GODDARD NEWS

GODDARD SPACE FLIGHT CENTER / GREENBELT, MARYLAND

VOLUME V, NUMBER 5 THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUGUST 12, 1963

Echo I Third Anniversary Celebrated Today

Echo I, the largest satellite launched to date, is celebrating her third birthday in orbit today. The 100-foot diameter sphere's thin skin (about half the thickness of the cellophane wrapper on a cigarette pack) is a bit wrinkled, but her shape is still good, and she still has a lot of the old bounce.

Collins Radio Co., who contracted with NASA to perform radio propagation tests on Echo I, has announced that its facilities will be opened to the wire services today for transmission of news stories via Echo I between Cedar Rapids and Dallas.

Launched August 12, 1960, she was an attention-getter from the beginning. Around the world eyes turned in her direction as she whisked by. Echo I was the first satellite which could be observed from the ground with the naked eye, appearing as a bright star in the night sky moving steadily across the horizon.

Before launching, 30 pounds of sublimating powders which change to gas in the near-vacuum of space were inserted into the deflated sphere. It was then folded, accordion-fashion inside the 26½-inch magnesium container.

About two minutes after the orbit was achieved, the magnesium container was separated by an explosive charge. The powders then expanded and inflated ECHO I into a spherical shape.

Her mylar plastic skin is coated with vapor-deposited aluminum which reflects radio waves broadcast toward her. There is no electronic communications equipment aboard Echo I, hence the designation "passive communications satellite."

Echo I can still be used for bouncing teletype and facsimile pictures as well as some voice messages, in spite of the bad influence of her hostile environment.

Her orbit is also remaining about the same, with no indication that it will be re-entering the atmosphere in the foreseeable future.

Echo I has already effectively served her purpose, since there is little more that she can provide in the way of scientific information. However, her continued visibility continues to make her an attraction to the world, and a bonus for America.

Echo II To Join Sister

Some of the information gathered from the first three years of Echo I's life will see fruitful use early next year when Echo II is launched to continue experiments with passive communications satellites.

Echo II will be larger than her wrinkled sister, with a diameter of 135 feet as compared to 100 feet. She will be built of more rigid material, and should hold her shape better than Echo I.

Echo II will also make a bigger image, making it easier to accurately bounce radio waves from her gleaming skin. And she will be easier to see from the ground, giving "Echo-watchers" a break.

Passive communications satellites may eventually be used for worldwide radio and telephone communications, permitting communication between certain points on the globe. Television transmission may also be effected. Echo I and later Echo II are the pioneers in a field with limitless possibility.

But until her big sister is launched, Echo I will continue to make her lonely orbits around earth, reflecting America's intent to use space for peaceful and worthwhile purposes.

Echo I, America's First Passive Communications Satellite

Tiros Technical Control—Hub of Weather Satellite Activities . . .

From newly furnished quarters in building 3, Tiros Technical Control Center acts as hub in the great circle of weather satellite activities.

The control center may be used for Nimbus operations when the second-generation weather satellite goes into action—but right now the first generation keeps the six-man staff headed by Ernie Powers busy around the clock.

All commands flashed to the satellite originate at Tiros Technical Control. After being determined from information received from Goddard's computing center, the command programs and station interrogation schedules for Tiros are then relayed to the two command and data acquisition ground stations located at Wallops Island and the Pacific Missile Range.

Powers, TTC manager, works with five contract technical representatives of the Radio Corporation of America; Joe Parisi, Leo Cleary, Tom Stewart, Warren Shaak, and Dan Bolgiano.

Tracked By STADAN

Tiros satellites are tracked by the Satellite Tracking and Data Acquisition network (STADAN), formerly referred to as the Minitrack network. Orbital information from STADAN goes directly to Goddard's computing center, which provides workable information for the United States Weather Bureau's National Weather Satellite Center and the theory and analysis personnel who in turn make their recommendations and requests to TTC.

The heaviest demands for satellite interrogation can come at any time of the day or night, depending on the position of the satellite, the position of the sun, and the requests from the Weather Bureau or other sources.

In addition, TTC is required to monitor and evaluate on a real-time basis, both the station performance and the behavior of the satellite.

The job of the control center is increased, naturally, when two operational satellites are in orbit at the same time, as is the case now with Tiros VI and VII.

Under these conditions, computer data is analyzed by the theory and analysis personnel assigned to Tiros, and the optimum schedule is determined. This schedule makes optimum use of station personnel with relation to the information requested by the Weather Bureau and other experiment-

This overall view of the front of Tiros Technical Control Center (TTC) shows Leo Cleary (foreground) and Joe Parisi (left background) and Tom Stewart checking information received from the satellite.

Bob Rados (right), Tiros project manager and Nancy Miller, of the Tiros project office are shown here before boxes symbolizing the quarter-million Tiros pictures received by Tiros VII. Tiros VII set this record late in July.

Goddard Speech and Paper Presentations

(Technical presentations approved as of August 6 for period of August 12 through August 25. Requests for copies of speeches and papers should be made directly to the author.)

PAPERS

Barbara Lunde, American Institute of Astronautics and Aeronautics Guidance and Control Conference, Cambridge, Mass., August 12-14, ***"Reliability vs Accuracy Tradeoffs in Guidance Equipment."***

C. Looney, Symposium on the Ionospheric Propagation of VLF Electromagnetic Waves, National Bureau of Standards, Boulder, Colorado, August 12-14, ***"ULF Utilization at NASA Tracking Stations."***

R. M. Rados, Conference on Artificial Satellites Virginia Polytechnic Institute, Blacksburg, Virginia, August 12-16, ***"Tiros."***

J. A. O'Keefe, Conference on Artificial Satellites Virginia Polytechnic Institute, Blacksburg, Virginia, August 12-16, ***"Geodetic Information and Implications."***

W. N. Hess, Conference on Artificial Satellites, Virginia Polytechnic Institute, Blacksburg, Virginia, August 12-16, ***"Van Allen Belts."***

F. B. McDonald, Conference on Artificial Satellites Virginia Polytechnic Institute, Blacksburg, Virginia, August 12-16, ***"Geophysical and Near Interplanetary Satellites."***

