dr. Kurt Debus, Bob Gray, and Jack King. Dr. Harry Goett is the speaker.

Cape Ceremonies Honor Delta Team

In ceremonies as warm as the Florida sun, NASA's most reliable booster — Delta — and the team behind it were honored March 1 for a success story unique to America's young space program.

Against the back-drop of the Atlantic and Delta launch pad No. 17, an estimated 200 persons sat in shirt-sleeve weather at Cape Canaveral to hear officials from government and industry call attention to the remarkable Delta and its team.

On the pad, a white new Delta rocket glistened against the Florida sky, poised for the next attempt at continuing the long list of successful launches.

On the stand, speakers representing NASA, the Air Force, and Douglas Aircraft reflected on the accomplishments of Delta, the contributions of the men and women who have made its record possible, and the significance of these achievements to America's overall space effort.

Dr. Homer Newell, director of NASA's office of space sciences, presented NASA's Group Achievement award to Dr. Harry Goett, Goddard director, who read the names of the Delta team and presented the award to Bill Schindler, Delta manager.

Dr. Goett presented a letter of appreciation from NASA Administrator James Webb to Charles Able, vice president of Douglas' missile and space systems division.

Welcoming remarks were made by Dr. Kurt Debus, director of the launch operations center at Cape Canaveral.

Others on the program were Colonel Ralph Swanson, deputy chief of staff for operations at the Air Force missile test center, representing Maj. Gen. Leighton I. Davis, commander of the Center; Dr. Richard Morrison, director of NASA's light and medium vehicles office; T. B. Norris, NASA's Delta program manager, and Bob Gray, chief of Goddard's field projects branch at Cape Canaveral. Jack King of LOC's public information office introduced the speakers.

Team Tribute

In his remarks Dr. Newell called attention to the significant part Delta has played in the success of Goddard's meteorological, communications and scientific satellite programs. He made special mention of the first international space venture between the U. S. and the United Kingdom, which resulted in the "resounding success" of Ariel 1.

Dr. Newell said that all elements of government and industry have "made Delta truly a national space program. The Delta team has had 16 times at bat, and a hitting streak of 15 in a row, for a batting average of .937. That is good hitting."

Addressing the Delta launch team directly, Dr. Newell said, "You are known throughout the business as one of the most dedicated and high-spirited teams in the space effort. . . . You have had to sail by the luring sirens of more spectacular, more glamorous efforts in other space ventures, and yet you have stuck with the job. Just as importantly, your families have borne with you the long hours at the launch site, the dedication to the task that brought success.

"You are a team that knows its business and does its business—from the industrial worker to the government employee, from the engineer to the technician, from the administrator to the secretary."

Dr. Newell paid particular note to the industrial contribution. "The contractors applied their resources effectively, contributed their judgment built up through the years, and played a major role in the entire development of Delta. This is an example of NASA-industry relationship that we hold up to the entire space effort and we hold it up high."

• • •

Fourteen More Deltas Are Ordered

NASA has ordered 14 more Deltas from Douglas Aircraft.

The announcement was made at Cape Canaveral, Fla., as the NASA Group Achievement Award was presented to Goddard's Delta Project Group, which manages the project for NASA.

The order brings to 40 the number of Deltas NASA has purchased since the program began in April 1959. When final contract details are completed, the new Delta order is expected to cost about $18.6 million.

In addition to the Delta hardware, a contract is being negotiated with Douglas to cover launch services for the new Deltas. This contract, expected to be signed soon, will total about $5 million.

Specific missions for all of the 14 new Deltas have not yet been assigned. However, most of them are expected to be earmarked for launchings of additional communications and

(cont'd on page 5, col 4)

Goddard Range and Range Rate, Technical Skill Pay Off

A new Goddard tracking system—range and range rate—and an old but indispensable human asset—the skill of the professional—have written a behind-the-scenes success story for Goddard's once missing Syncom.

The range and range rate system, designed under the direction of Wes Bodin, George Kronmiller, Pete Engels, Bill Shaffer, and Ed Hayes of the systems development branch, and Edmund Habib, assistant chief of the space data acquisition division, contributed data invaluable in preparing predictions on the whereabouts of Syncom, and ultimately in singling out the elusive spacecraft from billions of other specks in space.

Along with data from the Satellite network's Johannesburg, South Africa, station, Goddard's theory and analysis office, headed by Dr. Joseph Siry, was able to define the precise "search patterns" used in locating the spacecraft.

"We were very pleased with the performance of the range and rate system," said Pete Engels, head of the calibration techniques section, who was aboard the U. S. Kingsport in the Lagos, Nigeria, harbor.

Significant Decisions

Two significant developments which occurred under Mr. Engels' supervision contributed immeasurably, in the opinion of Dr. Siry, to the precise and accurate distance (range) and radial velocity (range rate) data transmitted by teletype to Goddard.

Engels

First of the important decisions came when it was discovered that the beacon signal from the spacecraft was too faint to lock onto the autotrack receiver and provide sufficient power for the antenna to follow the spacecraft. Mr. Engels immediately gave instructions to switch to the signal level output from the range and range rate receiver to get a visual indication of the spacecraft signal level.

"It was a spur of the moment decision but it paid off," said Mr. Engels. "We're not exactly sure why the beacon signal was faint but it may have been the attitude of the spacecraft, which shielded the antenna."

Second occasion for split second decision making came when the signal level from the spacecraft became so low the signal failed to lock onto one of the seven range tones, the 20-kilocycle sidetone, which is essential to obtain ranging data. The 100-kilocycle sidetone was quickly cut off and its power channeled to the 20-kilocycle tone. The result was an immediate lock-on and the transmission of the last set of ranging data.

"We knew the transfer of power was possible but we didn't know what effect it would have on the accuracy of the measurements," said Mr. Engels.

