GODDARD NEWS

GODDARD SPACE FLIGHT CENTER / GREENBELT, MARYLAND

VOLUME V, NUMBER 6 | THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION | AUGUST 26, 1963

NASA HEADQUARTERS GSFC NO

Goddard's Field Projects Branch Responsible for Delta, Agena, Centaur

The record that 19 successive Delta launch vehicles have set in flawlessly placing a variety of unmanned spacecraft into orbit didn't merely happen. It is the result of the painstaking efforts of hundreds of NASA and contract employees, each dedicated to seeing that his or her individual task is done to perfection.

Robert H. Gray, chief of Goddard's field projects branch at Cape Canaveral has a philosophy which makes the Delta successes more understandable: "100 per cent checkout assurance that everything on the vehicle and spacecraft is in perfect working order before launch."

"During the countdown, if we get any minute indication that something isn't normal—not necessarily that something is wrong, but that it isn't absolutely correct—we won't proceed until we're satisfied it has been thoroughly checked, and, if necessary, corrected." contends Gray.

"And, as spacecraft become more complex and expensive (some will cost more than their boosters) we must redouble our efforts to ensure that everything humanly possible to accomplish a successful mission is done."

Had it not been for this intensified persistence in assuring maximum conditions on every nut and bolt, from the base of the vehicle to the tip of the spacecraft, Delta's string of successes would have ended—abruptly and spectacularly—at seven.

It was during the last six minutes of the UK-1 countdown in April, 1962 that an abnormal condition was indicated as the second stage was being pressurized. The field projects personnel, applying the "100 per cent sure" philosophy, ordered the count halted for closer examination, then scrubbed on the speculation that something serious was wrong.

As it turned out, there was enough of a gas leak in the stage's tanks to have blown the Delta and its precious spacecraft to smithereens had the pressurization test lasted another minute.

Other Vehicles Are Larger

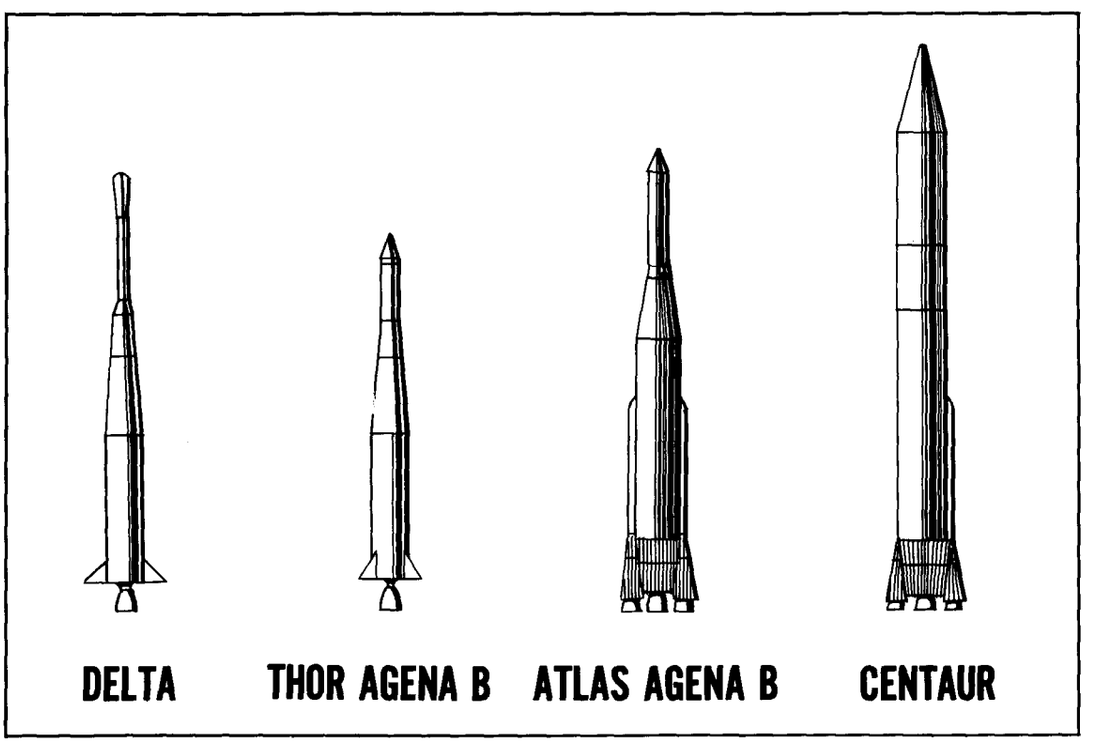
Delta, however, is just one of the three vehicles which are the launch responsibility of Goddard's staff of 80 scientists and engineers at Canaveral. The others, Agena and Centaur, are larger and will carry more complex and expensive spacecraft into orbit. These two vehicles are managed by Lewis Research Center.

Agena is used as a second stage for both Thor and Atlas boosters. Centaur is used with the Atlas booster (see illustration).

The responsibilities of the field projects branch begin with the Canaveral arrival of the booster—usually three to four months in advance of the launch date.

Gray and his people then monitor and direct the prelaunch preparations and launch operations of the boosters and the spacecraft.

Their schedule, already the busiest within NASA, will increase to an average of a mission every two weeks next year at Canaveral. They are also responsible for numerous launches from the Pacific Missile Range (PMR), where the branch manages an operation similar to that at the Cape.



Goddard has launch responsibilities for Delta, Agena, and Centaur vehicles.