H. Press, Conference on Artificial Satellites Virginia Polytechnic Institute, Blacksburg, Virginia, August 12-16, ***"The Nimbus Spacecraft."***

R. E. Bourdeau, Conference on Artificial Satellites, Virginia Polytechnic Institute, Blacksburg, Virginia, August 12-16, ***"Ionosphere."***

Barbara Shute, American Rocket Society, (place to be announced) August 19-21, ***"Launch Windows for Highly Eccentric Orbits."***

William M. Kaula, IUGG Assembly, Berkeley, Calif., August 19-31, ***"Application for Linear Regression and Generalized Least Squares to Analysis of Gravimetry." "Mantle Models Corresponding to a Given External Gravitational Field." "Geodetic Results Obtained from Close Satellite Orbits."***

M. Sugiura, IUGG Assembly, Berkeley, Calif., August 19-31, ***"The Sudden Commencement of Geomagnetic Storms: Morphology and Interpretation." "The Recovery Phase of Geomagnetic Storms." "Solar Wind Modulation of the Geomagnetic Field as Observed at the Earth's Surface."***

Rudolf A. Hanel, Radiation Commission of International Association of Meteorology and Atmospheric Physics, Berkeley, Calif., August 19-31, ***"Radiative Problems in the Upper Atmosphere of Venus."***

Daniel G. Mazur, Multi-National Communications Specialists' Seminar, Brandeis University, Waltham, Mass., August 15, ***"Communications Satellite Systems."***

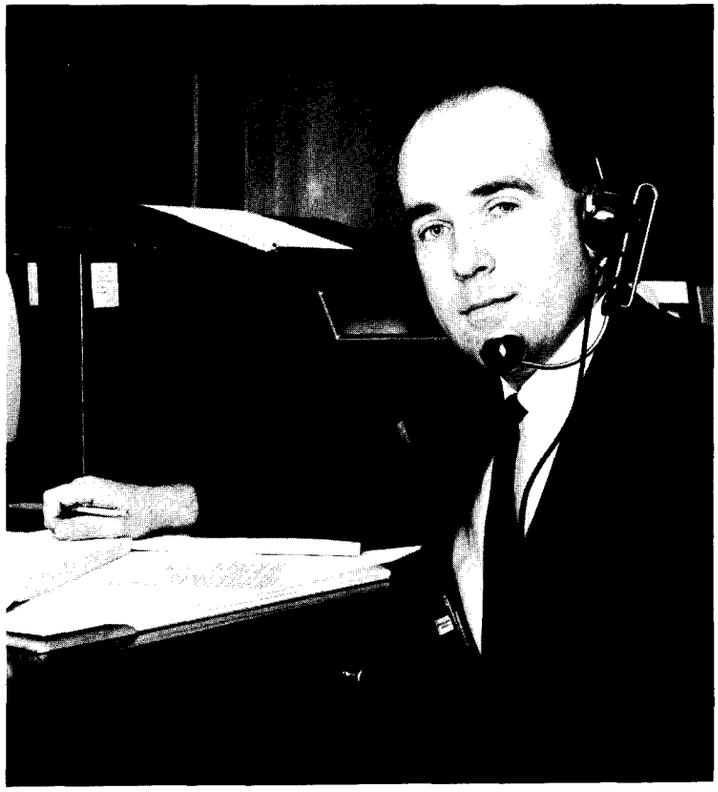
ers and the position of the two "weather eyes."

Hot Line in Use

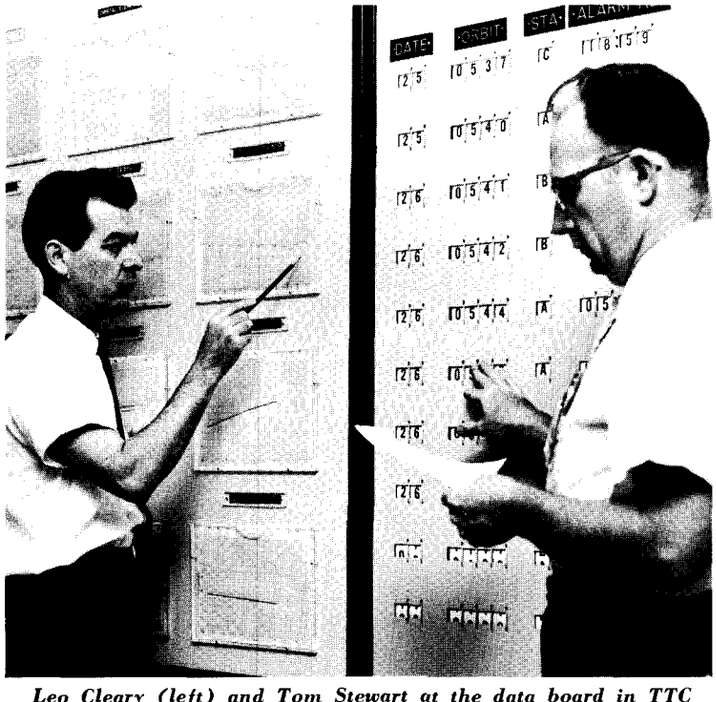
According to Powers, "TTC maintains a 'hot line' between the command and data acquisition ground stations and the Weather Bureau, and has the responsibility of keeping all parties informed of the actual sequence of operations and specific operating instructions."

The Tiros program has been recognized by a NASA group achievement award, and widely characterized as one of the most successful aspects of America's scientific satellite venture.

Tiros Technical Control Center stands at the center of the program—coordinating, monitoring, and directing the operation of the program.



Ernie Powers is director of Tiros Technical Control Center, located in building 3. He is shown here at the control console where he may be called at any hour of the day or night.



Leo Cleary (left) and Tom Stewart at the data board in TTC discuss the structural temperature of the satellite.

Syncom B Nears Final Orbit

Syncom B, launched July 26, will be "stopped" in its westward drift over the Atlantic Ocean when it reaches its desired position at 55 degrees west longitude. It is now nearing that position.