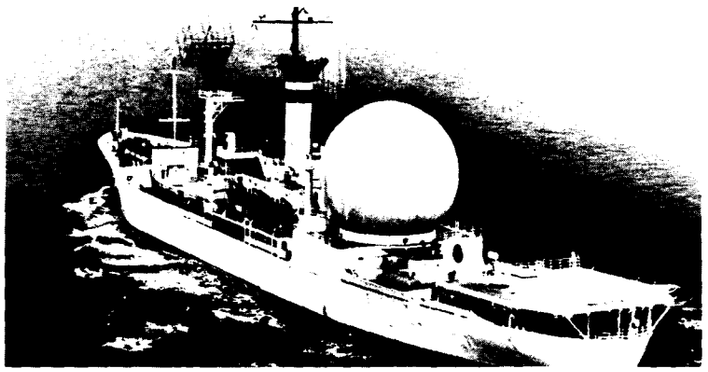
"With the 20-kilocycle tone we came very close to achieving the ultimate design accuracy of the system," said Mr. Bodin, branch head, in evaluating the performance.

With the range and range rate and angular data, plus estimates made from previous performances of the Delta rocket, Dr. Siry, Bob Chaplick, specialist in orbit and trajectory studies, Gerald Repass, mathematician, and others on Dr. Siry's staff determined the transfer orbit parameters of Syncom. Equivalent data would not have been accurately obtained from Minitrack data, which measures only angles and time, until more points could be established in Syncom's orbit.

Contributes Accurate Data

The range and range rate provided accurate data on the position and velocity of the spacecraft at the time of firing of the apogee kick motor, and led to the decision to fire the motor 10 minutes before the time set in the timer clock in the satellite.

Using this information and assuming that the velocity contributed by the kick motor to be either "nominal, plus 100 feet per second or minus 100 feet per second," three sets of search patterns were drawn up by Dr. Siry based on the alternatives.



The U. S. Kingsport in the Lagos, Nigeria, harbor serves as a ground station base for telemetry and radar contact with Syncom.

Using the patterns, the Boyden observatory at Bloemfontein, South Africa, with its big Super Schmidt telescope, entered the search along with other tracking stations and observatories within possible sight of the spacecraft. And sure enough, Syncom turned up almost exactly at one of the predicted points.

Designed by the Space Technology Laboratories under direction of Goddard, the range and range rate system utilizes some of the communications ground equipment of the U.S. Army Satellite Communications Agency and the communications transponder in the satellite. It employs the same concepts as a similar system now under development by Goddard (Goddard News, Feb. 25) to provide precise orbital information for "second generation" satellites in highly elliptical orbit.

Signals consisting of a radio frequency carrier plus range tones sent to the satellite and back measure the satellite's distance away, i.e., range, and its velocity with respect to the ground station, i.e., range rate. The time difference required for the range tone to travel to the satellite and back measures range, while range rate is obtained by measuring the carrier signal's doppler.

Unique Range Features

The Syncom ranging system, unlike the larger Goddard range and range rate system, did not require the spacecraft to fly an additional transponder. It utilized the Syncom's communications transponder for this purpose, receiving signals from earth on one frequency and returning them on another. The satellite is not used for communications while range and range rate data is being obtained.

Range and range rate equipment for Syncom is located at the ground communications stations at Lakehurst, N. J., and aboard the Kingsport. When Syncom was injected into its transfer orbit over the equator, only the Kingsport and the Johannesburg station were in sight.

Range and range rate system was used for the first time at 70 minutes after liftoff and again at 3½ hours during the transfer-orbit journey to apogee, when Syncom was about 21,000 miles from Lagos.

During this coast period, Johannesburg received data from the spacecraft. A communications test of 5 minutes also was conducted from Lagos. A voice message, music, and teletype transmission was sent up and down. All transmissions were successful, but contained considerable background noise.

At 22,000 miles, Syncom is very faint, only as bright as a star of the 17th magnitude, i.e., 25,000 times fainter than the smallest heavenly body visible with the naked eye. It's also pretty small, 28 inches across.

Drifting eastward in an orbital period of about 23 hours and 45 minutes, Syncom was last sighted by the large telescope at Canberra, Australia. Next sighting will be in several weeks by Pacific coast observatories. Communications tests also can be attempted again when in sight of U. S. communications stations.

Goddard News

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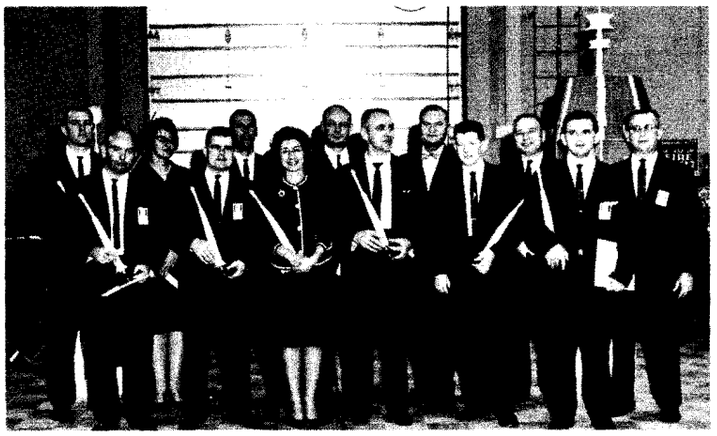
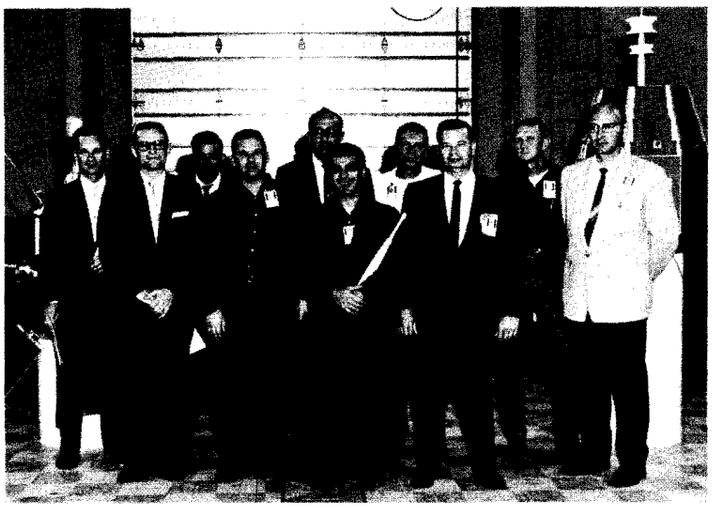
Editor .....Wesley Dibbern
Phone .....Ext. 4141 or 4142

A Deserved Tribute to the Delta Crew...