Robert H. Gray

'Flying Saucer' Clouds Studied By United States and Sweden

Sweden and the United States jointly conducted a series of sounding rocket launchings early this month to study noctilucent clouds near the Arctic Circle in northern Sweden. Some reputed "flying saucer" sightings in recent years have been later identified as noctilucent clouds.

These clouds are faintly luminous, very high and fast-moving, and can be observed at twilight only during short periods in late summer and at high latitude.

The effort is part of a continuing program between NASA and the Swedish Committee for Space Research for cooperation in the scientific exploration of the upper atmosphere. Goddard has been responsible for project coordination with Swedish scientists.

TAKING THE LOW ROAD:

Following the Path of the Satellites

At a cost of millions of dollars (but only minutes in time) a satellite launched from the United States is able to make its first pass over Goddard's South American tracking stations. At considerably less expense and more time—59 days to be exact—a car leaving New York can trundle across the deserts of Mexico, through the mountains and jungles of Central America, around the swamps of northern Columbia, and over the towering Andes to the station south of Quito, Ecuador.

Christopher Trump, information officer for Goddard's Institute for space Studies in New York, and his wife made the journey this spring under a Pulitzer Grant from the Columbia University Graduate School of Journalism. His report to the GODDARD NEWS *follows:*

It was a chilly fall day—May 1—when the car coughed to a stop at the whitewashed control shack 11,900 feet above sea level and ½ degree below the Equator. Low-hanging clouds concealed the snow peak of Cotopaxi. To the left of the building four llamas were making short work of the stubby grass.

Inside things were more like home — electronic gear, gray office furniture and a greeting from Director Donald McClenon. Surprised to see us? Not at all. Three weeks earlier two Americans on motorcycles had stopped in for a visit.

"This Pan American Highway is getting to be regular thoroughfare," commented McClenon.

At the moment the equipment was monitoring Goddard's OSO (Orbiting Solar Observatory) —a routine chore, since the station has the capability to receive data from three or four satellites simultaneously. This tracking is a 24-hour job seven days a week involving a staff of 60; about 20 from NASA and Bendix and the others, Ecuadorians. In addition to antennae receivers the station can visually track such satellites as Echo I with a special camera mounted in another building.

"It's possible," said McClenon, "but nine times out of ten we're socked in. The other night a fellow wrote in the log: 'no photo, couldn't find the shack.' "

However, there is an even more important use for the camera. Every six months Goddard's satellite network calibration plane arrives from Baltimore's Friendship Airport to fly over the station at various altitudes and angles of 10, 20 and 30 degrees on north-south and east-west flights. About 30 photographs are taken of the plane at different positions. They assure that ground tremors and settling have not impaired the accuracy (within two seconds of arc) of the antennae.

McClenon has been in Quito two years. In the evening he studies Spanish or he may be at the ham radio set, trying to raise a friend or relative in the States.

Deeper into South America

A thousand miles further south, in the Peruvian desert above the seaport of Ancon, is another tracking station. Here again a few Americans are working with Latin American colleagues in tracking an average of five satellites a day.

On June 8, 12,800 miles and five blown tires out of New York, we arrived at the tracking station at Colina, Chile. For the first time in days the sun poked through the late autumn fog of the central valley as Joe Bacigalupo, a Bendix field engineer, showed us around the property. This station, like the one near Quito, is a beehive of activity as construction progresses on a deep-dish scanner that will increase the capacity of the minitrack system used in Goddard's space tracking and data acquisition network (STADAN).

The Colina station has become a powerful magnet for the physics and astronomy departments of the University of Chile in nearby Santiago. The historic university provides about 25 full-time employees, and students make frequent visits to the site to work on research projects. In this way the space age has brought a new stimulus to one of the oldest universities in the hemisphere.

Our journey near its end, we found time for one more blowout and 2,335 additional miles in southern Chile before heading back to the States the easy way (relatively speaking) aboard a nitrate freighter.

Llamas roam near the antenna at the Quito STADAN Station.

At left is Goddard's Chris Trump, Institute for Space Studies, at the Quito station. Don McClenon, station manager is at right talking with Guillermo Bossano, an attorney from the Ecuadorian city.

Impetus

Editor's Note: This column of thoughts from various quotable sources will run whenever ideas are available which fit this definition—"comments which give impetus to the creative mind; which stretch and exercise the intellect." Publication does not necessarily imply endorsement.

"For every article one sees in a technical journal or for that matter even in the public press, a decision has to be made: is this worth reading or is it something that can safely be skipped? It seems to us that there is no acid test or even a small group of tests which will serve to distinguish infallibly between crackpot work and good science.

"Since there is no single test, the best we can do is offer a check list of some of the attributes of science and of the crackpot to help in making this decision.

"If predictability is to be used as a test of science, what then shall we do with the astronomer? Astronomy is universally conceded to be a science and in fact is one of the few sciences not only acclaimed but supported by the general public with no demand for a 'practical' payoff. Some aspects of astronomy include predictions; orbital motions for example, can be predicted with great precision, but there are large areas of astronomy for which prediction is virtually impossible. . . .

"In a similar way, it could be argued that a crackpot can be spotted by the (crackpot) way he tries to communicate. If he talks like a crackpot, fine, perhaps you can thereby damn him, but you take a real risk by doing so. Many weird ideas (weird, that is, after the acid test of time) have been advanced in the canonical form of true science. Yet there are many examples in history of people we now regard as outstanding scientists whose early writings look like those of a raving lunatic.

It seems fruitful (and fruitfulness is one of the attributes of science) to try to list some of the attributes of scientific endeavor (and/or crackpotism) and try to use the list as a measuring device.

