



*Tiros VII is shown arriving at Cape Canaveral prior to its successful launch June 18. The satellite, the system, and the Delta booster used for orbital insertion are all Goddard projects—part of one of the most remarkable success stories of the space age. (See story and pictures on page 6.)*

## *Echo II Takes the Limelight at Lakehurst*



### *President de Gaulle Views OSO At Paris International Air Show*

The Paris International Air Show, June 7-16, attracted up to 125,000 visitors per day, including France's President Charles de Gaulle, shown above examining an operational prototype of Goddard's Orbiting Solar Observatory (OSO).

Francis Le Doux, head of the structural and mechanical applications section, and John E. Jackson, planetary ionospheres branch consultant represented Goddard at the show. Dr. Ishtiaq Rasool, Institute of Space Studies, came to Paris from the COSPAR meeting in Warsaw to assist due to the large crowds.

Le Doux coordinated erection of Goddard satellites for exhibition, including the OSO shown here. Both men were on hand to answer questions, as both are conversant in French.

The United States pavilion housed the most complete presentation of present and future space programs ever assembled under one roof. President de Gaulle reportedly spent more than 20 minutes at the display and expressed deep interest in it.

An Echo II Prototype is currently the dazzling star of what might aptly be described as a Hollywood type spectacular. The satellite is "on location" at an historic site, the Naval Air Station, Lakehurst, New Jersey. Echo, puffed up to her full 135 feet, is the center stage performer in the "super colossal" setting of the air station's famous Hangar 1, a huge structure 807 feet long, 262 feet wide, and 178 feet high.

The production is one of a continuing series of tests for the Echo II satellite. Measurement of the Echo rigidized skin characteristics during inflation, and at full inflation, plus the radio reflectivity of the "balloon" are the object of these tests of Echo II which will take to the skies this winter to join a sister star performer, the slightly smaller Echo I.

#### **Observer-Reporter**

A Goddard PIO, Jack Howard, on-the-spot with news reporters during some of the tests, gave his observations.

The tests looked like a Hollywood production—but by no means an ordinary one. The Echo posed majestically in a set 211,434 square feet in area

and 178 feet high. Lights flooded her glossy surface, and special cameras and radars scanned her spherical shape from high scaffoldings on either side of the balloon.

The satellite under lights, the cameras and antennas on the scaffolds, and the little groups of people here and there about the expansive deck of the hangar lent to the appearance of a movie set. The resemblance was heightened by Jim Burton's motion picture cameramen Ron Craig and Ted Hopkins who did the shooting for the technical record. Like all the Echo test crew, they were on the job night and day.

If the visitor's image of a motion picture production were that of frenzied directors screaming orders at prima donnas, the image of popular legend, then the scene at Lakehurst didn't fit the image. But if he had in mind the marvel of organization that a movie production usually is, the Echo tests filled the bill.

Around the clock the testing went on. Shifts changed; members of the various crews took over with no hitches, meshing their particular specialized tasks

*(Cont'd on page 7, col. 1)*



Roy Hagenmeyer (left) and Giles H. Spaid, who designed and engineered the small payload examine the results of their work.

## Relay Report from South of the Border

Life in Brazil was the topic when Relay team member Jorge Lemgruber Emerick, visited Goddard recently.

Jorge is manager of telephone services for Radional, a Brazilian subsidiary of I.T.&T. He's also Goddard's Relay coordinator at the Rio mobile station where he acts as liaison between Radional and the Brazilian government.

Active in communications work since joining I.T.&T. 22 years ago, Jorge spoke enthusiastically of the success of Relay and the future of communications satellites.

"From the results we have had with Relay so far, I am confident that satellites will provide a reliable form of communications in the future," he predicted.

He said a few more years of experimentation are still needed before an adequate system is perfected. But when it is, Brazil and South America, which lack a communications system comparable to the U.S., can be expected to benefit immeasurably.

He said that the number of telephone sets in Brazil demonstrates one area of the communications network in South America that has further need of advancement. For example, there are 1 million sets in oper-

ation in the country compared to 80 million in the U.S.

Since most of South America's population is unevenly distributed there are great distances over which a communications network must be formed. At present international phone conversations are still transmitted mainly on high frequency radio.

Jorge is well informed on such matters, for he handles Radional's domestic and international phone services throughout Brazil. Radional carries 90 per cent of the phone services in and out of the country. In addition, a considerable amount of the domestic long distance telephone traffic is also carried by Radional.

Fluent in French, Spanish, Italian, Portuguese, and English, Jorge fits in well as a member of the Relay Ground Stations committee, whose members are American, French, German, English, Italian, Brazilian and Japanese.

He finds his new assignment as Relay coordinator most challenging and even a little unique, for the Rio station is the only communications satellite ground station south of the equator. It is completely mobile, was constructed at Nutley, N.J., by I.T.T. Federal Laboratories and flown to Rio.

## Payload Offered to World Scientists

The eyes of the world are on space, but unfortunately the majority of the smaller nations are unable to do anything about their innate interest. An offer made by Goddard at the Committee on Space Research (COSPAR) symposium last month in Warsaw may change this situation.

Dr. Siegfried J. Bauer and John E. Jackson of Goddard's planetary ionospheres branch presented a paper there offering the world scientific community the design of a small (70 pound) multipurpose payload and a ground telemetry station which could be used for ionospheric research.

Bauer and Jackson said that the payload's "versatility, simplicity, and relatively low cost should make it an ideal tool for the investigation of the many problems of the ionosphere . . . , especially during the International Quiet Sun Year (IQSY)."

The payload would not be manufactured by NASA, but the plans would be made available on request. Therefore, the price of the payload and ground equipment would vary according to manufacturer. It can be produced at a cost which many interested underdeveloped nations can afford.