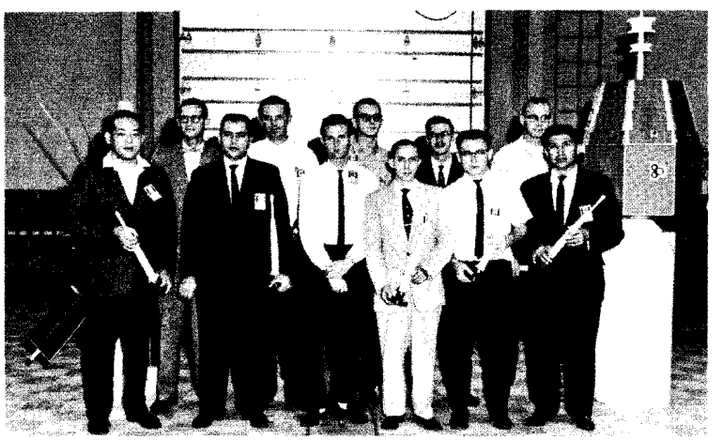


Back row, left to right, are spacecraft systems branch personnel John F. Corrigan, Elizabeth E. Corwin, Art Chilton, M. L. Moseson, John D. Gossett, Anthony Brozena, C. P. Smith; front row, Louis J. Ratcliffe, Walter Nagel, Lucille Loche, Bill Schindler, Robert Wilkinson, Frank M. Piszkin. Not pictured are Daniel G. Mazur, Charles R. Gunn and Tom Campbell.

Left to right are field projects branch personnel John J. Neilon, Raymond L. Norman, Robert H. Gray, Ernest G. Whitney, Helen R. Evans, Halford R. Greenlee, Mildred K. Fidler, Harold Zweigbaum, Regina D. Victor, Frederick G. Thorne, Bob Buck, Mary A. Brammer, Donald C. Sheppard, James W. Johnson, Frances S. Joseph and Lonnie L. Hughes.

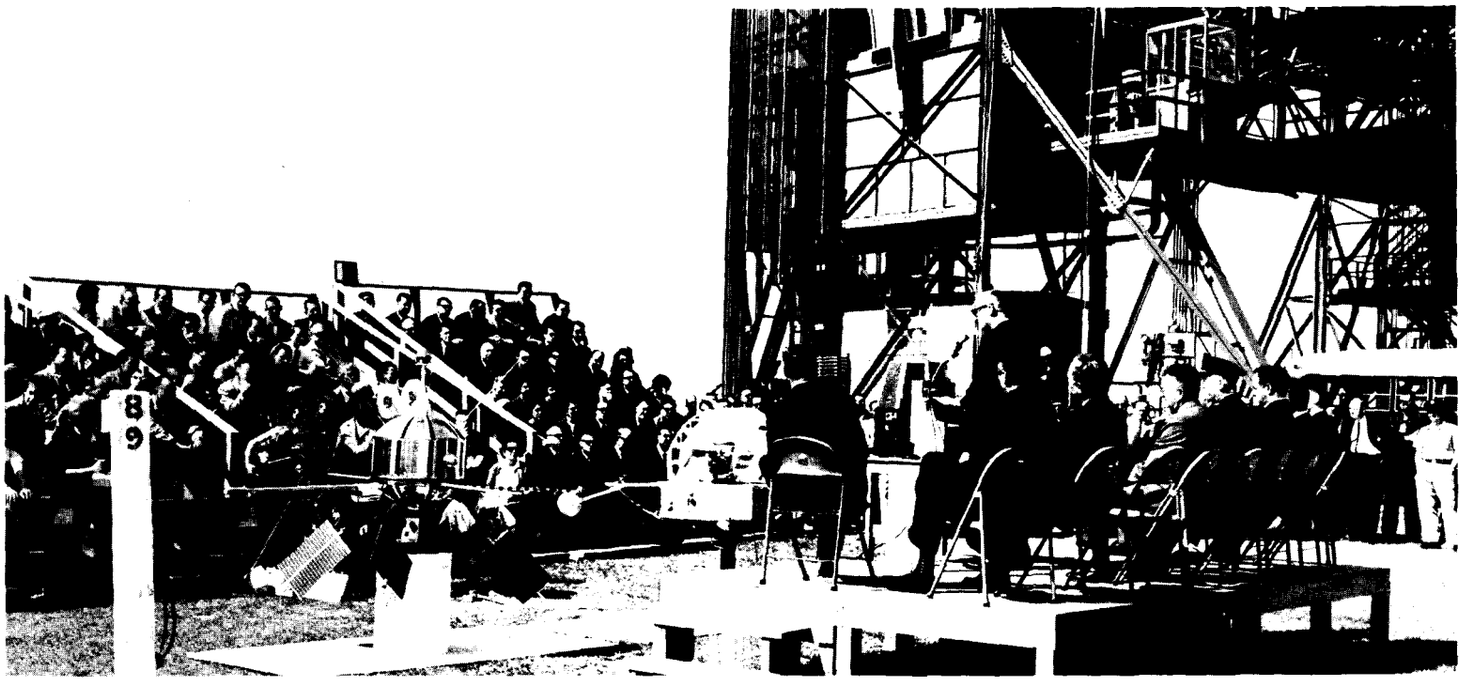


Left to right are field projects branch personnel Donald W. Phipps, Fred J. Stevens, William B. Moriarty, Hugh A. Weston, George C. Gentry, Jerry Tritto, Andrew A. Marck, Harry O'Dell, Paul J. Rowe, John R. Zeman. Not pictured are Marinus H. Latour, Mason Comer, and Arthur J. Mackey, Jr.