When it reaches the desired place, it will be lowered into a nearly precise synchronous orbit so that it will appear to trace an elongated figure eight pattern along the 55-degree meridian to points 33 degrees north and south of the equator.

Although Syncom has not reached its final position as we go to press, several interesting experiments have already been conducted. Last week, the satellite was used to broadcast a 300-word news story and picture of President Kennedy to Lagos, Nigeria. This action was followed by a news story and picture of the governor of Nigeria being broadcast to the United States. The exchange dramatized the first satellite communications between this nation and Africa established by Syncom.

Tense expressions broke into wide smiles of relief here at Goddard after the Syncom team at COMSOC in building 3 accomplished the first communications test between Lakehurst, N.J. and the communications ship Kingsport in Lagos harbor.

A note of humor was introduced by an early Syncom test, run before the picture and news story exchange.

This early test was not anticipated by crewmen aboard the Kingsport who had just previously been dismissed from duty stations. The skipper sounded general quarters, the crew responded and the station was "on the air" within eight minutes, with many crewmen still in their underwear.

A Moment of Triumph: Tension breaks in COMSOC when the first communications between Lakehurst and the Kingsport via Syncom is affirmed. Seated: (left to right) Don Williams and Bill Snyder of the Hughes Aircraft Company. Standing: (left to right) Dr. Joseph Siry, Robert J. Darcey, and Dr. John W. Townsend of Goddard.

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*

Jet Propulsion Laboratory Seeks Unmanned Lunar a

Jet Propulsion Laboratory, located at the foot of the scenic Sierra Madre mountains in Southern California, has already given the United States its first Earth satellite (Explorer I) and its first successful Venus fly-by.

The facility also has a mission that stretches the imagination of the most conservative—conducting many of NASA's programs for the unmanned exploration of the moon, the planets and interplanetary space.

JPL is a research and development organization operated for the space agency by the California Institute of Technology (Caltech). Basic research in rocket and jet propulsion began there, thus the name which remains with the organization.

America's first operational surface-to-surface guided missile, the Army's Corporal was developed at the lab prior to its NASA contract. On December 3, 1958, shortly after the creation of NASA by the Space Act, JPL was transferred to the civilian agency.

Mariner II, the first successful Venus fly-by, caught the imagination of the world, and laid the foundation for the next Mariner attempt—a Mars fly-by to be attempted in 1964. Other planetary programs aim to orbit and land on the planets after fly-by programs are completed. A jupiter fly-by is also in the planning stage.

The lunar program at JPL includes Ranger (hard-landing) and Surveyor (soft-landing) unmanned probes. These steps are considered necessary prior to manned landings on the moon's pockmarked surface. Surveyor will carry several television cameras and a soil testing instrument.

ON THE EDGE OF DEATH VALLEY

Another JPL responsibility is the Goldstone Tracking Facility, the "big ear" of the space programs. The facility is located in a natural bowl-shaped area in the California desert. There, on the edge of Death Valley is a huge tracking antenna with a diameter of 85 feet mounted 110 feet high.

The Goldstone site is one of three parts of JPL's Deep Space Instrumentation Facility (DSIF). The other sites are located at Woomera, Australia and Johannesburg, South Africa. The two foreign sites are staffed and operated by the host countries under the technical direction of JPL. These stations join the Goddard-operated space tracking and data acquisition (STADA) and manned space flight networks in tracking NASA spacecraft.

The first radio signals were bounced off Venus from Goldstone, and the DSIF set a record last November by retaining radio contact with Mariner II until it was more than 53 million miles from the earth.

Deep space communications will be improved by a planned big dish at Goldstone 210 feet in diameter, one of the largest envisioned by man.

The Jet Propulsion Laboratory boasts one of the most complete technical libraries in the world. The center carries out a full program in addition to the more "glamorous" aspects of its mission —Ranger, Mariner, and the big dish network.

The lab has a full-fledged research and advanced development program, which peers into the future of electric propulsion, nuclear electric power, advanced chemical propulsion, and many other areas.

The Caltech—NASA organization's systems division analyzes, designs and evaluates the overall systems for missions from concept through accomplishment.

The telecommunications division emphasizes advanced research in microwave, maser and parametric amplifiers, and other communications media. They also develop all radio equipment aboard the spacecraft and at the DSIF stations.

Closely identified with the scientific community, the space sciences division devises experiments and equips them with the necessary scientific instrumentation.

JPL's guidance and control division holds the responsibility for keeping the spacecraft on course, generating its timed functions, maintaining its attitude in space, and powering the experiments on board.

The center has an engineering mechanics division and an engineering facilities division, in addition to a propulsion division, which carries on the work from which the name JPL was derived.

As man continues to seek answers in the boundlessness of space, JPL will continue to provide answers and to raise new questions in a field in which it has pioneered—space.

Dr. William H. Pickering (seated), director of JPL, discusses a project with Brian Sparks (left), deputy director and V. C. Larsen, Jr., assistant director for business administration.

Jet Propulsion Laboratory is shown here from the air, with the Sie scenic backdrop. The modern 10-story central engineering buildin phase of construction in the center foreground.

INSIDE GODDARD
GODDARD SPACE FLIGHT CENTER / GREENBELT MARYLAND

August 12

Co-Workers Find SCUBA Diving Exciting

Exploring Davey Jones Locker is how sport diving enthusiasts Jim Diehel, test and evaluation division and Mike Hegarty, management services and supply division spend their spare time.

A little over a year ago Jim and Mike became water companions. SCUBA (self contained underwater breathing apparatus) diving is not a hobby for a lone splasher. They always travel in pairs—you must come to know your partner as well as you know yourself—this is important.

After the rubber suits and other standard equipment have been properly checked out, Mike (left) examines his air tanks while Jim lifts his into place before strapping them on.

Surprised by a Rip Tide

Recently Jim and Mike made a trip to New Jersey. It was a normal day as they made their dive. All was calm below. But, as with any other sport, anything can happen. When they surfaced, they found theirselves in the middle of a rip tide and a quarter of a mile from shore. In a situation like this team work and knowing your partner comes in handy.