The payload, which was successfully test flown from Wallops Island twice late last year, is a miniaturized version of the two-frequency continuous radio wave propagation experiment which has been used by Goddard experimenters for

several years. This experiment measures electron density in the ionosphere (i.e., the part of the outer atmosphere where ions and electrons are present in quantities sufficient to affect the propagation of radio waves).

Simply speaking, the experiment sends out two radio waves—one which is not affected by the ionosphere and one which is. Then propagation characteristics of the two waves are compared by the experimenter to find electron density.

The radio wave with the highest frequency is also used to obtain tracking information from the Doppler effect, as well as for the telemetry of two additional experiments to be chosen by the individual experimenters. With a weight of approximately 70 pounds, the payload can be launched by Nike-Cajun or Nike-Apache sounding rockets, or any other vehicle with similar configuration and capabilities.

The payload and ground station concept, discussed by Bauer, Goddard project scientist, and Jackson, branch consultant, was designed and engineered by Giles H. Spaid and Roy Hagenmeyer. All are members of the planetary ionospheres branch.

The small payload design offered to the world scientific community is the result of NASA's international program of cooperation in scientific space research. The payload and ground station equipment was, therefore, designed with low cost and versatility as requisite factors.

### Goddard Speech and Paper Presentations

(Technical presentations approved as of June 25 for period of July 1 through July 14)

#### SPEECHES

- Dr. A. G. W. Cameron**, The Gordon Conference on the Chemistry and Physics of Space, Tilton School, Tilton, N. H., July 1-5, "Formation and Development of the Sun and Solar Nebula."  
**Dr. John O'Keefe**, Summer Seminar in Space Mathematics, American Mathematical Society, Ithaca, N. Y., July 1-8/9, "The Earth-Moon System in the Light of Recent Discoveries in Space Science"; Trinity College, Washington, D. C., July 6, "The Surface of the Moon"; and Summer Institute in Astronomy and Space Sciences, (NAS and Franklin Institute), Philadelphia, July 15, "The Earth and Its Motions."  
**W. Nordberg**, Institute of Aerospace Sciences, Colorado State University, Ft. Collins, July 10-12, "Present State of Experimental Research in the Mesosphere."  
**L. R. Stetter**, Rock Creek Amateur Radio Assn., July 12, "NASA Communications Network."

#### PAPERS

- Dr. K. W. Ogilvie**, 6th Intl. Symposium on Ionization Phenomena in Gases, Paris, July 8-10, "Interplanetary Plasma Probe."  
**Dr. K. Omidvar**, 6th Intl. Symposium on Ionization Phenomena in Gases, Paris, July 8-10, "Ionization of the Energy Levels of the Hydrogen-Like Atoms by Electron Impact."



Talking with Jorge L. Emerick (center) are (from left): John Flaherty, communications branch; Doug Tepp, Bendix; and Dane Russell and Don Kendall, Space Technology Laboratories.

# A Woman's Space in Science . . .



**MRS. EDITH REED**  
*Some of the Blame to the Fair Sex*



**MISS BARBARA SHUTE**  
*Improve Our Guidance Counseling*

Some criticize America's space program because we have no women "up there."

But we have a lot "down here" who are helping push America to new heights in the peaceful competition for space leadership.

The newly found place of the woman in scientific and technical positions can be attributed to a variety of reasons.

Pat Gorman, chief of Goddard's advanced orbital programming branch, whose 24 employees include 8 women, offers several explanations. "Because women provide such a valuable service in the home, there used to be a feeling that they couldn't be effective elsewhere," said Mr. Gorman. "Now the increased life span of women offers them a chance to do more than marry and raise a family. When their children are grown, many women return to or commence full-time careers."

He believes that as the emphasis on physical endurance in a job gives way to intellectual requirements women are finding much wider acceptance and use for their talents.

"Women and men both have much more control over their destinies than ever before," said Mr. Gorman.

Dr. Wilmot Hess, whose theoretical division boasts 8 ladies in scientific-technical positions, credits a woman's attention to detail and her ability to solve complex calculations and perform theoretical analysis for her steady rise. "There are lots of jobs in the field, and there are a lot of unmarried men," he quipped.

A sampling of opinions of women scientists at Goddard offers many interesting reflections on the subject of women in science.

**Mrs. Edith Reed**, physicist in the astrophysics branch, feels women bear a fair share of the responsibility for not entering the scientific fields more than they have. "It's not that there is prejudice against women, but only a few women have an interest in science. In contrast to men, a higher proportion of women are more interested in preparing for marriage than in developing academic interests." At Goddard, Mrs. Reed is co-experimenter with Prof. Jacques Blamont of the French Centre National de la Recherche Scientifique (CNRS) in developing a photometer for measuring the various wave lengths in the visible and ultra-violet air-glow. The photometer will be flown on OGO-C. Mrs. Reed has spent over 10 years working with rocket-borne mass spectrometers both at NRL and at Goddard. Her husband is also a Goddard employee. Mrs. Reed believes women often have "a special talent for intelligent and patient handling of detail that can be a real asset in science."