Representing New Mexico State University and RCA, which provide spacecraft and vehicle instrumentation support to the field projects branch are, left to right, Tom Noda, Bob Dicks, Tom Wieske, Dave Guyse, Richard Bruner, Jim Gallivan, Ernie Bourguin, Arthur Fuller, Glen Lindsey, Warren Harkey, Ernie Jeminez. All are New Mexico personnel except Dicks, Wieske and Bourguin, who represent RCA.

Dr. Goe't presents a letter of appreciation to Charles Able, vice president of Douglas Aircraft, on behalf of James Webb, NASA administrator.



Dr. Homer Newell, director of NASA's office of space sciences, addresses an estimated 200 Delta Day spectators at launch pad No. 17.

Many Factors Contribute to Delta Success Story

Delta became a member of the national launch vehicle family four years ago. At that time it was intended to be a temporary or "interim" booster. The NASA contract signed with Douglas Aircraft company in 1959 called for 12 Deltas. No more were contemplated.

Delta's launch debut in May 1960, at Cape Canaveral, offered little hope for its longevity in the family of space boosters. Its first job was to orbit an Echo communications satellite.

The "Delta 1, Launch Attempt Number 1," on May 5, ended with a "scrub" because Delta had a loose power connection. On May 13, the NASA - Douglas team tried again. This time, except for a five-minute "weather hold," countdown and liftoff were normal.

But Delta's third stage didn't ignite and the Echo satellite ended up in the Atlantic ocean instead of in orbit. This ill-fated first performance tended to confirm Delta's "interim" role.

Success Comes

By mid-summer, the second Delta was ready for another Echo launch attempt. Twice—on Aug. 8 and Aug. 9—the launch was scrubbed because something went wrong with Delta.

However, on its third try, on Aug. 12, Delta 2 performed as planned, and the Echo I, an inflated sphere passive communications satellite 100 feet in diameter, went into orbit, ultimately to be seen by millions of people around the world.

This first success seemed to be all Delta needed. Its Echo I performance grew into a string of 15 consecutive successful missions. In the words of NASA Administrator James E. Webb, Delta became "NASA's most reliable launch vehicle." The initial order for 12 boosters has been increased to 40, and Delta has "joined the family" and is staying well in the forefront.

Success Factors

Many factors have contributed to Delta's outstanding success. First of all, its basic components came from reliable, well-tested, existing hardware.

Its first stage—now modified from the original version—is basically the Douglas-developed, Air Force Thor intermediate range ballistic missile. Its modified Aerojet liquid fuel second stage and its solid fuel ABL X-248 third stage were used first on the Vanguard rocket which scored its initial orbit success five years ago this month.

The basic Delta is well engineered and possesses inherent versatility and capability, but not by hardware alone has it achieved its remarkable record of success.

Both T. B. Norris, Delta program manager at NASA headquarters, and Bill Schindler, Delta vehicle manager at Goddard, agree that while Delta is an outstanding rocket to begin with its 15-in-a-row record is the result of other equally important factors.

A Team Effort

They cite, for example, the close-working NASA - Douglas team. Many of its members were initiated into rocketry on the early multi-stage rockets developed during the 1950s. Without these invaluable years of continuous experience and know-how—making even the most technically perfect rocket perform properly would indeed be a difficult task.

Equally important, Norris and Schindler say, is the fact that people associated with the Delta never have been satisfied with success per se. From the management and technical standpoints, the Delta program undergoes a continual reevaluation and reassessment, and the vehicle itself is evolutionary in nature rather than static.

For example, the DM-21, higher thrust first stage was adopted last year along with extension of the propellant tanks of the second stage to give it the longer bursting time needed to achieve a synchronous, circular orbit.

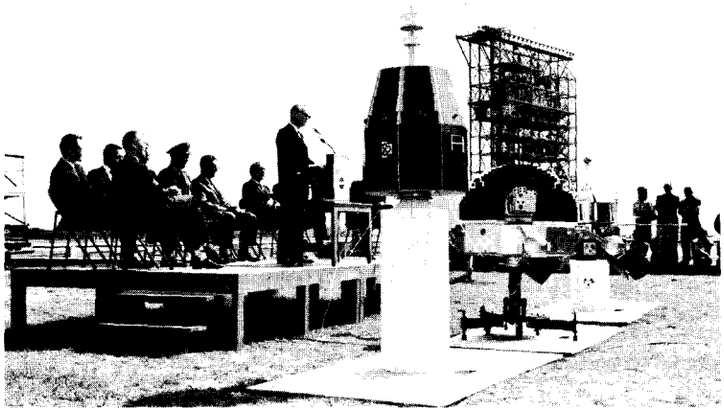
Finally, under NASA supervision, Douglas, the Delta prime contractor, with its key sub-contractors, has had a vital role in the Delta program.

The Douglas sub-contractor team includes the Rocketdyne Division, North American Aviation, first stage propulsion; Aerojet General Corp., second stage; Allegany Ballistics Laboratory, third stage management; Naval Propellant Laboratory, third stage manufacture; Bell Telephone Laboratories, second stage guidance.