"The scientist says 'I did thus and so and observed its effect; you are free to repeat my steps.' The crackpot often says, 'This is revealed truth; sorry, but I and my followers are the only ones who can obtain these results.'

"The scientist seeks to devise controlled experiments if he can (the astronomer, for example, rarely can); the crackpot often seeks to avoid controlled experiments.

"There is a principle which says that, of two possible explanations for the same phenomenon, scientists prefer the simpler; that is, the one requiring the least hypotheses.

"The argument here is that the more scientific a subject is the more it tends to lead to 'fruitful' results. The meaning of 'fruitful' here is the ability to suggest new ideas—new approaches and new tests—rather than practical or material results.

"Weight of authority tells, among scientists; it is equivalent to building up credit. Each new subject which claims the mantle of science is supposed to be immediately submitted to known and recognized scientists for both opinion and test.

"Most scientists soon discipline themselves in accepted methods of communication with their colleagues, their cohorts, and the public. The crackpot scorns accepted channels (he is even apt to deride those who 'knuckle under' to accepted practices).

"This is a minor point, perhaps, but we expect a scientist to tend toward humbleness, and we tend to honor him accordingly.

"In general, the scientist tends toward phrases like 'It appears that. . .,' 'It would seem plausible that. . .,' and the like. The crackpot is generally dogmatic and arbitrary.

"The true crackpot can frequently be spotted on this test alone. He proceeds with an argument like this: 'They laughed at Fulton. He was right. They're laughing at me. *Therefore,* I must be an equal genius.'

"It seems to be a characteristic of crackpot literature that statistics are not only used, but continuously explained. The crackpot is fascinated to have discovered that a coin tossed 1000 times doesn't necessarily fall heads 500 times. The true scientist may give the chi -squared value, but he seldom ends the sentence with an exclamation point."—*Fred J. Gruenberger, The Rand Corporation.*

Goddard's Syncom II in Place After Intricate Maneuvers

The final maneuver to bring Syncom II "on station" has been successfully completed, placing the satellite in definite synchronous orbit over Brazil and the South Atlantic Ocean.

Goddard engineers directed nitrogen jets on board the spacecraft to be fired as the satellite neared the desired meridian of longitude. The actual command was executed from a ground station at Lakehurst, N. J.

Administrator James E. Webb called the completion of the maneuver the culmination of "one of the outstanding feats in the history of space flight."

He added, "the knowledge required to achieve the synchronous orbit with Syncom II fills an important gap in our exploration and utilization of space."

This was the third in a series of three jet firing operations which slowed the spacecraft's drift from a speed of 7 degrees a day and guided it to its prescribed position.

Syncom is now moving at the same speed as the earth's rotation, thus appearing to hover over one area constantly. This is not a true stationary orbit, that is, in perfect alignment with the plane of the equator and appearing to stay in one place over the equator.

Instead, it will remain in synchronous orbit over Brazil and the Atlantic Ocean while moving in a figure 8 pattern 33 degrees north and south of the equator.

Syncom II is now traveling at about 6,800 miles per hour approximately 22,300 miles high. Station-keeping will take very little energy. There is enough hydrogen peroxide and nitrogen gas abroad to keep the satellite at 55 degrees west for about two years.

President John F. Kennedy and Nigerian Prime Minister Sir Abubakar Tafawa Balewa joined other U.S. and Nigerian leaders in formally inaugurating the Syncom satellite with a live public telephone call between the heads of state last Friday. The half-hour demonstration program (via Syncom) was arranged by the United States Information Agency. It originated from the White House and Voice of America studios in Washington, and the ground station aboard the U.S.N.S. Kingsport in Lagos Harbor, Nigeria.

GODDARD NEWS

Phone—Ext. 4141 or 4142

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

—DR. ROBERT H. GODDARD

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

Bruce Brough, *editor*—Shirley Deremer, *Inside Goddard*

Goddard Claims One of America's Finest Electroplating Facilities

Jim Meadows checks the dimensions of a circuit pattern on the negative to make sure dimensions are as specified.

Plastic-coated tanks filled with rainbow-hued bubbling liquids are arranged, row on row, in a brilliantly lighted spotless laboratory in building 5.

Skilled artisans, outfitted with acid-resistant clothing are engaged in scrubbing metal plates, immersing objects in tanks, and adding chemicals. This activity effortlessly performed by skilled professional electroplaters, can be seen in Goddard's electroplating laboratory, one of the finest in America.

"Often we have people referred to us who are amazed to discover we have a complete facility here for etched circuits, plating, anodizing, chemical milling and electroforming," commented Charles E. Whitfield, section head. "Yet we have done jobs for every division in Goddard."

Whitfield has six craftsmen working with him: Earl Ellis, James Meadows, Wade Smith, Frank Purvis, Leonard Owens and Allen Fritter.

The section manufactures printed circuit boards with through-holes, plating for satellites, electroforms optical and electronic components, chemical mills, electro-plates metallic and non-metallic materials, and anodizes, dips and hard coats aluminum.

Unusual problems presented to this group encompass the manufacturing of micro thick aluminum oxide coatings for material detectors, gold spheres 0.001 inch thick, and ellipsoidal reflectors. These and many other problems have been met and fully solved by the section.

Printed Circuits Aren't

Printed circuits are not printed at all. They are fabricated by a photo-engraving process here at the center in Whitfield's plating facility.

A four by five-foot lighted frame containing an oversized drawing of a miniature printed circuit trundles into place on a seven-foot high overhead track. Then lights flash on—and a huge engineering camera records the intricate pattern on a photographic

This overall view of the main laboratory in the plating area shows Al Fritter (foreground) preparing electronic parts for plating. Frank Purvis (center) is ready to use another plating solution. Wade Smith is cleaning a form.