**Miss Barbara Shute**, physicist in the theoretical division's special projects branch, suggests improved guidance counseling to direct young women into the physical sciences. "Girls are too often steered into secretarial or similar courses because its closer to the things they usually do." At Goddard, Miss Shute works on satellite orbits, involving orbit determination and prediction; she selected the launch time for Explorer XII; and works on trajectories of materials leaving the surface of the moon, all of which are things girls usually don't do. She says that "there is greater equality of opportunity for women in scientific positions in government than in private industry." *(Continued on next page)*



**MRS. WINIFRED CAMERON**  
*Don't Be Bound by Tradition*



**MRS. JOAN JONES**  
*An Area Where Women Can Excel*



**MRS. DOROTHY HOOVER:** *Utilizing Our Full Potential*



**MRS. BARBARA LUNDE:** *From Grade School to a Masters in 7 Years*

**MRS. ELVA GLOVER:** *Interest Aroused by a High School Teacher*



**Mrs. Winifred Cameron**, astronomer in the theoretical studies branch of the theoretical division, believes women's capabilities are equal to men's. "Girls who have an aptitude for math and science should apply the aptitude. They shouldn't be bound by conventional attitudes." Mrs. Cameron, whose special area of research deals with surface features of the moon, uses her scientific background to encourage her two young daughters "to use their potentialities as much and as early as possible."

**Mrs. Joan Jones**, mathematician in the advanced orbital programming branch, believes women can perform better than men in certain areas, programming for one. "Women are sticklers for detail and their interest span is longer when it comes to tedious tasks or desk work." Mrs. Jones, whose father was a math and science teacher, took a liking to math when taking a prerequisite course in medical technology. She is a graduate of Morgan State College.

**Mrs. Dorothy Hoover**, mathematician in the mathematics branch, believes "women may be underestimated" and their potential may not be fully put to use. She believes this situation is beginning to improve because President Kennedy has been so articulate on the subject of equal opportunities for women. Mrs. Hoover is a B.S. graduate in mathematics from Arkansas AM&N and received Masters degrees in math and physics from Atlanta and Arkansas Universities, respectively. She is a recent co-author of a chapter in a new series, *Methods in Computational Physics*, Vol. 2, *Quantum Mechanics*.

**Mrs. Barbara Lunde**, physicist in the stabilization and control branch, completed her high school and college education and received a Master of Science degree in physics all in only 7 years. She has patents pending for an Integrating Droplet Accelerometer (a component in an inertial guidance package for a missile or spacecraft), developed while at MIT's instrumentation lab, and for an infra-red position sensor (to tell the position of the infra-red source as well as the intensity), developed since coming to Goddard. Claiming women haven't yet gained complete equality in the sciences, she acknowledges there may be some justified reasons, but most are unjustified, based on traditions and customs.

**Mrs. Elva Glover**, mathematician-programmer in the mathematics branch, attributes her interest in science to a high school instructor who aroused her interest in physics. She carried through with her interest for a Bachelor of Science degree in math from Morgan State in 1960. Her present emphasis at Goddard is on orbit determination.

**Mrs. Virginia Zanner**, data systems analyst in the physics branch and presently coordinator of the S-6 data program, "went against the stream and took science courses in college," switching from math to physics in her junior year at Rice Institute. Today she finds no particular barrier to being in a technical field—"as long as a woman works as hard as a man and doesn't expect any extra privileges." She concedes, though, that sometimes men find "they just can't work with women." Mrs. Zanner blends a busy and diversified social life with her scientific pursuits. She is a member of the Acting Company of the Shakespeare Society of Washington, president of the Washington Readers' Club, a Den mother, and presently is directing several one-act plays for Goddard's Drama Club.

**Mrs. Sally Richmond**, mathematician in the advanced orbital programming branch, remembers that she "couldn't take a course in mechanical drawing in high school because I was a girl." Nevertheless, today she holds a Phi Beta Kappa key from Fisk University, from which she is a recent graduate. While capability has nothing to do with sex, Mrs. Richmond says women may not move into positions of leadership so readily as men. For the future

**MRS. SALLY RICHMOND**  
*A Sprinkling of Liberal Arts*



**MRS. VIRGINIA ZANNER**  
*Hard Work and No Extra Privileges*



## "Swiftly" Puns Shake Center, Employees Report Convulsively

*Pun—A play on words of the same sound but different meanings or on different applications of a word, for the witty effect*

Nothing is safe from the punster, and Goddard is no exception. The latest fad making the office and cocktail party circuit is the adverbial pun—or as it is popularly known, "The Tom Swiftly."

It seems that a few wags throughout the country seized upon the adverb emphasis style of the writer of the old Tom Swift books. They had such titles as "Tom Swift and His Comic Rays," "Tom Swift and His Aerobee," "Tom Swift and His Gauss-Making Machine," "Tom Swift With His Erg Heads," ad infinitum. It is reported that in "Tom Swift Up The Amazon," a native canoe overturned. The alleged text follows:

"The native is being eaten by the crocodile," Tom said grimly.

We've heard some space-oriented Swiftlys around the Center recently.

"I am confident the budget request for your branch is adequate," he remarked dolefully.

"It failed in thermal vaccum, eh!" he said testily.

"FY 63 travel funds are exhausted," the boss said wearily.

"But it was programmed," he commented automatically.

"This proposal was due two weeks ago," he remarked punctually.

"We are going to a single source contact," he whispered quietly.

"Building 8 will be ready soon," he said cavernously from his desk in Building 5.

"The inter-building shuttle bus will be along any minute now," he remarked hourly.

"We can shield against radiation damage in space," he said heavily.

"Watch how you are handling that isotope," he declared atomically.

"Perhaps we should have an alternate design," he remarked duplicatingly.

"Let's go through headquarters channels," he said compromisingly.

"The Mars probe will have to be thoroughly sterilized," he announced septicly.

"It was only a routine headquarters review," he said nervously.

"Better not tell the press about this," he said openly.

"These particles have high velocities," he said energetically.

"And when they hit a magnetic field things happen," he declared electrically.

"Let's fly it on Ariel," he proposed spiritedly.

All these are known as single Tom Swiftlys. You get a bonus when you can make a double Tom Swiftly.

"Which satellite did it—Relay or Telesat," he repeated actively.