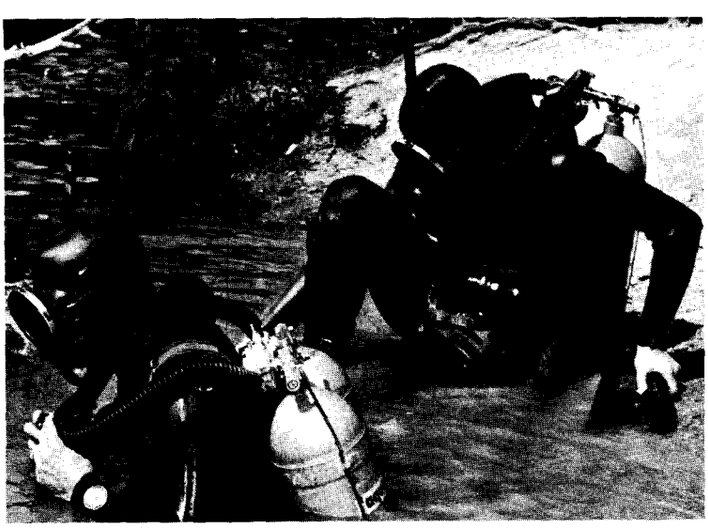
Mike lost his weight belt, bringing him to the surface and forcing him to "ditch" his equipment on the nearby rocks. Jim still had his weight belt on plus the 85 pound tanks making it rough battling the high waves. Nevertheless, using a buddy line, Mike quickly pulled Jim safely to the rocks. "To top it all," said Mike, "After wrestling with the rip tide, when we were safely on shore I had to break my toe." Needless to say he took quite a ribbing.

Graduates of SCUBA School

Prior to coming to the Washington area Jim lived in New Jersey at Point Pleasant Beach on the Atlantic Ocean. He started spear fishing when his equipment consisted of only a mask and a pair of fins.

Jim's interest grew and he wanted an answer to his question, "What would I find if I went deeper?" He knew this took training and special equipment. After moving to Maryland he joined the Atlantis Rangers School for SCUBA in Riverdale, Md. and is now a full fledged diver.

Mike, who is also a graduate, became interested through a neighbor who is an instructor at the Atlantis School for SCUBA.



Mike (left) puts his mouth piece in and waits for Jim to put his fins on. One never starts diving without the other buddy.

Extensive Training

Both Jim and Mike went through four months of training which included two hours once a week of actual pool sessions, a series of lectures and a three-hour written examination. The first quarry dive is not more than 30 to 40 feet. Jim and Mike said their deepest dive has been 120 feet.

Escaping the summer heat Jim and Mike head down to real cool waters.

SCUBA diving requires quite an array of clothing:

Starting with the skin tight rubber suit—Jim and Mike line the inside of the suit with talcum powder and begin the half hour process of getting dressed. After the suit comes the Mae West, rubber shoes and gloves, the underwater knife and the depth gauge and compass, then the rubber hood and flippers.

Last and most important are the two portable compressed air tanks weighing 85 pounds. After this, they are ready for the plunge. With temperatures in the 90's and those *skin* tight rubber suits, they are glad to hit the water.

The two water buddies have ventured to places such as Indian River outlet in Ocean City, Md., Lewes, Delaware and Nags Head, N. C.

Recently they have added a new experiment to their hobby of exploring the depths of the waters—underwater photography.

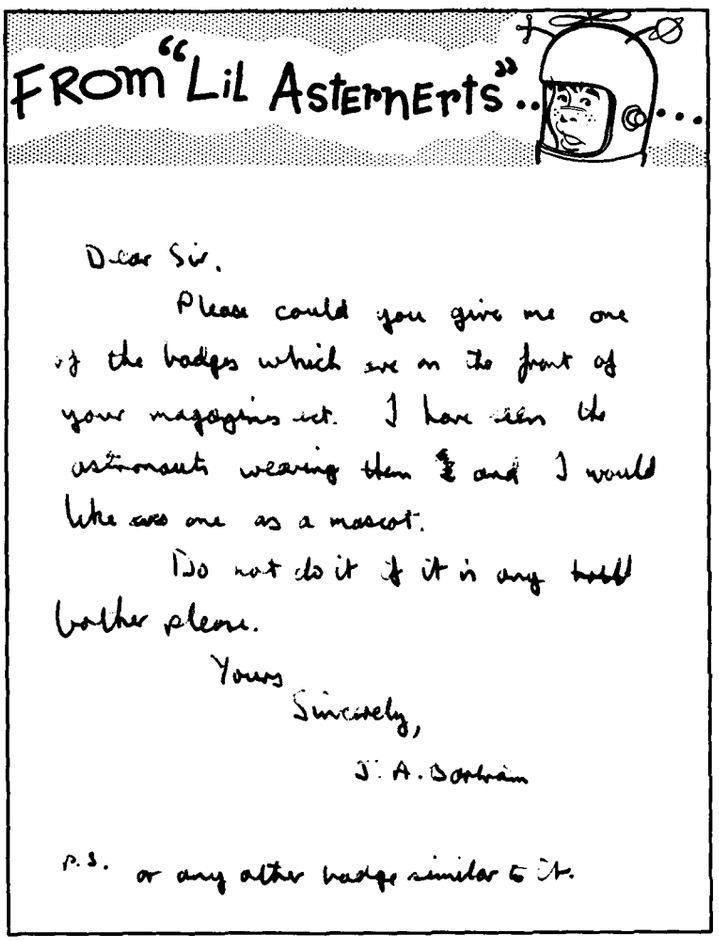
A Vacation for the Families

Where go the divers so go their families. Jim, his wife Pat, their boy Jimmy—and Mike, his wife Joan and their boy Kevin make one big happy family. Pat and Joan said they get just as big a kick out of going with their husbands as the men get out of sport diving and exploring. Mike's boy Kevin, 14 months old received his first pair of flippers for his birthday in May.

Jim said, "One thing about SCUBA diving as a hobby, there's always new waters or something new to explore. We have a saying: 'Every diver has a bottomless quarry.'"

As an after thought Mike added, "Oh—and you have to be a good swimmer."