Dusty Rhodes Finishes 12th In National Matches

Dusty poses with his many trophies, medals and sterling awards. He has over 100 wins.

One of the important factors of Dusty's hobby is keeping those pistols in tip top condition. Here Dusty cleans his .45 caliber pistol which he used in the National matches.

"Pistol Pack'n" Lloyd (Dusty) Rhodes, data instrumentation development branch, has quite a shoot'n record to boast about. Dusty competed in the 1963 National Matches (Pistol Division) held Aug 1-10 at Camp Perry, Ohio. Out of 600 civilian competitors he finished in 12th place.

In the civilian category, he attended as a member of the State of Maryland team.

Total participation in the matches, including wives, was 2771. The national matches are sponsored jointly by the Armed Services and the National Rifle Association (NRA).

In the three gun aggregate match, which determines the national rankings. Dusty used a .22 caliber pistol, scoring a 868-20x; a center fire pistol, scoring a 836-16x; and a .45 caliber pistol, scoring a 837-20x. The total, for the three gun aggregate was 2541-56x of a possible 2700-270x. That's extremely good marksmanship in any language.

This was Dusty's best for the national matches competition and his third best personal overall score. He won five sterling silver teaspoons at the national 1963 matches, which makes a total of 44 pieces of sterling he has received to date. He also attended the national matches during 1958 and 1959 while employed by Hollowman AF Base as a member of the N. Mexico State Pistol team.

His wife Anne said, "This is great, we have ten complete place settings and it hasn't cost us a cent."

Dusty first became interested in pistol shooting in 1958 when he attended the United States Military Academy (West Point) in New York State. He has been competing, as a member of the NRA, since 1955.

There are four categories to work for starting with: Marksman, Sharpshooter, Expert and Master (which is the top). Rusty achieved the Master category in June 1956 while he was employed by Geophysical Service Inc. in Santa Barbara, Calif.

Dusty his wife Anne and their five sons—Michael Sean, four; Robert, six; Danny, eight; Steven, 10; and Lloyd III, 12, reside in Cheverly, Md.

Lloyd III seems to be following in "Dad's" footsteps. At the age of 12 he has competed in the Junior Rifle Program which is sponsored by NRA.

Dusty's magical goal is to be a member of the exclusive 2600 club.

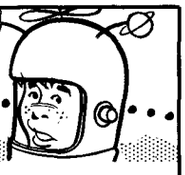
He is a member of the NASA-Goddard Gun Club whose membership exceeds 100.

INSIDE GODDARD

GODDARD SPACE FLIGHT CENTER / GREENBELT MARYLAND

August 26, 1963

FROM "LIL ASTERNERTS"...



Dear Sir, Aug. 8,

I am a boy of 9 and I collect space. I would like for you to send me some books and pictures about space to add to my collection.

Jerry T.

TID FROLICS AT BRIGHTON DAM

The sunshine and people made a great combination for the technical information division picnic.

The big day was Aug. 10 and the place was Brighton Dam.

Events at the picnic included balloon blowing, tug of war, sack races and baseball. The women surprised the men by overtaking them in the tug of war.

Committee members responsible for the successful day were: Ron Craig, Aletha Gardner, Betty Gasch, Leon Ringler and Bea Wyatt.

Leo Smith, graphic services branch, finds it hard to tell Timmy and Barbara Ann the ride is over. Pilot for the cruise is Clifford Brown.

Gay Ferrante, procurement division, like everyone else, is looking forward to the Labor Day weekend. Gay reminds us not to be too gay on the highways.

Goddard Welcomes

Hageman

Osler

Peters

Imlay

Mills

Kramer

Kullberg

Mitchell

Payton

Penge

Small

Zivkovich

Katherine Hageman, space data acq., div; *Samuel Osler, Joseph Peters*, spcft. sys. & proj. div.; *Marietta Imlay, Byron Mills*, test & eval. div.; *Robert Kramer*, spcft. int. & sounding rocket div.; *Donna Kullberg, Walter Mitchell*, proc. div.; *F. J. Payton*, data sys. div.; *Anthony Penge*, operation & sup div.; *John Small*, facil. engr. div.; *George Zivkovich*, office of asst. dir. for admin.

Greg Hutchison, son of Don Hutchison, chief of TID, readies his fishing rod to try for a catch.

—From Aluminum to Zinc

plate reducing it exactly to the size a Goddard engineer has specified.

This is the first step in a process by which the section will produce a "printed" circuit for one of NASA's latest satellites.

In addition to non-conductive materials (fiberglas and plastics), the section plates over almost any metal. Plating materials used include: copper, nickel, cadmium, chromium, silver, gold and rhodium. On request, any of the plating craftsmen can plate exotic or unusual metals on selected backing materials.

Waste Disposal—Ventilation Stressed

A new unit is being completed to chemically dispose of toxic chromic acid waste. Chromic acid is a by-product of the plating process which formerly had to be diluted greatly before it could safely enter the sewer system.

Goddard's shop claims one of the most advanced ventilation and air purification systems in use anywhere. Where most systems only exhaust air, the Goddard system blows and exhausts. There is an exhaust above each tank where toxic solutions are used.