Future Schedule

Delta will continue to play its important role in the U. S. space program well beyond the mid-1960s. In addition to continuing assignments to lift future Tiros, Orbiting Solar Observatory, Telstar, Relay, Echo, and Syncom satellites into orbit, two new programs are presently assigned to Delta. They are:

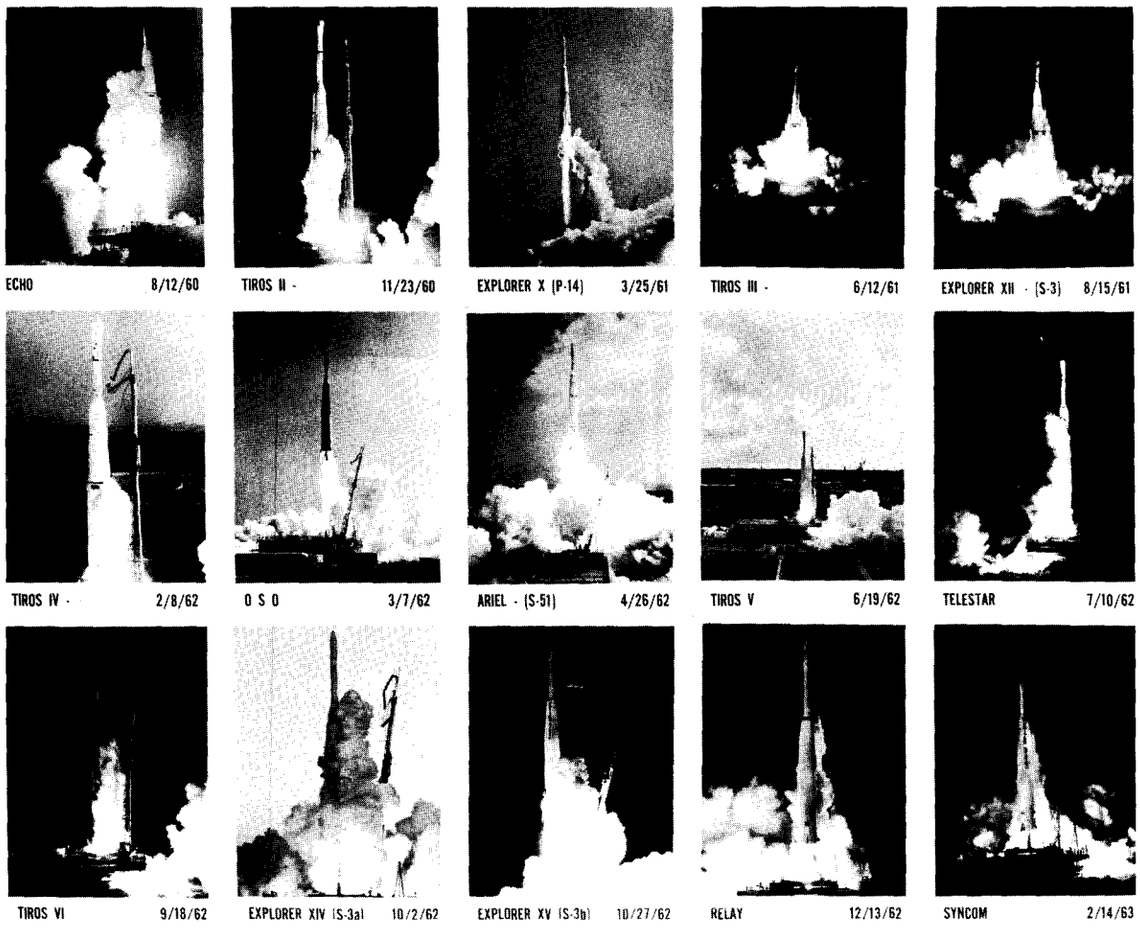
- The S-6, atmospheric structure satellite, a 375-pound orbiting laboratory to measure atmospheric pressures, ion densities and temperatures and study the composition of neutral particles.
- The interplanetary monitoring platform (IMP), a 125-pound spacecraft designed to study the radiation environment of cislunar space and develop a solar flare detection capability for the Apollo program.



Three Goddard spacecraft successfully launched by Delta rockets are exhibited before Delta Day visitors.

Dr. Kurt Debus, director of launch operations center at Cape Canaveral, welcomes officials and spectators to Delta Day ceremonies.

Back row, left to right, John J. Neilon, William R. Schindler, John D. Gossett, M. L. Moseson; front row, left to right, Dr. Richard Morrison, Bob Gray, T. B. Norris.



40 Deltas Bought Since '59

(cont'd from page 1)

meteorological spacecraft as well as new scientific satellites.

Unmatched Record

Since May 1960, 16 Deltas have been fired from Cape Canaveral. Except for the first flight, which was unsuccessful, succeeding Deltas have performed their missions flawlessly.

The Delta record to date of 15 consecutive successful firings is unmatched by any other U.S. space vehicle. Estimated cost of a Delta launch—exclusive of the satellite payload—is about $2.5 million.

When the initial Delta contract was signed in April 1959, 12 vehicles were ordered. At that time, Delta was intended to be an "interim" vehicle. However, because of its reliability and versatility, 14 more Deltas were ordered in October 1961. The 1963 order of an additional 14 vehicles now emphasizes the fact that Delta will remain a keystone in the U.S. space booster vehicle family for years to come.

July 9 Radio Noise Detected in Peru Gives Data on Energy Distribution.

What is synchrotron radio noise?

An electron spiralling in a magnetic field emits radio frequency energy. If its velocity is sufficiently close to that of light, the energy will be emitted over a band of frequencies, the maximum occurring much higher than the vibration frequency of the electron. This emission is known as synchrotron radiation.

Ochs

What has been learned about the natural radiation belt from the noise studies?

The natural Van Allan belts are composed of trapped electrons spiralling around lines of force in the earth's magnetic field. Dyce and Nakada in 1959 suggested that synchrotron radiation from these belts might be detected from the ground with suitable receiving equipment near the magnetic equator. At the Jicamarca Radio Observatory near Lima, Perú, we had attempted to detect this radiation but without success. The negative results, however, only indicated that the synchrotron radiation from the natural belts was certainly not much greater than predicted by Dyce and Nakada, and our equipment was not sensitive enough to detect it.