In full dress uniform and with batons, the Spacettes pose with their director Marilyn Brown (left).



Boosters Will Try For World-Wide Championship

If there were scouts for Slow-Pitch Softball the "Boosters" on the Goddard league would certainly have been discovered.

Team captain John Morton, data operations branch, said, "We're sometimes referred to as the 'Old Smoothies'."

Currently leading the eastern division of Goddard's Slow-Pitch Softball league the Boosters, with a record of ten won and one lost, are entering the D.C. Metro Softball ASA (Amateur Softball Association) Tournament.

August 17 is the date playoffs begin, Braden Field in Greenbelt is the place—where the Boosters will expose their athletic talents against other top area slow-pitch teams. If they win—it's on to Jones Beach in New York, to represent the D.C. Metropolitan area in the Open Division of Slow-Pitch World Champions.

They will compete with top leagues representing countries from around the world. The championship games will be played Aug. 30-Sept. 2.

Good luck boys—we're in there pitching for you.

The Spacettes Have Been Launched

"I love a Parade" is the chant from the Spacettes of the Seabrook Majorette Corps under the direction of Marilyn Brown, of the government accounting office here at Goddard.

The Spacettes were first organized this March and started with 22 girls. Now they have grown in number to 34 "high stepping" majorettes and one boy, 7-year-old Steven Brandt.

Ranging from age 2½ to 17 years they put on quite a show in their orange and white uniforms. Sponsoring the Spacettes is the VFW Free State Post 8950.

The Spacettes performed in their first parade on July 4 in Takoma Park, Md.

The senior group of the Spacettes entered in competition for the first time on July 4 and won second place honorable mention. This was quite a feat for the Corps. It is rare for a majorette corps to win any competition during their first year.

Why are they named the Spacettes?—Seabrook is one of many sub-divisions surrounding Goddard and quite a few Goddard children are members. With this in mind they decided on Spacettes (after majorettes).

Daughters of Goddard personnel are: Kathi daughter of Nancy Bateman, fabrication division; Leta and Bethann daughters of Betty Armstrong, mechanical systems branch; Michele daughter of Art Brouard, IBM contractor; Linda daughter of George Hornak, property branch; and of course Debbie daughter of Marilyn Brown, director of the Spacettes.

In addition to being members, two of the older majorettes are also teachers, Thelma Gasch, niece of Betty in the Library and Susan Haislip, daughter of U.S. Marshal Haislip.

Not a Spacette, but a teacher, is Linda Felter Canning, wife of Tom Canning, procurement division and daughter of Betty Felter, technical information division. Linda can be seen at any Redskin football game performing with the famous Washington Redskinettes.

The Spacettes can be seen "twirling and stepping high" in the traditional Greenbelt Labor Day parade.

A benefit dance for the Seabrook Majorette Corps will be given on August 17 at the VFW on Telegraph road.

GODDARD WELCOMES

Management Services & Supply Division
Ahern, Edmund J.

Spacecraft Systems & Projects Division
Alam, Harold H.
Parker, Joseph

Financial Management Division
Daisey, Peggy J.
Kaifer, William J.
Payne, Dorothy

Tracking & Data Systems Division
Elder, Walter H.
Fortune, Chester M.
Patterson, Suzanne

Space Data Acquisition Division
Huddle, John
McKowan, Paul

Fabrication Division
Jackson, Argent C.

Operations & Support Division
Loving, John L.
Merton, Adrian
Vanderhoof, Judith

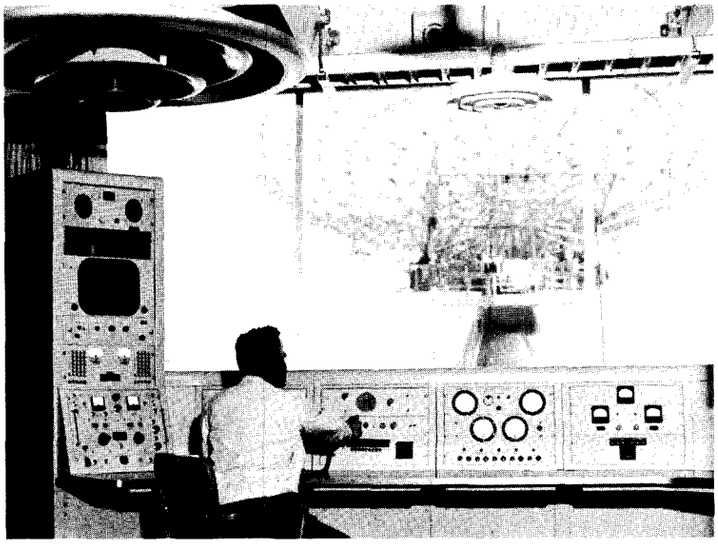
Procurement Division
Madden, Cheryl
Robertson, Barbara
Vleesehouwer, Francis

Test & Evaluation Division
Schorman, Richard

Facilities Engineering Division
Welkner, William G.

Organization & Personnel Division
Wildes, William

ınd Planetary Landings



From his operating console, a JPL engineer turns the Goldstone antenna toward space.

JPL's fine technical library contains more than 180,000 books, documents, and bound journals.

ra Madre Mountains forming a can be seen nearing its final

Research and development engineers work together designing spacecraft of the future.

Editor's Note: This is the seventh in a series of special articles on the activities and responsibilities of NASA's far-flung operations.

News About Space & Aeronautics

● A miniature, solid-fuel microrocket only half the size and weight of present systems employing nitrogen gas has been developed for Goddard by Rocket Research Corp. of Seattle. The complete system, consisting of propellant tank and valves, weighs 2.3 pounds (0.4 without propellant). A four-inch spherical tank contains enough propellant to control a five-foot satellite for one year.

• • •

● " . . . We must continue our intensive non-military effort along the entire spectrum of space and space-related sciences. The primary responsibility for this effort rests with the National Aeronautics and Space Administration. Its close cooperation with the Department of Defense will not only further its own objectives of the peaceful conquest of space but also help create the building blocks for the future military systems which may be required, to repeat President Kennedy's words, 'to make sure that space is maintained for peaceful purposes.' "—*General Thomas S. Power, Commander-in-Chief of the Strategic Air Command.*

• • •

● Mariner II, which successfully performed a Venus fly-by mission on Dec. 14, 1962, completed its first orbit of the sun August 1.