"Neither, it was the balloon," he echoed passively.

The fad is on, why not submit your space-related "Tom Swiftly" to INSIDE GODDARD?

You Are A Member . . .

### GEWA

When you raise your right hand and take the oath of office, you automatically become a member of the Goddard Employees Welfare Association (GEWA). As a member, you are eligible to receive the benefits and privileges it affords.

#### Employees Interest

President Allen Franta said, "To stimulate and strengthen the esprit de corps and morale of the employees is the prime purpose of the GEWA." In general GEWA promotes the social, athletic, educational, cultural and welfare interests of all members. To this end they encourage and support the organization of groups and functions at Goddard dedicated to these interests.

The GEWA is managed by the Goddard Employees Welfare Council which is composed of a minimum of five members, appointed by the Director. Performing their duties are: president, Allen L. Franta; 1st vice president, Fred J. Friel; 2nd vice president, Stuart A. Snyder, treasurer, Ben Herman and executive secretary, Alberta C. Moran. Management representative to the executive council is assistant director for administration, Dr. Michael J. Vaccaro.

#### Social Activities

Planning + organization = fabulous. This is the motto of the social planning committee.



Dr. Vaccaro

A. L. Franta

F. J. Friel

S. A. Snyder

B. Herman

Alberta Moran

The committee is composed of a minimum of five members which are elected from the membership at large and serve for one year.

At your service for 1964 are: Roland Van Allen, chairman; Fay Satterfield, vice chairman; Sue Boulware, secretary and John Libby, treasurer.

#### In the Fall

If you think the spring dance was such a success, the committee has big plans for a "re-e-ally big show" this fall. INSIDE GODDARD cannot reveal what's in store for you lucky people. But you can be sure that when the time comes INSIDE GODDARD will tell all in time for you to attend.

Center-wide activities receiving the support from your Welfare Association are as follows:

#### GODDARD CLUBS

Dramatic Club  
Astronomy Club

NASA-Goddard Gun Club

Archery Club  
Bowling:  
Men's Tenpin-1963-64

Mixed Tenpin-1963-64

Mixed Duckpin-1963-64  
Tuesday Night League  
Thursday Night League

Softball League  
Slow-Pitch Softball League  
Basketball Team

Band  
Girls Softball League

Acting President  
Director  
President  
Vice President  
Sec-Treasurer  
President  
Vice President  
Sec-Treasurer  
Executive Officers

Chief Instructor  
President  
President  
Vice President  
Sec-Treasurer

President  
Vice President  
Sec-Treasurer  
President  
Vice-President  
Sec-Scorekeeper  
President  
Vice President  
Sec-Scorekeeper  
Team Manager  
League Organizer  
Committee Chairman  
Treasurer  
Officiation  
Scorekeeper  
Awards  
Organizer  
Team Captain  
Co-Manager  
Managers

#### OFFICERS

Diana Uber  
Virginia Zanner  
Dick Wiack  
Frank Bartko  
Dr. David L. Harris  
John Zegalia  
Edwin Reid  
Raymond Kruger  
Joseph Parisi  
Larry Brown  
Jack Watterson  
Robert Bush  
Ron Browning  
Fran Federline  
Bob Underwood  
Dusty Rhodes  
Richard Plock  
Tony Andrella  
Dorres Hughes  
S. DiBenedetto  
Robert Keefe  
Jessica Dunne  
Joseph Greco  
Charles Jones  
Jean Campbell  
Jim Stephens  
Bob Snyder  
William C. Isley  
William C. Lund  
Robert C. Estes  
John R. Thurber  
Harry E. Montgomery  
Tom Cherrix  
Kay Church  
Diane Doss  
Chuck Stuart &  
Jim Heinz



## INSIDE GODDARD

GODDARD SPACE FLIGHT CENTER / GREENBELT, MARYLAND

July 1, 1963

## FAB Division Has FABulous Picnic

All the elements were there—sunshine, waterfall, good food, games and lots of people. The place was Brighton Dam where fabrication division met to have their picnic.

More than 250 people enjoyed the aroma of hot dogs and hamburgers that came from the charcoal burners.

The entertainment committee went all out on the picnic games. They made sure that the "Mama's and Papa's" intake of calories were worked off and the kiddies had a "real picnic" keeping H. Melvin Bickford (better known as Harry) busy blowing up balloons.

Arrangements for the successful event were made by fabrication division chief Maurice Levinsohn. Committee members were: Merhlyn Pickett, Nancy Bateman, Lee Horning, James Poland, Wade Smith, Paul Mulhollen, Charles Graefe, Henry Bernstein, Carl Walch, Kathy Sawyer, Frank Martin, Vince Canali, Tony Votta and Billy Arnold.

The question in fab division now is "When's the next picnic?"



"Miss Goddard" (above) kept busy turning out hot dogs—while Sharon Skinner (below) entertained with her accordion.



Above, the gals take a try at jumping off some of those calories. Below, the kids that had hush puppies on found they had a better chance in the shoe race.



### Frum 'Lil-Asternerts

National Space Administration  
Public Relations - Dear Sir We have  
a club called The Scientists. If you  
could please send us some material  
that can be used in our Club and  
our Scout troop, it would be  
a appreciated.

John M.  
Bobby B.

## Feel Like Play Acting?

The newly organized Drama Club at Goddard has not produced any Broadway plays yet but are having a "ball" just acting like hams. Diana Uber, theoretical division, first came up with the idea of a drama club and ran an ad in the personnel bulletin. The response was small, but Diana said "we have plans for producing some short one-act plays and this should draw more interest."

The club is presently doing workshop plays being directed by Virginia Zanner of the physics branch.