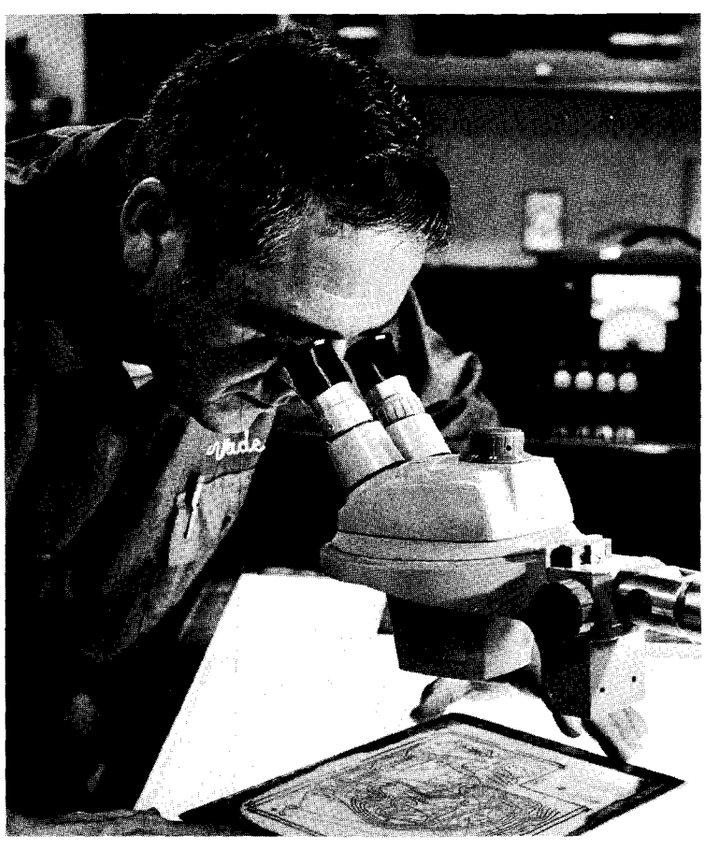
A vapor hone in the plating area cleans corrosion from circuit boards by bombarding the material with a chemical vapor under high pressure at high speed.

Experienced, Specialized Personnel

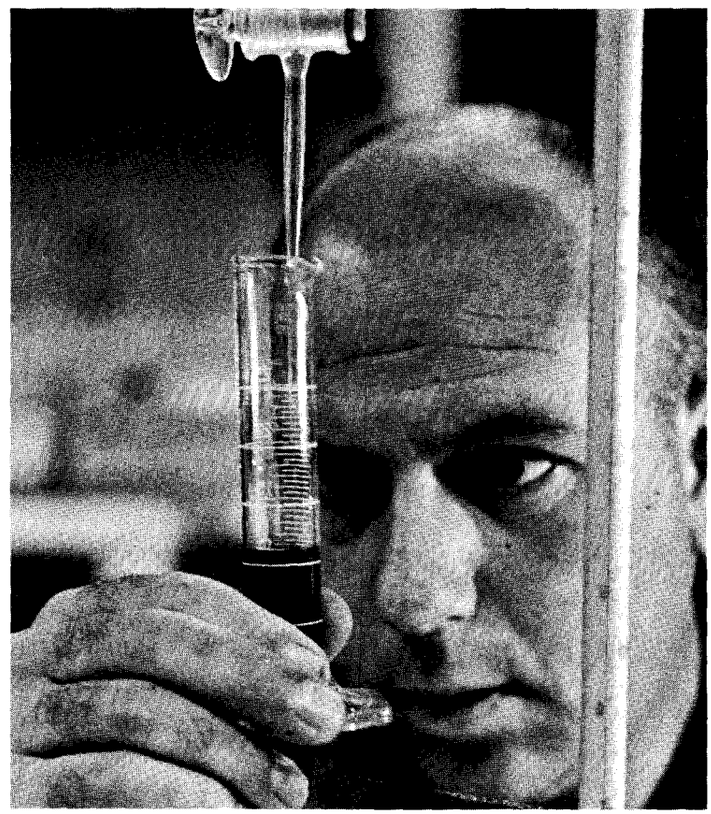
The personnel all are experienced in their specialties, and any one of the six is capable of analyzing his own plating solution before use. Circuit boards are also inspected under a microscope before plating.

Section head Whitfield has designed a tiny plating device for use in plating minute ball bearings with precious metal. The rig was fabricated for him by the machine shop, and is in use plating bearings for test purposes.

Plating, a craft centuries old, is brought into step at Goddard with the space effort by qualities that have made America great—innovation and adaptation to meet the need at hand.

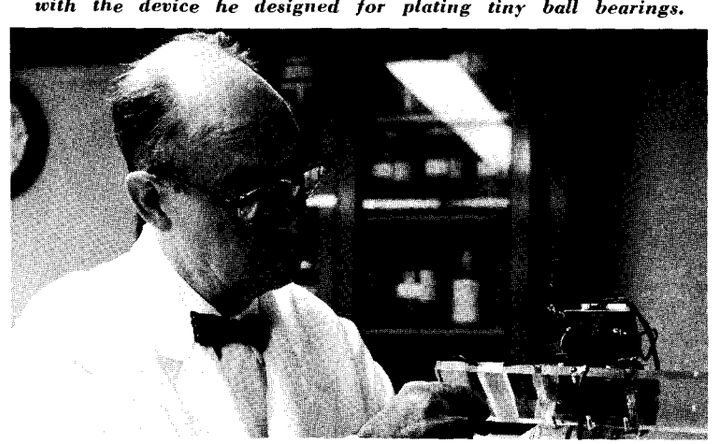


Wade Smith checks through-the-hole plated circuit board with a high-powered microscope.



Frank Purvis analyzes a nickel bath plating solution.

Jim Meadows (above) prepares art work for a "printed" circuit for the engineering camera. Section head Whitfield (below) with the device he designed for plating tiny ball bearings.