What is the significance of the polarization studies of the July 9 nuclear explosion over Johnson Island?

Gerard R. Ochs has been associated with the Central Radio Propagation Laboratories of the National Bureau of Standards, U. S. Department of Commerce, since 1956. Prior to 1960, he was engaged in the study of meteor trails by radio, and their practical application for radio communications. Since then, he has been a member of the staff of Jicamarca Radio Observatory near Lima, Perú. In this capacity, he has been responsible for the design and construction of the 22-acre antenna array at Jicamarca. He has taken part in various observing programs there, including measurements of synchrotron radio noise and the recent Venus radar experiment. Mr. Ochs spoke at the last weekly Goddard colloquium on March 8. A condensation of his talk, "Some Recent Observations of Synchrotron Radio Noise at Jicamarca Radio Observatory," is presented here.

The synchrotron radiation from electrons trapped in the earth's magnetic field is linearly polarized in an east-west direction. If the wave propagates normal to the magnetic field lines, the direction of the polarization is preserved. The receiving antenna at Jicamarca was pointed normal to the magnetic field to satisfy this requirement. When a very strong signal, linearly polarized in the east-west direction, was received shortly after the July 9 nuclear explosion, there could be no doubt that it arose from synchrotron radiation coming from a newly created radiation belt.

What conclusions have been made about the energies of the particles?

The rate of drift and dispersion of the electrons injected into the earth's magnetic field is dependent upon the electron energies. From a study of the first half hour of radio noise recordings after the explosion of July 9, Dr. D. T. Farley, Jr. of NBS has been able to estimate the distribution of energy of the trapped electrons producing the radio noise. This energy spectrum has been found to very closely match that of the bomb fission spectrum.

NBS has a large scientific facility in Perú. What is unusual about it?

The Jicamarca Radio observatory is actually a joint project of the NBS and its Peruvian counterpart, the Instituto Geofísico del Perú. Perhaps the most unusual feature of the station is the 50 megacycles-per-second dipole array antenna. Its collecting area of 22 acres is believed to be the largest in the world at the present time. Over four miles of 6-inch coaxial transmission line and over 6 miles of open wire line composed of 1-inch tubing are used to connect the 18,432 dipoles to a common feed point.

How was NBS's recent Venus experiment performed and what was learned about the planet?

It was fortunate that the experiment could be performed at all during the last close approach of Venus. The pointing direction of the Jicamarca antenna can be changed only slightly so that the planet must appear overhead at Jicamarca close to the time of its nearest approach to earth. Dr. Frank Drake of National Radio Astronomy Observatory pointed out to the Jicamarca group that the relatively rare combination would occur in late November and early December.

The experiment was performed the first week in December by transmitting alternately 3 millisecond and 0.5 millisecond pulses, 10 each per second, for approximately 3 minutes while the planet drifted through the antenna beam. The antenna was then rephased slightly to point farther west and the incoming signal was recorded, somewhat over five minutes after it was sent.

Analysis of the magnetic tape recordings has not been completed. However, preliminary results indicate that the average surface of Venus must be very smooth since no echoes were received farther than 500 kilometers away from that part of the planet closest to the earth. In all cases the signal arrived in short bursts which may indicate that flat areas exist on the planet's surface capable of focussing the echo.

Goddard Speech and Paper Presentations

(Technical presentations approved as of March 12 for period of March 18 thru April 3)

SPEECHES

Dr. W. E. Behring, solar physics branch, Optical Society of America, March 25-27, Jacksonville, Fla. ***"Theory of the Concave Grating for Arbitrary Locations of the Light Source"***

Dr. W. N. Hess, theoretical division, Institute of Radio Engineers, March 25-28, New York. ***"Progress Report on the Van Allen Radiation Belt"***

J. T. Mengel, asst. dir. for tracking & data systems, Joint NASA/DOD/FAA Guidance Systems Symposium, March 14-15, Bolling Air Force Base, Washington, D. C. ***"World Wide Tracking Networks"***

Charles E. White, spacecraft systems branch, American Rocket Society, April 1-3, Palm Springs, Calif. ***"OAO Structures"***

W. A. Wolman, systems review group, American Society for Quality Control, April 2, Washington, D. C. ***"Reliability Analysis for Space Sciences"***

PAPERS

C. R. Laughlin, space projects integration office, Institute of Radio Engineers, March 25-28, New York. ***"The Diversity Locked Loop—A Coherent Combiner"***

J. S. Albus & D. H. Schaefer, flight data systems branch, Institute of Electrical & Electronic Engineers, March 25-28, New York. ***"Satellite Attitude Determination: Digital Sensing and On-Board Processing"***

Free Civil Defense Course Open to Goddard Personnel and Families

A training course in civil defense open free of charge to all Goddard personnel and their dependents begins April 10. It will be taught each Wednesday from 7:30 to 9:30 p.m.

Arrangements were made by the Goddard civil defense planning office through the adult education division of the Prince George's County board of education.

Consisting of 12 hours of lectures and films, participants will receive instruction in individual and family action necessary in disasters, including nuclear war.

The course will be taught by Dr. Robert Travis, certified instructor in the Maryland department of education. Exact location will depend on the response received by the civil defense planning office.

Recent Technical Publications Authored by Goddard Staff

F. C. Cunningham, "Earth Reflected Solar Radiation Incident Upon Spherical Satellites in General Elliptical Orbits," NASA Technical Note D-1472, February 1963.

J. C. Seddon, "A Model of the Quiet Ionosphere," NASA Technical Note D-1670, March 1963.

S. Paull, "A Magnetic Core Voltage-To-Frequency Converter," NASA Technical Note D-1677, February 1963.

A. Cameron, "The Origin of Atmospheric Xenon," NASA Technical Note D-1685, February 1963.

W. N. Hess, "Neutrons in Space," NASA Technical Note D-1696, February 1963.

Four Engineers Train at Goddard to Open New India—U.S. Program

Four Indian engineers have arrived at Goddard to implement a new program of space research between the United States and India.