Also in the wings is an original play by Gene Norman, ex-Goddard employee, entitled "Miss Roberts." Future plans include producing this for a Goddard audience.

The club is still small and young enough for new members. Diana said, "We're all amateurs with little or no experience, so it's anyone's stage."

If interested contact Diana Uber, ext. 4444.



Harry in action.



Sandy Haines plays the wife of a young author, Bill Parker, who is financially embarrassed.



Virginia Zanner (left) directs a one act play "Overhead." From left, Bob Coley, Judy Holland and Diana Uber. Sandy is trying to revive Bill.

scientist-technician: "A sprinkling of liberal arts" in your general development.

*This is the first in a series of articles dealing with women in science and their jobs at Goddard.*

**Mrs. Jaylee Burley**, astronomer in the theoretical studies branch, is specializing at Goddard on O-B stars in the milky way. Presently working on her Ph.D. dissertation at Georgetown University in the study of stellar motions as related to galactic structure, Mrs. Burley credits the "intellectually stimulating atmosphere" at Goddard and the happy combination of academic study and work application for arousing her interest in astronomy. For the young woman considering a scientific career: "Stick to physics and math for the basic concepts that you will need later."

**Mrs. Melba Roy**, who heads 4 women and 7 men in the program production section of the advanced orbital programming branch, thinks women should go into scientific areas if they have an interest and an aptitude. "Women shouldn't let the fear that they shouldn't go into a field hold them back." Mrs. Roy, who was valedictorian of her high school class and graduated summa cum laude from Howard University, developed an interest in scientific subjects in high school, partly because "there was no subjectivity in grading." At Goddard she works primarily with orbital programming of the center's scientific satellites. Her section's mathematical computations translate scientific information into data almost as fast as a high speed computer. Her group was once honored for being "incredibly accurate" in their programming computations. "The right thing is happening at Goddard," observed Mrs. Roy. "Work is being evaluated on its quality and extraneous factors are being eliminated."

**Miss Elise Fisher**, mathematician-programmer in the theoretical division's mathematics branch, thinks women may be at a disadvantage with their male colleagues if they "don't participate in the informality of office discussions which often are very beneficial for a free exchange of ideas." She believes women are "more systematic and become less impatient or discouraged because of routine aspects of a job." Miss Fisher taught at Valparaiso University and worked at NOL before coming to Goddard where she does experimental programming on satellite orbit determination.

**Mrs. Mary Hann**, mathematician in Dr. Joseph Siry's theory and analysis office, finds mathematics provides a sound and comprehensive background for work in a variety of fields—physics, engineering and astronomy. "But one who has a liking for and ability in scientific work can do well," Mrs. Hann says. "Sex makes no difference. Women are no better equipped; even in home economics some of our best cooks are men." Mrs. Hann, who served in the WACS, and worked on bomb ballistics for the Army, long range navigation for the Air Force and Vanguard I for NRL, "could always remember numbers but never names." Today, instead of curling up with a good book, Mary Hann prefers a good calculus problem.

**Mrs. Eugenia Brooke**, mathematician in the sounding rocket branch, has had an interest in math since early childhood. "I was doing long division before first grade. It just came easy for me." It came so easy, in fact, that she wasn't content to let tradition turn her aside from a career in math. Persisting in her fight against convention, Mrs. Brooke became the first woman in the history of the University of Maryland to take a course in the engineering college. It was a course in engineering mathematics for freshmen. "Women aren't left out so much as they used to be, especially at Goddard. Perhaps it is because everyone in the world is getting a more equal opportunity. People are being recognized for ability, not sex or color."

**MRS. MARY HANN**  
*Some of Our Best Cooks  
Are Men*



**MRS. EUGENIA BROOKE**  
*Long Division Before First  
Grade*



**MRS. JAYLEE BURLEY: Happy Combination of Study and Work**

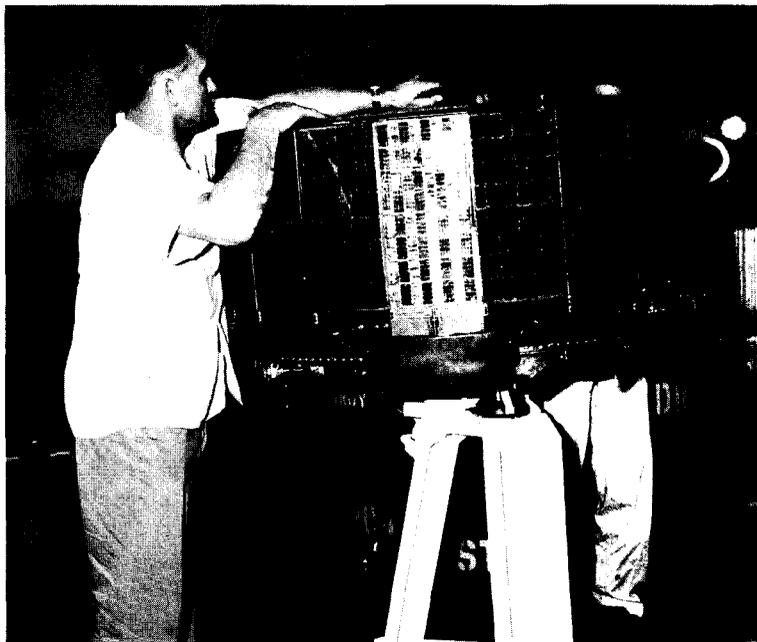


**MRS. MELBA ROY: Don't Let Fear Hold You Back**

**MISS ELISE FISHER: A Free Exchange of Ideas**



## Two Eyes Will Be Watching 1963 Hurricanes—Tiros' VI, VII



Tiros VII is removed from its container and prepared for mating with the Delta booster at Cape Canaveral.