Dr. John O'Keefe

Discusses Moon 'Scars'

"Deep disturbances in the earth" may be the scars of the moon, left from billions of years ago when that satellite tore away from its mother planet.

Dr. John O'Keefe, assistant chief of Goddard's theoretical division, presented this concept of the formation of earth's natural satellite to scientists attending the week-long conference on artificial satellites held early this month at Virginia Polytechnic Institute.

This idea has cropped up many times during the past century as pure speculation, but has received some support in recent years from the artificial satellites.

Satellite measurements of the earth's gravitational field have provided precise measurements of the earth's mantle (the layer under the outer crust). O'Keefe said that the hills and valleys recorded in the mantle support the theory that they are results of the moon's break-away more than four billion years ago.

The Roanoke, Va., *World-News*, reporting on Dr. O'Keefe's presentation at VPI, said: ". . . Calculations of how much the earth should be flattened by rotational forces do not agree with the true amount of flattening indicated by artificial satellites.

"As an explanation for this discrepancy, Dr. O'Keefe suggests that the earth is 'remembering' a time when it was rotating at a much faster rate than the present 24-hour cycle.

"Dr. O'Keefe speculated that the moon was formed 4½ billion years ago, the time when it is presently thought the core of the earth was formed, followed by the mantle. He reasoned that the moon was formed at the same time as the mantle because the moon's mass has a density like that of the mantle.

"At the time the core was formed, Dr. O'Keefe said, the earth was rotating once in three hours. As the mass of the earth cooled, iron separated from the mixed ingredients of the liquefied planet and formed the core.

"Already whirling at the point of instability, the formation of a core would push the planet over the edge of stability, Dr. O'Keefe said. The earth would assume the shape of a cigar becoming flatter and flatter until some of the tortured material broke off to start its own existence.

"The process of breaking off also would retard the swift rate of rotation, the scientist said, but not enough to force the young moon and earth to end their separate existence.

"Dr. O'Keefe said the theory could be substantiated if exploration of the moon's crust should reveal a similar composition to that of earth's. He cautioned that as yet, 'these remarks cannot claim to be an established theory.' "

News About Space & Aeronautics

● NASA will launch two Explorer-series satellites on a Scout launch vehicle late this year.

Langley Research Center has awarded a $478,922 contract to the State University of Iowa, at Iowa City, to provide one of the University's series of Injun satellites containing instruments to record corpuscular radiation streaming into the earth's upper atmosphere from space.

The second spacecraft will be a 12-foot polka dot inflatable sphere similar to Explorer IX to measure air density.

Both the sphere and the Injun are scheduled to be launched into a near-polar orbit from the Pacific Missile Range late in 1963.

The launch will mark two firsts:

—It will be the first attempt to measure air densities by a polar orbiting satellite.

—It will be the first attempt to use Scout to place two satellites into orbit at the same time.

The two-part experiment is intended to provide new scientific knowledge of how the earth's atmosphere reacts to radiation from space. It is thought such radiation tends to heat the upper atmosphere, thereby changing its density and probably causing it to extend further upward from the earth.

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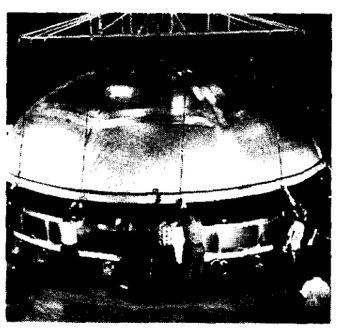
● A large version of the proverbial "chrome-dome", this upper dome of a fuel tank for the Saturn V moon rocket is being lowered into place on a "Y-ring" to which it will be welded at Marshall Space Flight Center. The Y-ring will then be welded to a cylindrical skin segment to form half a tank. The two tank halves will be joined after antislosh baffles have been installed. Two tanks, with connecting skin segments, will form the main fuselage of the S-IC stage. Five F-1 engines, developing 7.5 million pounds thrust, will then be installed to the thrust structure.



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● On the third birthday of Echo I, a $362,000 contract for three Echo II balloons was negotiated by Goddard with the G. T. Schjeldahl Co. of Northfield, Minn.

One of the new balloons will be used for further static inflation tests. Another one will be used for orbital flight, and the third is a backup. The Echo II balloon is 135 feet in diameter, and constructed of laminated mylar plastic and aluminum.

• • •

● ". . . Those who argue that we should dispense with the frills of science and space exploration, and concentrate on the necessities of military development, forget that we can't really say what the military necessities in space will be.

"Our crystal ball is not that good, and it would be foolhardy to pretend that it is. We do not wish to develop a Maginot line in space, only to have it flanked by forces of greater flexibility. We need to develop in a broad way our space capability so that we shall have the ability to move in any direction required by future events to meet any threats along whatever lines they may develop.

To do otherwise would be like the person who decides to learn to play the piano, but eschews practice of the fundamentals, and goes directly to learning some difficult piece that he likes. Not only will he have unnecessary difficulties in learning the composition, but once he has learned it that will be all he can play. In contrast, the individual who goes at fundamentals first will, in due time, be able to play in stride not only that piece but also all others of comparable difficulty. . . ."—*Dr. Homer E. Newell, Director of NASA's Office of Space Sciences*

U.S.–U.S.S.R. to Coordinate On Peaceful Space Projects

NASA and the Academy of Sciences of the USSR have given final approval to a Memorandum of Understanding which outlines procedures to be followed for carrying out a coordinated weather satellite program, joint communications experiments with Echo II, and joint contributions of satellite data to the World Magnetic Survey to be conducted in 1965.