Scheduled for training in the sounding rocket branch for about six months, the Indians are learning the techniques of the first sounding rocket program to be introduced to their country this summer.

Under a memorandum of understanding between NASA and India's department of atomic energy, the program will be a joint scientific effort to explore the equatorial electrojet and upper atmosphere winds from the geomagnetic equator.

Karl Medrow, head of the sounding rocket branch and Goddard's project manager for the program, said that the experiments will be launched from a site which the Indian government is now setting up near the geomagnetic equator at Thumba, on the southwest coast of India near Trivandrum.

Dovap Specialization

Two of the Indians, A. S. Prakasa Rao (nicknamed "Junior") and P. P. Kale, are specializing in the dovap system (an acronym for doppler velocity and position) and will operate the dovap trailer ground station.

R. Aravamudan (shortened to "Dan" by his American colleagues) and B. Ramakrishna Rao (called "Senior") are training in telemetry, radar tracking and timing, and communications. All are under the supervision of Ed Bissell, head of the sounding rocket instrumentation section at Beltsville.

"The men have demonstrated sound educational backgrounds in the short time they have been with us," said Mr. Bissell. "Our approach now is to give them the practical instruction that they can use in carrying out their own sounding rocket program."

While eager to get to work, the group already is being exposed to some practical realities of life at Goddard quite unrelated to their intended missions. Temperatures well below the 50 degree minimums they have ever experienced in India and communicating among themselves only in English (each speaks an Indian dialect unfamiliar to the others) are two aspects of their new lives they are adjusting to readily.

Practical Instruction

To carry out the practical phase of instruction at Goddard, at least 25 per cent of the time will be spent at Wallops Island in operating the dovap and telemetry portable ground station trailers under field conditions. The two trailers are being assembled under Goddard direction and will be shipped to India in late spring under the agreement.

At Wallops, they will run acceptance tests on the airborne transponders, check out alignments and adjustments on antennas, and participate in actual flight firings utilizing the dovap system.

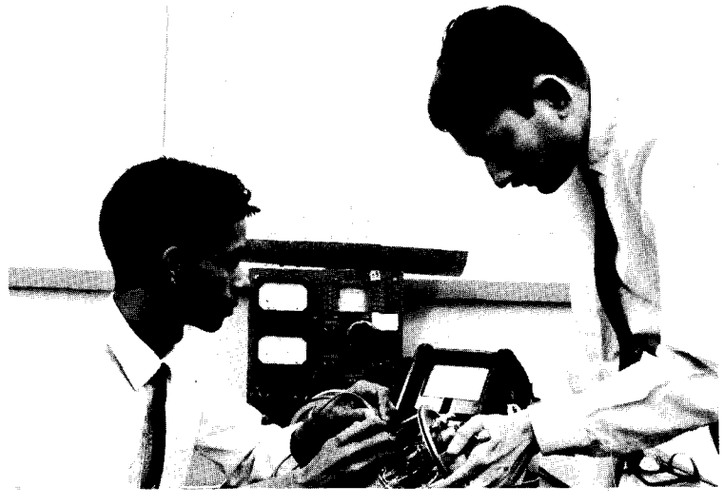
The telemetry "team" will train in airborne instrumentation, assist in assembling the telemetry trailer and use telemetry equipment located at Beltsville and Wallops on flight tests launched from Wallops. →

The training will be applied to the experiments carrying magnetometer instrumentation. These experiments will measure electric currents in the magnetic field and help determine the reasons for the increase in the field, which usually occurs between dawn and mid-day. The altitude of the electrojet is between 90 and 100 kilometers (about 56 and 62 miles) and it measures about 100 to 200 kilometers (62 to 125 miles) in width, centered on the magnetic equator.

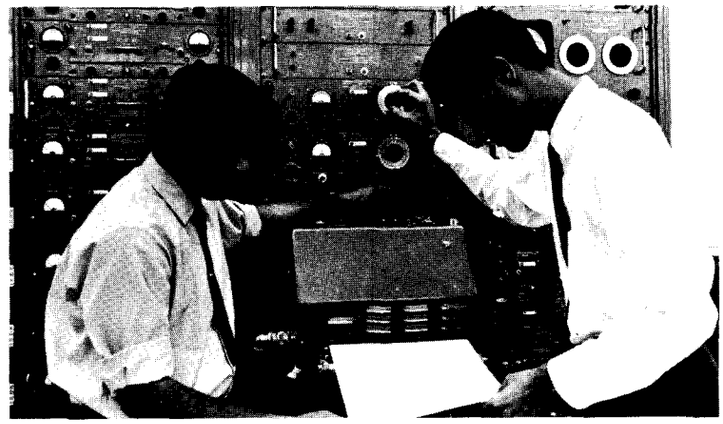
Exploration of the upper atmosphere winds will be conducted by the sodium vapor technique. (Goddard News, Jan. 28) for which Wendell Smith of the physics branch is project advisor.

For the experiments, NASA will provide the launch vehicles; launch, tracking, and telemetry equipment; and training of Indian personnel. India will provide supporting equipment and facilities, personnel, observations and data analysis, and the sodium vapor payloads. Dr. Lawrence Cahill of the University of New Hampshire is the chief NASA scientist and will provide the magnetometer experiment.

Members of the subcommittee on applications and tracking and data acquisition of the House of Representatives committee on science and astronautics toured Goddard last week. Listening to a briefing on the Nimbus meteorological satellite from William Stroud, left, head of the aeronomy and meteorology division, are Representatives Ken Hechler, West Virginia, subcommittee chairman, and John W. Davis, Georgia, Thomas M. Pelly, Washington, and Donald Rumsfeld, Illinois, members of the subcommittee. Present but not pictured was Representative John W. Wydler, New York. Other presentations were made by Goddard representatives Robert Mackey, head of the communications branch, and Hal Hoff, assistant head of the operations and support division. Dr. Harry Goett, Goddard director, welcomed the group.