Receiving initial post-launch data from various tracking stations and Cape Canaveral are (from left): Gerald Johnson, Adrienne Zenuk, Bob Chaplick and Harold Bierley. All are assigned to project Tiros from Dr. Siry's theory and analysis office.



The President of India, Dr. Sarvepalli Radhakrishnan, was a guest at Cape Canaveral a little more than week before Tiros was launched. Here he is shown (left) being briefed on the project by Goddard's Ernie Powers, Tiros project coordinator.

The seventh Tiros, launched last month just one year after the fifth Tiros, has joined the sixth Tiros watching the world's weather. America's "heavenly twins" have a very earthly job to perform—that of obtaining earth cloud cover pictures over hurricane and typhoon breeding areas during the upcoming tropical storm season.

NASA's remarkable Delta booster marked up its 18th straight success with the Tiros launch, which smoothly placed the seventh consecutive television and infra-red observation satellite into orbit exactly as planned, exactly when planned. The only problem in the entire process was a 24-hour hold, after which the near perfect launch was executed. Tiros VII is circling the earth in a 400-mile orbit once every hour and 38 minutes.

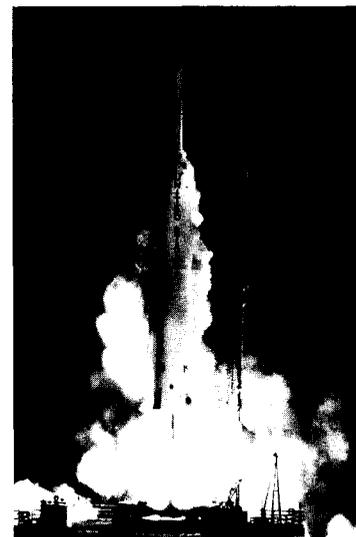
Tiros technical control in Goddard's building 3 worked with precision during countdown and launch, and through orbital insertion. The entire Tiros program is a Goddard enterprise, under the overall direction of W. G. Stroud's aeronomy and meteorology division. Development of hardware and operation phases of the project are directed here.

On the first orbit, the new Tiros transmitted pictures of a cloud vortex over Newfoundland, which was identified as a cyclone. First pictures were received at Goddard, Cape Canaveral, and the National Weather Satellite Center at Suitland, Md. (near Washington) in less than one hour.

Tiros VII, along with Tiros VI, will provide the most complete coverage to date of the remote areas of the earth where dangerous tropical storms begin. The latest Tiros will be in position over the vast Atlantic and Caribbean storm areas during the peak hurricane season in August and September.

The two weather satellites have been placed into orbits which will enable them to supplement each other's coverage of the global weather scene.

John A. Maskasky is Tiros spacecraft manager, Albert L. Thalhamer is data acquisition systems manager, Harold Oseroff manages data utilization, and Bob Gray is in charge of launch operations at the Cape. These men, along with Tiros



Here is the launch of the satellite, marking the 18th straight successful implementation of the Delta booster.

project manager Bob Rados and the rest of the team have helped make the weather satellite program one of the most successful enterprises in America's young space effort.

The Tiros team was at work long before dawn on the morning of the launch, along with all support elements. As Rados put it, "you have to get up pretty early in the morning to top this group. They know their job—and they do it well."

### Recent Technical Publications Authored by Goddard Staff

"Goddard Space Flight Center Contributions to the COSPAR Meeting May 1962." (Combined authors), NASA Technical Note D-1669, May 1963.

L. J. Blumle, "Satellite Observations of the Equatorial Ionosphere," D-1756, June 1963.

Dr. H. A. Whale, "The Excitation of Electroacoustic Waves by Antennas in the Ionosphere," D-1760, June 1963.

Dr. Peter Musen, "On a Modification of Hansen's Lunar Theory," D-1745, June 1963.

William M. Kaula, "Tesseral Harmonics of the Gravitational Field and Geodetic Datum Shifts Derived from Camera Observations of Satellites," D-1848, June 1963.

Karl Stumpff, "The Long-Period Motion of the Trojans, with Special Attention to the Theory of Thuring," D-1416, June 1963.

Stefan Schreier, "On the Breakdown Voltages of Some Electronegative Gases at Low Pressures," D-1761, June 1963.

Syun-ichi Akasofu and Joseph C. Cain, "The Magnetic Field of the Radiation Belts," D-1762, June 1963.

**ECHO TESTING***(from p. 1)*

into the whole picture smoothly. Many of them were tired, a little hollow-eyed from lack of sleep. But there was no friction, no visible irritation. There was no lack of enthusiasm either, even though the testing had become routine—old stuff!