A project of NASA's Jet Propulsion Laboratory, Pasadena, Calif., Mariner II was launched Aug. 27, 1962, and traveled a distance of approximately 540,000,000 miles to complete the first solar orbit.

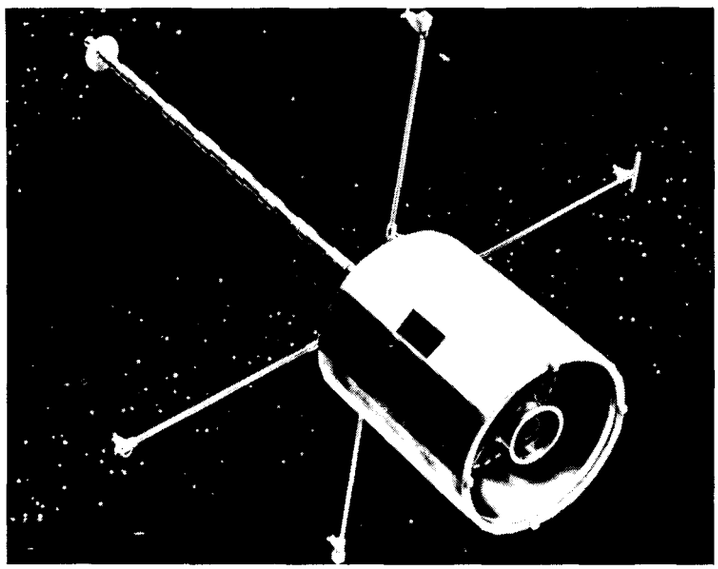
• • •

● Current estimates of the amount of liquid hydrogen which will be required by Marshall Space Flight Center between April 1, 1965 and December, 1970 total 78.28 million pounds at a cost of about $37 million. Forty-five companies have been asked to submit bids for provision of the hydrogen for use in tests of the S-IVB stage of the Saturn IB and V space rockets and at MTO in tests of the S-II stage of the Saturn V moon rocket. Both stages are powered by J-2 engines burning liquid hydrogen and liquid oxygen.

After award of a contract, expected about December, construction of a storage facility within 50 navigable miles of MTO and a new liquid hydrogen manufacturing plant situated at the contractor's discretion will begin.

• • •

● The Pioneer project received a boost recently when Ames Research Center (where the project is managed) announced the selection of Space Technology Laboratories, Inc., a California firm, for negotiation on a contract for design and fabrication of four Pioneer spacecraft. The total value of the program will be approximately $15 million according to *The Astrogram*, a publication of Ames. Pictured below is an artist's conception of the Pioneer spacecraft.



Tape Recorders Built Here Test OGO Experiments

The flight model shown here is identical to tape recorders flown on balloons in mid-June from Fort Churchill, Canada by Dr. Frank B. McDonald, head of the fields and particles branch and two foreign scientists working at the center under NASA international fellowships. The recorders were designed and built at Goddard.

McDonald and Dr. V. K. Balasubrahmanyan of India and Dr. D. A. Bryant of Great Britain tested several Goddard experiments to be flown on OGO.

The special tape recorders stored data gathered during the flight of the balloons to the upper reaches of the atmosphere. After the balloons burst, the tape recorders and instrument packages were recovered by parachute.

Goddard's recording techniques section designed the recorders, which were built in-house by three fabrication division model makers who are assigned to the techniques section and work in a lab area in building 6.

All recorders flown at Fort Churchill worked extremely well according to Dr. McDonald. "In one case," he said, "the data was completely useable after plunging 125,000 feet and landing in a lake when the parachute failed to open."

The model makers, Calvin Allison, Charles Heerd and Carl Walch have been assigned to this work from six months in one case and up to two years. As the demands increased, first one and then a second man was added to the contingent. The men have built recorders for S-51, S-52, SA-3, various balloon recorders, and a recorder for OSO.

Examining the flight model of a tape recorder designed and built in-house are (from left): Calvin Allison, Charles Heerd and Carl Walch, fabrication division model makers.

Recent Technical Publications Authored by Goddard Staff

James E. A. John and John J. Hilliard, "Power Transistor Cooling in a Space Environment," NASA Technical Note D-1753, July 1963.

John H. Boeckel, "The Purposes of Environmental Testing for Scientific Satellites," NASA Technical Note D-1900, July 1963.

F. B. McDonald and W. R. Webber, "Cerenkov-Scintillation Counter Measurements of the Light, Medium, and Heavy Nuclei in the Primary Cosmic Radiation from Sunspot Minimum to Sunspot Maximum." NASA Technical Note D-1754, July 1963.

L. S. Walter, "Experimental Studies on Bowen's Decarbonation Series, II. P-T Univariant Equilibria of the Reaction: Forsterite + Calcite = Monticellite + Periclase + CO_2," NASA Technical Note D-1843, July 1963.

Peter Musen, "A Discussion of Halphen's Method for Secular Perturbations and its Application to the Determination of Long Range Effects in the Motions of Celestial Bodies. Part I." NASA Technical Report R-176, 1963.

Lawrence Dunkelman, "Ultraviolet Photodetectors," NASA Technical Note D-1718, August 1963.

Aaron Temkin, "Positron-Hydrogen Scattering," NASA Technical Note D-1849, August 1963.

Mohammad Rahmatullah, "Some Aspects of Stratospheric Circulation Derived from Meteorological Rocket Firings Over the United States During the Winter of 1961," NASA Technical Note D-1755, July 1963.

Gordon J. F. MacDonald, "The Structure and Strength of the Inner Planets," NASA Technical Report R-173, 1963.

John C. New, "Achieving Satellite Reliability Through Environmental Tests," NASA Technical Note D-1853, July 1963.

Wilmot N. Hess, "Energetic Particles in the Inner Van Allen Belt," NASA Technical Note D-1749, July 1963.