A. S. PRAKASA RAO and P. P. Kale work on a dovap airborne transponder to be used in the sounding rocket program.



B. RAMAKRISHNA RAO and R. Aravamudan check a telemetry record during rocket payload integration at Goddard's Beltsville building.

News About Space & Aeronautics
—from the other centers and headquarters—

Flight Research Center at Edwards expects delivery this month of a Lockheed-Jet Star aircraft purchased for $1,325,000 from Lockheed-Georgia company, Marietta, Ga. The plane will be used for research purposes and modified to include a variable stability control system to permit the plane to fly a variety of advanced research missions. It will investigate such areas as aircraft flying qualities, automatic and manual control systems, pilot instrument displays and pilot training. Special emphasis will be placed on the simulation of those characteristics expected to be found on a supersonic craft.

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The largest contract awarded by NASA—$418,820,000—has gone into force with Boeing for development and production of the Saturn V first stage. The contract calls for 10 flight boosters and one ground test booster. The Saturn V first stage, largest rocket unit under development in the nation, will be powered by five engines each developing 1.5 million pounds thrust. Marshall will be the technical supervisor of the contract. Preliminary work on the booster has been started under an interim contract.

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D. Brainerd Holmes, director of the manned space flight office at NASA headquarters, has named two deputies, Dr. Joseph Shea and George Low. Dr. Shea, who becomes deputy director for systems, formerly headed the systems directorate. Mr. Low, presently director of spacecraft and flight missions, becomes deputy director for programs. Previously all major directorates reported directly to Holmes. The changes are designed to provide speedier action channels and generally strengthen the office organization.

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Albert Siepert, NASA's director of administration since 1958, will be the new deputy director of the launch operations center at Cape Canaveral. He will be the immediate deputy to Dr. Kurt Debus, director. Succeeding Mr. Siepert at NASA is John Young, whose job as deputy director of administration will be filled by Don Cadle, who has been director of resource programming in NASA's office of programs.

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A synchrocyclotron capable of accelerating protons to energies up to 600 million electron volts and to be used for advanced radiation studies in support of space missions will be built by the Catalytic Construction company of Philadelphia for NASA's new Space Radiation Effects Laboratory in Virginia.

The Catalytic Company will build, install and test the huge machine which will be a part of the new laboratory to be built at Oyster Point, in Newport News, about 10 miles west of the Langley Research Center. Langley will have management responsibility for the laboratory and cyclotron construction project.

In addition to the synchrocyclotron, the contract includes a 10 million electron volt electron accelerator, beam transport system, general controls and instrumentation, and related engineering services.

The laboratory facility will be used for simulating the high energy corpuscular radiation encountered in trajectories or orbits of proposed space flights.

Laboratory studies will include effects of radiation on spacecraft materials and components, as well as studies of shielding against radiation. The laboratory and cyclotron are expected to cost about $12 million and are scheduled for completion in mid-1965.

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Ames Research Center has been given management responsibility of the Pioneer and Solar Probe projects. Scheduled for a late 1964 launch. Pioneer will measure the characteristics of and the interrelationships between the particles and fields in space. The spacecraft will have 20 pounds of instruments and follow elliptical orbits around the sun. Communications with Pioneer will be attempted up to 50 million miles from the earth.

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Advanced degrees are held by 12 per cent of Marshall's 2,300-member professional staff. Fifty-six of the 285 professionals hold doctorates and 229 have masters'.

Representing the Boy Scouts' Region 6, Conrad A. Plyer, Jr., 16-year-old Columbia, S. C., Eagle Scout, presents the Viewpoint of Youth plaque to Goddard Associate Director Eugene Wasielewski.

12 Leading Scouts Visit Goddard

The nation's 12 leading Eagle Scouts representing each of the Scouting regions toured Goddard as part of their "Report to the Nation" visit to Washington recently.

Representing Scouting's 5,300,000 members, the honored Scouts trip to the capital and other eastern points of interest included visits with an array of leaders in federal, state and local government. Keith Kentopp, assistant director of public relations for the National Council of Boy Scouts, wrote that the trip was a great success.

"They had a real great week, highlighted by their visits with President Kennedy, Secretary Celebrezze, J. Edgar Hoover, Supreme Court Justice Goldberg, and NASA Administrator James Webb, but the greatest personal thrill and delight was that fantastic visit to Goddard. Their tour and the remarks of your Associate Director, Mr. Wasielewski, led two of the boys to seriously reconsider their vocational interests and lean towards some aspect of space exploration. For example, both of the fellows planning on medical careers are now thinking of space medicine."

2 T&E Engineers Chair IES Sessions

Two engineers in the test and evaluation division will be chairmen of sessions at the 3-day national convention of the Institute for Environmental Sciences in Los Angeles in April.

Tom Hollingsworth, head of the thermal-vacuum facilities section, thermodynamics branch, will chair the session on space simulation facilities. Neal Granick, research engineer in the structural dynamics branch, will be chairman of the advanced vibration technology session.

In addition, papers will be presented by the following test and evaluation division personnel: Dan Cope, assistant project manager for the space environment simulator, "Problems in the Construction of a Space Environment Simulator;" John New, division chief, "Achieving Satellite Reliability thru Environmental Tests;" and A. R. Timmins and K. L. Rosette, thermal-vacuum test section, "Experience in Thermal-Vacuum Testing Earth Satellites at Goddard."

An estimated 2,500 are expected to attend the meetings in the Statler-Hilton hotel. Approximately 70 papers are expected to be presented and 90 exhibits displayed.

Goddard men interested in trying out for the 1963 softball team should contact Jim Stephens, extension 4434. Organization of the team is now underway. It will compete in the Prince George's County Recreation Association league, a class A league. Interested persons should call by April 1.