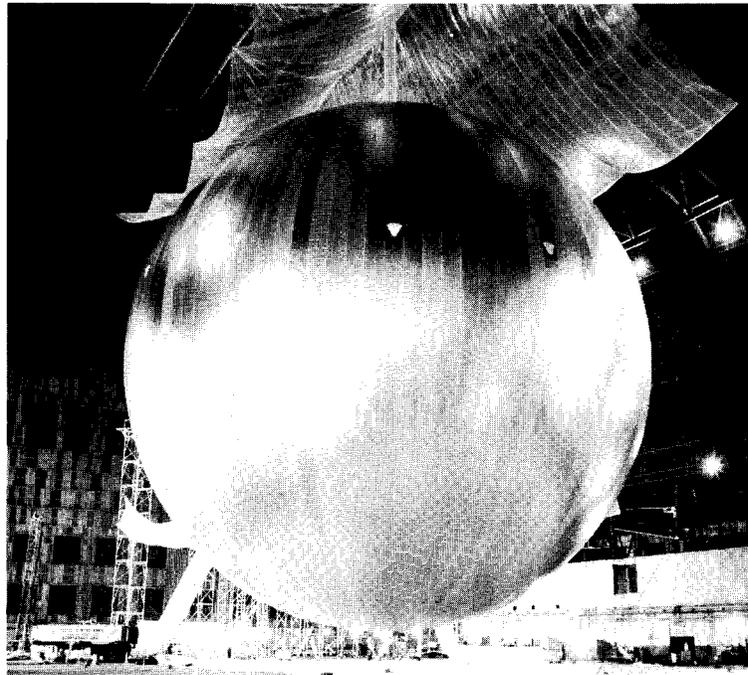
The visitor might have pondered about this a bit. Why all the high morale? This wasn't a glamorous program like Mercury or Saturn or Apollo. It is a low budget program without widespread public appeal, even though balloon technology had proven to be, and will continue to be a prime source of scientific discovery—as well as development of communications techniques. There was none of the excitement of Cocoa Beach to compensate for the long hours of research. In the few hours when the Echo crews weren't working, they were catching up on much-needed sleep in a motel in a nearby quiet out-of-season resort town, where sidewalks were folded promptly at nine.

The visitor would come to the conclusion that this remarkable good discipline was a tribute to, and a result of the kind of people employed by all the organizations participating in the tests. And right he would be.

But the smoothness of these tests was the result of many people in many places, civilian and military, government and industry. All the considerations for selecting the site, preparing it for the tests, furnishing the special equipment, and testing called upon the special knowledge and talents of people in NASA, Goddard Echo project, Navy, Army Map Service, Geological Survey, and widely diversified industries — Schjeldahl, Westinghouse, Conduccion, Chesebore-Whitman, and the General Ladder Company.

Let's start with Robert Goss. No show can be put together successfully without the director, in this case, Bob Goss, Echo test director. Was Bob Goss tense, nervous? You bet he was. But you'd never have guessed it from his friendly manner. He could give a direct order befitting an infantry commander in combat and make it sound like an invitation to a high tea.

Or take Herb Eaker, Echo project manager, who is "producer" of this show. He set



*The Echo II, fully inflated, is in position for the beginning of the testing sequence. Its 135-foot diameter is roughly equivalent to the height of a 12-story building. The large compressed-gas trailer on the left gives some size comparison. (Turn to page 8 for more Echo II photos.)*

the calm mood necessary for the well-disciplined production. It wasn't that Herb was indifferent, nonchalant, about the project. On the contrary, he's a perfectionist.

John Thole, Assistant Project Manager, who can be called the "author" of the plan for the balloon's inflation system, seemed to be exuding confidence. But Thole also was sweating it out because of the inter-relationship of tests with the S/C test program he had formulated. Or Henry Sweet, who was responsible for the pressure control and pressure recording systems. If strained, he didn't show it. He was extremely meticulous in executing his responsibilities—and confident all the way.

The same calm, but taut attitudes, were shared by technical personnel, such as Harold Horiuchi, assistant test director and Normal Martin, project coordinator: T&E division's Larry Smith and Dan Flannagan from Fabrication, who was a jack-of-all-trades and seemingly tireless throughout the tests; and Larry Kobren and Charlie Staugitis from Dr. H. E. Frankel's materials section.

Last, but by no means least, there are the liaison personnel from the host organization, the Naval Air Station, Lakehurst. These are what the Navy calls Can Do types—men who get things done. They include Lt.

Gene Moccia, & Chief Tangney, salty types of the days of lighter-than-air-craft, who get a faraway look in their eyes when they see a balloon.

**Testing**

Tests to which the prototype of Echo II are being subjected are varied and interesting. The major experiment is to measure, photogrammetrically, the spacecraft's contours, in order to know its degree of sphericity at varying levels of inflation pressure such as will be encountered in inflation following Echo II's launch from the Pacific Missile Range. These tests are being conducted under the technical direction of S. H. "Howie" Genatt of Goddard's optical systems branch and Dick Underwood, from the Army Map Service, which is performing the photogrammetry.

The other major experiment is being conducted by the Conduccion Corporation of Ann Arbor, Michigan, under the technical direction of John Thurber. This measures radio frequency reflectivity of the Echo II balloon from various simulated heights.

The Westinghouse Electric Corporation had the responsibility of installation of all equipment and for coordination of the tests. The scaffolding required was erected by

two companies from Newark, New Jersey: the Chesebore-Whitman Company and the General Ladder Company.

**The Stage & The Set**

The assistance and cooperation of the Navy has contributed directly to the smoothness of the test operation. Hangar 1 is one of the very few places where it is possible to test a balloon as big as Echo. Originally, when the project sought a site for testing, the Carlsbad Caverns in New Mexico were considered because of their unchanging conditions of humidity, temperature and atmospheric pressure. However, even these great caverns proved to be too small.

Though big enough, Hangar 1 posed some problems itself. The facility is so huge, that it develops its own weather situations.

A long canopy was rigged above Echo in the hangar's roof structure. Sheets also were dropped vertically. These took care of weather and falling foreign matter, and protected the balloon from metal surfaces as it inflated.

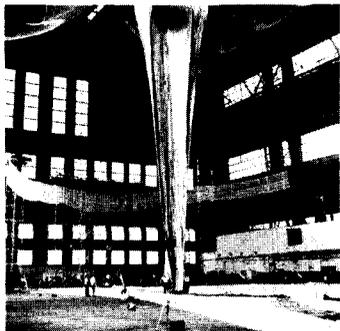
Also, in preparation for the tests, scaffolding had to be erected on either side of the balloon to support radar and photogrammetric equipment.