Haney Succeeds Lt. Col. Powers

Paul Haney has been appointed Public Affairs Officer for the Manned Spacecraft Center, Houston, effective Sept. 1.

Haney succeeds Lt. Col. (Shorty) John A. Powers' familiar "voice of Mercury Control", who will be reassigned. Colonel Powers duties have not been determined.

Before joining NASA in Dec. 1958, Haney had worked as assistant city editor of the *Washington Evening Star.*

A native of Akron, Ohio, he received his bachelor of arts degree in journalism from Kent State University, Kent, Ohio, in 1949. He also attended Georgetown University Law School in Washington.

Arabian Shaikh Visits Goddard, Tours Facilities

Shaikh Rashid bin Said al Maktoum, ruler of the oil-rich Shaikhdom of Dubai on the Persian Gulf is shown in the optical shop during his tour of Goddard last Wednesday. The Shaikh's party of seven included two of his sons. Most of the ruler's 45,000 subjects live in or near the town of Dubai, which has been likened to Venice because of a waterway which divides the area. The group arrived July 30 aboard the Queen Elizabeth for a tour of the United States. The Shaikh is center foreground.

Young Scientists Recognized . . .

For a brief period in the Spring, all eyes are on the technically-motivated high school student as science fairs take the limelight across America. Then, after a flash of recognition for months of hard work, all is quiet.

At a time when this country is moaning for a bumper crop of scientists and engineers, the supply is not keeping pace with the growing demand. (See *Impetus*, next column). The scientific community is sometimes "too busy" to encourage and nurture sharp young minds—minds that may find encouragement in another field where someone shows greater interest.

Two good examples of young persons' contributions to science have been a topic of discussion at Goddard during recent weeks:

Notice, for example, this scene in the lobby of building one, where a computer designed and built by a high school student (Walter L. Hagen of nearby Gaithersburg High School) is attracting attention from passers-by almost constantly. Other science fair winners from the area will have their handiwork on display in coming weeks (although some of the winners had dismantled their projects before being informed of this display).

And witness the front-page news story carried by a wire service earlier this month when a question by a gifted 10-year old caused space propulsion scientists to reconsider their theories on an advanced rocket concept.

Sylvir Bartoo (left) and Bill Davis prepare to try their skills at the computer reaction test. The computer was built by a local high school student.

Deep Space Tracking Discussed

Dr. Henry Plotkin (left) and Dr. Robert Coates at the meeting.

Deep space optical tracking and communication was the topic of discussion of the Research Advisory Committee on Communications, Instrumentation and Data Processing at their meeting here at Goddard July 30 and 31.

The committee was established by the office of advanced research, and technology, NASA headquarters.

The committee is composed of 27 leading scientists from industry, the three military services, universities, National Bureau of Standards, and NASA.

Dr. Henry Plotkin, Goddard's optical systems branch head was one of the speakers at the two-day meeting. Dr. Robert J. Coates, chief of the space data acquisition division is the Goddard representative on the committee.

Committee chairman is Dr. S. W. Herwald, vice president of research, Westinghouse Electric Corp.

Impetus

Editor's Note: This column of thoughts from various quotable sources will run whenever qualitative and stimulating 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.

"Since 1959, Russia has turned out more engineers and scientists than we have—and they are producing some capable people. According to a recent article in *Engineering and Scientific Newsletter*, the Soviet Union during the . . . 1960's will turn out . . . *three times as many engineers and scientists as are expected to be trained in the U.S. during the same period.*

"As reported in the Winter, 1962, issue of the *Engineer*, freshman engineering enrollment has dropped at U.S. colleges for five straight years. According to the Engineering Manpower Commission, the percent of engineering freshmen to total freshmen declined from 10.8 percent in 1957 to 5.9 percent in 1962. . . .

"Frankly, I am not so concerned with the shortage in numbers. I join those who believe that the shortage in quality is a more serious matter.

"Let us now examine some of the reasons for the shortages.

"Some prominent educators agree that too many students are side-stepping what they consider to be the more difficult programs. In fact, they are not equipping themselves in high school and preparing to take difficult programs in college. This is demonstrated by the marked downward trends of enrollment of high school students in mathematics during the last 50 years. Over that period, there has been a consistent decline in the proportion of high school students who take college preparatory math. While we are worrying so much about 'why Johnny can't read,' maybe we should devote more time to finding out 'what makes Johnny run from math.' We are losing many potential engineering candidates because they lack the mathematical foundation.

"But there are other reasons for the shortage in numbers. It is apparent that the role of the engineer and the satisfactions of a career in engineering are not well enough understood and appreciated. One reason for this is that students are not getting proper steering, guidance, counselling, and encouragement along the way—beginning with the lower grades and extending through high school and even into college. Another reason is that achievements and accomplishments of engineers are not heralded widely in any form or by any means. Even engineers themselves do little to underscore the usefulness of their work or the value of their contributions to society. . . .

"It is my personal conviction that too many engineering schools fail to offer the right kind of education to make an engineer a well-rounded man. Indeed, unless they have revamped their curricula within recent years, they may not even be making him a well-rounded engineer! As Dr. Thomas Stelson of Carnegie Tech points out, the evolution of new knowledge in the B.S. degree program is about 10 percent a year. Thus, a B.S. graduate today has essentially reached a level of advanced training that a Master of Science graduate attained 10 years ago. Another way of looking at this is that a graduate loses his college training through 'decay' at the rate of 10 percent a year. If this is true, and I believe it is, an engineer must increase his knowledge at the rate of 20 percent a year just to remain of equal value to his company. To advance, he is going to have to spend 25 percent of his time—his own time off the job—in furthering his professional knowledge.

"I am convinced it is not possible to turn out a qualified, broad-based man in the short space of four years. It takes at least that long just to give him the technical background he needs. If he is to get at all acquainted with the other subjects he must have to broaden his mind above the level of technical competence alone, it is going to take at least a fifth year of study—possibly more. The first four years would give him a broad background; the fifth would be a year of specialization. In addition, there is need for the engineer, while still in college, to come to grips with the humanities—with history, English, political science, and economics. . . ."
—*C. E. Reistle, Jr., president of Humble Oil Co.* in an address to the American Petroleum Institute.