The Memorandum of Understanding was drafted at meetings between American and Soviet scientists at Rome in March, and at Geneva in May of this year, subject to review by NASA and the Soviet Academy.

A full-time telecommunications link between Washington and Moscow is scheduled for establishment by early 1964 for the transmission of cloud photographs and other data from experimental meteorological satellites operated by each country.

The memorandum provides that other countries may receive such information from this link on a cost-sharing basis. Ultimately, this program is to involve coordinated launchings of operational meteorological satellites.

Echo Experiments

The Echo II experiments will involve transmissions between the Zemenki Observatory of the Gorky State University in the Soviet Union and the Jodrell Bank Observatory in the United Kingdom. These experiments, beginning early in 1964, will include transmissions from the United States to the Soviet Union, using conventional facilities between this country and England.

In the magnetic field survey, each country will launch a satellite to measure the earth's magnetic field, supplementing the various ground, sea and aerial measurements undertaken internationally during the World Magnetic Survey. Results will be exchanged and compared.

The bilateral space program stems from an exchange of views between President Kennedy and Chairman Krushchev on cooperation in space activities following the successful orbital flight of American Astronaut John H. Glenn in 1962.

The principal scientific negotiators have been Dr. Hugh L. Dryden, Deputy Administrator of NASA, and Academician Anatoly A. Blagonravov, Chairman of the Commission on Exploration and Utilization of Outer Space of the Soviet Academy of Sciences.

Explorer Scout Dean Manolatos (center), presents a resolution to Dr. Goett honoring the center's support of scout space projects.

Goddard Speech and Paper Presentations

(Technical presentations approved as of August 20 for period of August 26 through September 8. Requests for copies of speeches and papers should be made directly to the author.)

PAPERS

Rodger A. Cliff, Association of Computing Machinery, Denver, Colorado, August 27-30, ***"Computing Squares and Square Roots by Series."***

Myron Lecar, American Astronomical Society, New Haven, Conn., August 26-29, ***"Steady State Atomic Populations in Stellar Atmospheres."***

R. J. Coates, 5th International Symposium on Space Technology and Science, Tokyo, Japan, September 2-7, ***"Telemetry Data Processing for the Eccentric Orbiting Geophysical Observatory Satellite."***

Robert H. Pickard, 5th International Symposium on Space Technology and Science, Tokyo, Japan, September 2-7, ***"Relay I Spacecraft."***

Wilfred E. Scull, 5th International Symposium on Space Technology and Science, Tokyo, Japan, September 2-7, ***"The Orbiting Geophysical Observatories."***

Hong-Yee Chiu (Institute), 5th International Symposium on Space Technology and Science, Tokyo, Japan, September 2-7, ***"Formation and Detection of Very High Density Stars."***

Robert E. Bourdeau, USNC-URSI General Assembly, Tokyo, Japan, September 9-20, ***"Space Flight Studies of the Ionosphere."***

SPEECHES

Laverne R. Stelter, American Radio Relay League, Sheraton Park Hotel, Washington, D.C., August 31-September 1, ***"NASA Communications."***

13 Selected For ¾ Program At Catholic U.

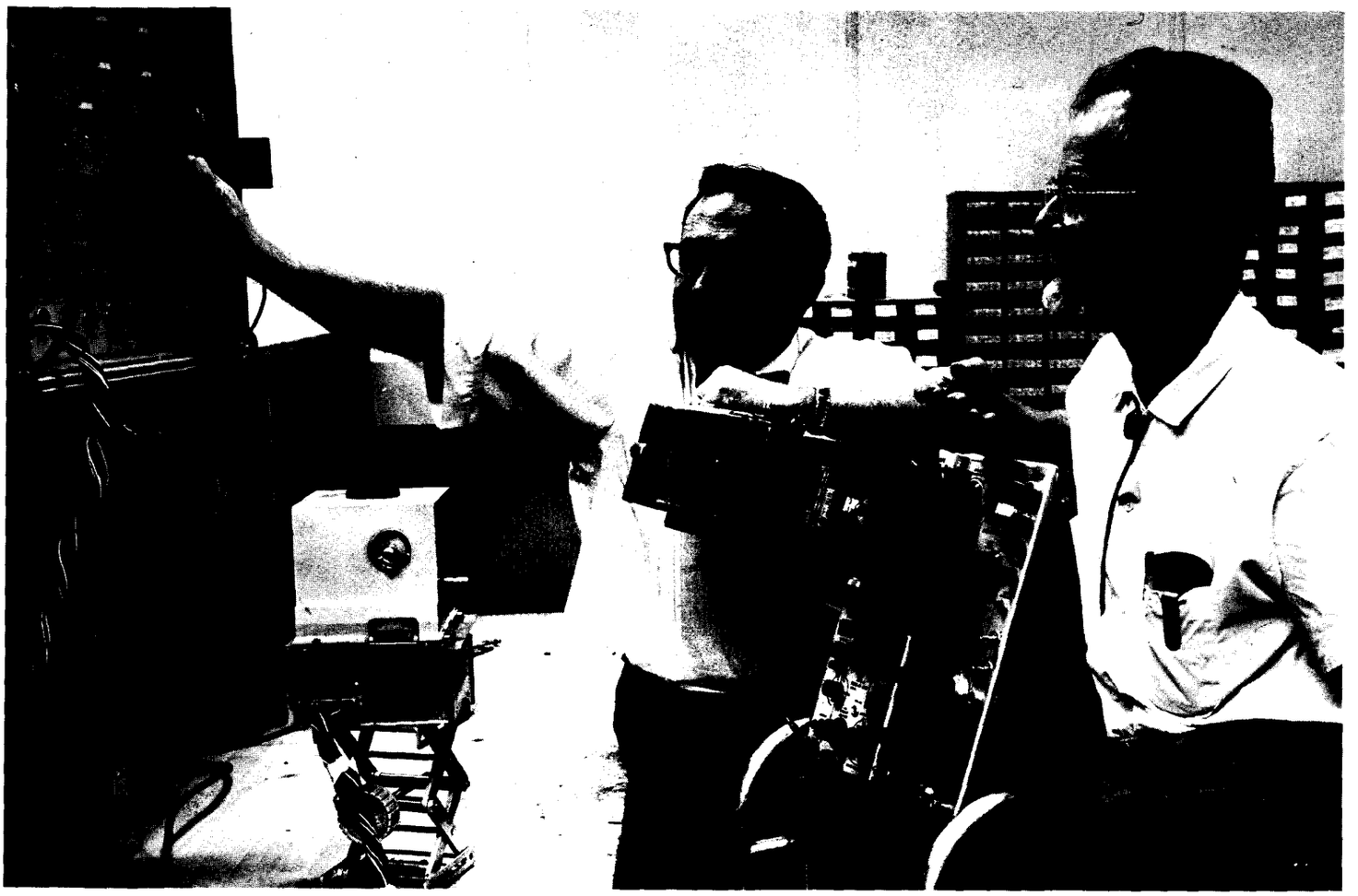
Thirteen Goddard employees have been selected for the three-quarter graduate study program at nearby Catholic University this Fall. The center had five students in the program during the 1963 Spring semester. They are involved again this semester along with eight newcomers.