One of these scaffolds, 47 feet above the deck, is built on an arc representing 30 degrees of Echo circumference, for radio frequency reflectivity measurements. An antenna at each end of the arc bounces signals off the balloon to a receiver traveling along the arc on a dolly. The other scaffold, 57 feet off the deck, holds photogrammetric equipment, principally two Swiss-made precision aerial cameras with special close-up focal lengths and film with a great range of contrast and high resolution. One camera was provided by the Geological Survey, the other by the Navy Bureau of Weapons. These cameras are set up to overlap and give a stereoscopic effect. The cameras record the contour characteristics of the satellite's surface during the various phases of inflation with a profile accurate to 1/16 of an inch over a 10-foot section on the balloon.

Other instruments on the scaffolds, 67 feet high, electronically record contour, balloon motion and pressure on Echo's surface.

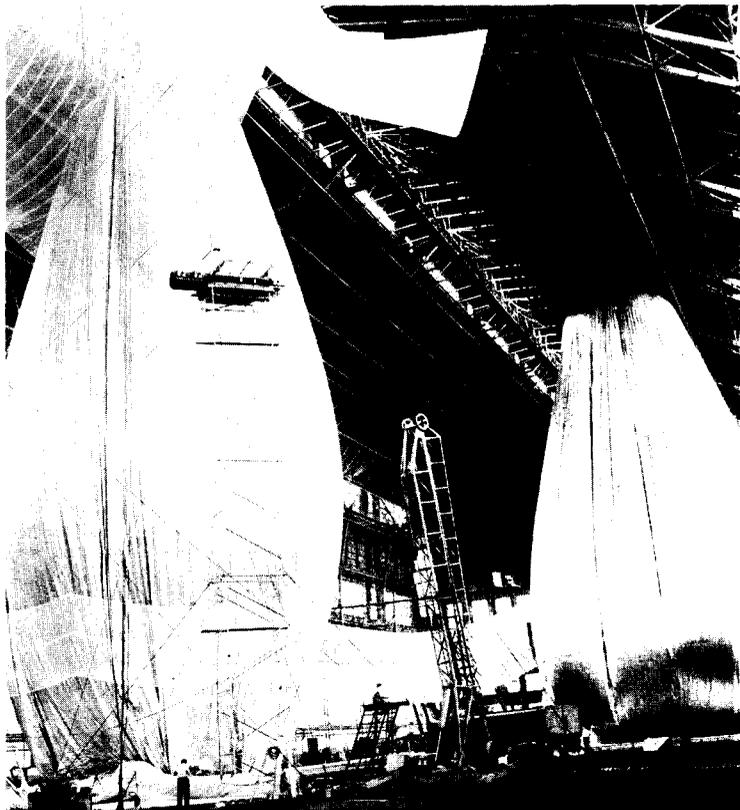


Goddard's Echo static inflation test team includes, from left, Bob Goss, test director; Larry Smith, John Thurber, Harold Horiuchi, assistant test director; Henry Sweet, Charles Staugitis, Lester Millman, Larry Kobren, Sol Genatt, Dan Flanagan, and Ted Hopkins. Photographer is Ron Craig.



Echo begins its gradual inflation. At the end of the first hour of the 12-hour inflation process this is how it looked.

**The Broad Scene**  
 The presence of Echo at Lakehurst lent drama in itself. The satellite seems to bring together the historic past and the promising future. Hangar 1, built in 1921, housed the Navy's big dirigibles, like the Shenandoah, Los Angeles, Akron and Macon. Germany's Graf Zeppelin and Hindenburg also were berthed there.  
 Hangar 1, built for the United States' largest airships, now has moved to America's largest spacecraft.

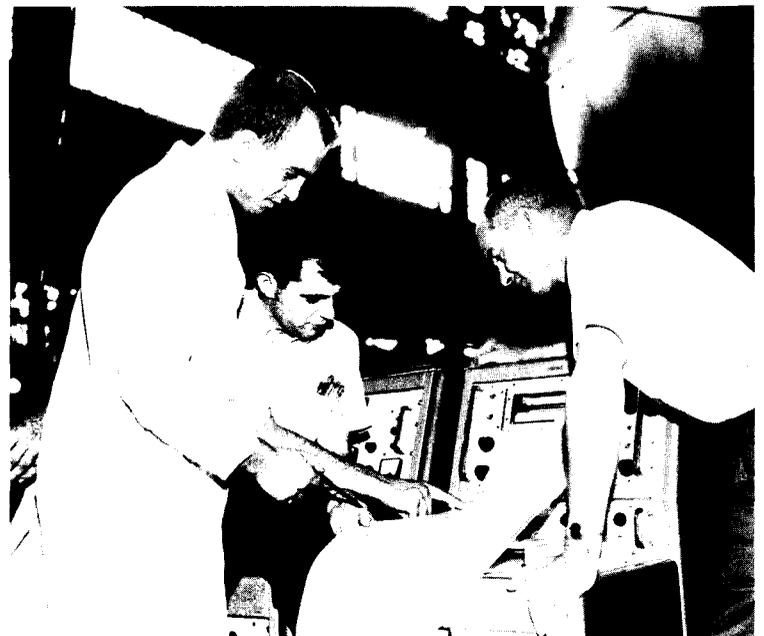


Two giant Echo test balloons, the prime balloon at the left and the backup at the right, pass the 3-hour inflation mark. The backup was used for initial dry-run purposes.

*As Seen in Life . . .*



Photo by Life Magazine Copyright Time, Inc.  
 A Life magazine cameraman caught this unusual picture during the Echo testing. The "miniature" balloon is a 15-foot helium-filled sphere. The picture appeared in a recent issue of Life.



Goddard's John Thurber at the left and Howard Brooks and Bob Vinson of the Conductron Corporation check r-f measurements from the data console.