Assurance Council Emphasizes Spacecraft Reliability

As the Center's space programs expand with accompanying increases in complexity, long-life requirements and investments in time, money and materials, a hard new look is being taken at spacecraft reliability.

"There has always been considerable evidence of reliability in Goddard programs, as demonstrated in large measure by the success of our satellites," said Dr. William Wolman of the systems review group in the space science and satellite applications directorate. "The change in emphasis is in organizing and formalizing the program, rather than introducing it."

Heading up the job of forming a systematic and vigorous reliability assurance program is the 6-man staff of the reliability assurance council. It is the highest staff advisory group at Goddard responsible for policies and procedures in reliability and quality assurance. It reports directly to Dr. Harry Goett, director.

The council includes: Herman LaGow, chairman; Dr. William Wolman, secretary; William Stroud; John New; Albert Ferris; and John Popp.

"The key to reliability assurance is not a magic new formula but factors such as reliability assessment, quality assurance and a vigorous system test program under environmental conditions simulating actual operations," said Dr. Wolman.

These criteria soon will be contained in Reliability Assurance Program Plans to be developed by each Goddard project manager and subjected to review by the council. RAPP, a new innovation of the council, will be specific in listing stringent requirements of design, materials and testing.

"Military specifications for electronic parts such as capacitors, resistors, and transistors normally require these parts to withstand vibration of 20 g's at frequencies up to 2000 cycles per second, whereas, for spacecraft applications, we require 40 to 60 g's at frequencies up to 5000 cycles," said Harry Street, electronics engineer in the systems review group.

Stringency in materials and testing is equally strict and it is expected to get more so with continued advances in science and technology, and accompanying need for more reliability. But since one "can attribute all space failures to some aspect of quality or reliability," according to Dr. Wolman, the need for concern is well taken.

Herman LaGow, chairman of the council, said that "faulty components mean dismantling major subsystems and removing the components that were produced under inadequate specifications. This causes time delays with attendant cost increases."

Assuring compliance of RAPP by industry contractors will involve a team effort of procurement representatives, technical personnel, contract management, and government inspection agencies.

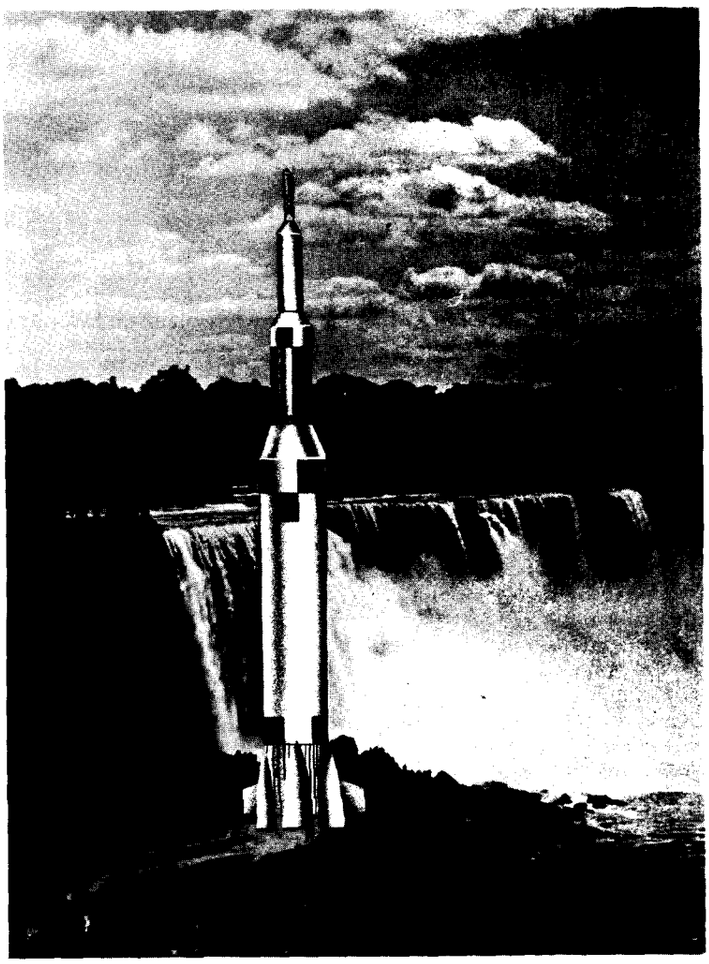
"We want to emphasize on prime contractors and Defense Department inspectors consciousness of our requirements for quality products of high reliability," said Mr. LaGow. "In the process, industry will, I am sure, become more aware of these problems and cooperate to improve reliability and quality."

Means of assuring compliance will take the form of preinspection and post-award conferences, closer cooperation with subcontractors and suppliers, more extensive use of government source inspection procedures, and positive measures of dealing with offenders.

Reliability assurance, or, in the words of Dr. Robert Seamans, associate director of NASA, "the assurance that men and equipment will do what they are supposed to do at the right time and for the right period of time, in every phase of long and complicated operations," is vital to the success of Goddard's role in the space program.

Members of Goddard's reliability assurance council are (from left): Lee Potter, alternate member; John Popp; Bill Houston, alternate; William Stroud, alternate chairman; Dr. William Wolman, secretary; John New; and Russell Dorrell, alternate. Regular council members absent are: Herman LaGow, chairman; and Albert Ferris.

HOW BIG IS SATURN V?



Just how big is the Saturn V booster? No piece of hardware has caught the imagination of NASA employees and the public at large as has the gigantic moon booster, pictured here in approximate scale beside Niagara Falls. The falls were referred to by American Indians as "the father of waters" due to their impressive visual image and thunderous roar.

A recent news release from the public information office of the George C. Marshall Space Flight Center in Huntsville reported: "The only thing in this country even approaching (the Saturn V's) output of low frequency sound is Niagara Falls."

In size, however, the Saturn booster is a hands-down winner. The 350-foot booster towers over the height of Niagara—it is more than twice as tall.