The program helps upgrade the technical competence of Goddard employees; it allows employees to work most of the week while carrying a heavy graduate study program; it allows both the employees involved and Goddard to benefit from intensive study carried on over a reasonably short period.

Ten of the thirteen are pictured below with James Reese, head of the employee development branch.

Three-quarter program students for the Fall semester are (from left): FIRST ROW—Kenneth Rosette; George Honeycutt; Earle Young; James Reese, head of the employee development branch; Donald Kniffen; Albert Fleig. SECOND ROW—David Small; James Harlow; Thomas Carson; James Williamson; and Leo Blumle. Students not pictured are: John Stolarik; Tom Flattey; and Sterling Smith.

Second-Generation Dust Detector Reveals Speed, Momentum, Kinetic Energy, and Direction



Wesley Alexander (left) and Luc Secretan check the electronics of the new dust detector (light colored box in foreground). The tubes protruding from the detector shell point in four directions, enabling the detector to determine the direction of travel of cosmic dust particles.

A second-generation dust detector will be aboard EGO, designed by four Goddard scientists of the astrochemistry section, astrophysics branch. The new detector can detect particle speed, momentum, kinetic energy and approximate direction. It can receive particles from four directions, compared to two directions in past detectors.

Previous detectors, such as the one designed by the section and used successfully aboard Mariner II and Explorer VIII, could not judge the speed of the cosmic dust particles which impacted, according to section head Wesley Alexander.

Alexander and three branch scientists—Otto Berg, Curtis McCracken and Luc Secretan—came up with an ingenious method of measuring particle speed in a 1 inch diameter tube. There are four of these tubes mounted on the square box containing the electronics, giving the sensors the ability to sample dust from four directions

A short distance from the mouth of the entry tube, a metallic film about one-tenth the thickness of the mylar skin of Echo I closes the tube. The thin film does not appreciably slow the particle, but it does produce an electronic signal which starts an oscillator timer. When the particle hits the impact plate at the end of the tubular structure, a second signal stops the timer mechanism.

Since the distance is a known factor, the time and distance are used to compute the relative velocity of the dust particle. The device can measure time between one millionth and thirty millionths of a second.

Particles one micron and larger can be detected and measured by the innovation. A one micron particle weighs about one trillionth of a gram. The film is so thin that even a tiny one-micron dust particle is many times larger in diameter than the thickness of the film. An acoustical sensor on the back plate measures momentum as well.

In previous dust detectors, there was no means of measuring the mass of the particles which struck the acoustical sensor. In the second-generation detector, mass can be closely determined due to the other measurable variables (speed, momentum, etc.).

When the section was given a weight limitation of less than seven pounds for their complex experiment (for use aboard EGO), they found it necessary to design a case of extremely thin fiberglas, coated on both sides with a thin metallic film. This method gives the delicate electronics double shielding, and results in an extremely light but strong "box" for the entire experiment. The final flight model weighs less than six and a half pounds.

A contractor, Marshall Labs, built the delicate macro-miniaturized digital circuitry and power supply. Another contractor, Labco Scientific, Inc., built the sensor electronics to the specifications drawn by Alexander and his team.

The information from the second generation dust detector will greatly surpass that from any past experiment of like nature, adding significantly to our knowledge of the particles travelling through interstellar space. Cosmic dust is a mystery -but one that will soon be yielding some valuable information to NASA scientists when EGO goes into orbit.

Recent Technical Publications Authored by Goddard Staff

Lloyd Carpenter, "Computation of General Planetary Perturbations, Part I," NASA Technical Note D-1898, August 1963.

D. A. Bryant, G. H. Ludwig, and F. B. McDonald, "A Scintillation Counter Telescope for Charge and Mass Identification of Primary Cosmic Rays," NASA Technical Note D-1757, August 1963.

F. J. On and R. O. Belsheim, "A Theoretical Basis for Mechanical Impedance Simulation in Shock and Vibration Testing of One-Dimensional Systems," NASA Technical Note D-1854, August 1963.