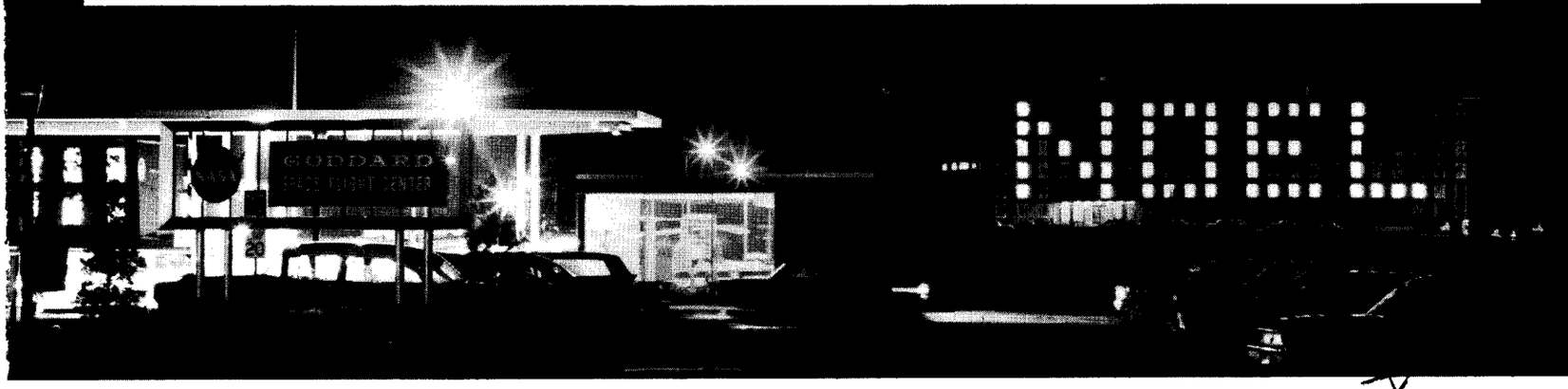
GODDARD NEWS

GODDARD SPACE FLIGHT CENTER / GREENBELT, MARYLAND

VOLUME VI, NUMBER 2 — THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION — DECEMBER 16, 1963



By choice, not by chance, the lights in building 8 spell out a holiday greeting. The idea came from William O'Leary.

X GSFC

Relay's First Birthday Will Be Its Last

Relay, NASA's first successful active repeater communications satellite, celebrated its first birthday last Friday, the 13th.

The 172-pound satellite is not scheduled to have another. As we go to press, Relay is scheduled to "die" at any moment. Soon Relay will be silent, after a distinguished "life" of about one year.

The silence will be no surprise to the Relay crews at ground stations on four continents. Death was foreordained when Relay was still on the drawing board.

Experimental satellites which chatter away long after they cease to be really useful could clutter up the nonexpansible communications spectrum, reasoned the project's engineers.

So they planned a lifetime of just one year, to be ended by an electrolytic material which would eat away a connection to the main power lead from the solar cells at a planned rate of erosion.

While Relay was designed to end her life on her birthday, December 13, her ground station crews have been amusing themselves with speculative pools about the exact time of her demise, for there was a give-or-take tolerance of several days in the design.

"Amusing themselves" is a misleading phrase, perhaps.

To plagiarize Daniel Webster: "She was only a small satellite, but there were those who loved her."

The Relay crews developed a fondess for their orbiting hunk of hardware similar to the devotion other men feel for fine racing cars or sailboats. In part, it was something like the particular affection a parent feels for a sickly child who finally grows up to lead a healthy, vigorous and useful life.

Relay I had ailments in early youth which caused most people to despair of her life—but not the crews who worked night and day to nurse her back to health, to live the longest and most productive life of any communications satellite to date—a life including more than experiments and public demonstrations.

Relay

There was jubilation at Cape Kennedy (then Cape Canaveral) when another Delta blasted off at dusk last December 13 to place Relay into orbit. There was jubilation also when Goddard announced acquisition of Relay's signals from the tracking stations:

At NASA Headquarters in Washington; at the Radio Corporation of America's laboratory near Princeton, New Jersey, where Relay I was designed and built; at the Space Technology Laboratories in California, whose crews at the test and command stations would soon help provide the magic that gave Relay her long, useful life; at Andover, Nutley and Rio, where AT & T and ITT men stood by to experiment; at the United Kingdom's station at Goonhilly Downs on King Arthur's Cornish peninsula and at the station of their fellow Celts across the English Channel at Pleumeur-Bodou, Brittany in France.

Most of all, there was joy in the Communications Satellite (COMSAT) Operations Center at Goddard, the focal point of

(Cont'd on p. 6)

From The Director:

Season's Greetings

Once again a year of accomplishment and growth is drawing to a close. I am sure that each of us derive a personal satisfaction from the major role that Goddard continues to play in the space program. This satisfaction is matched by the challenge that lies ahead of us in the year to come.

I extend to every Goddard employee and their families my thanks for their support that has made the accomplishments of the past year possible. Also, my sincere best wishes for a joyous Christmas season, and for a productive and prosperous New Year.

Harry J. Goett

HARRY J. GOETT
Director

Tomorrow's TIROS Will Have Automatic Picture Transmission

TIROS H is scheduled for launch tomorrow carrying a new and unique experimental camera system which is designed to give meteorologists an instantaneous look at cloud cover patterns. The primary mission of this TIROS is the evaluation of the subsystem, called APT (Automatic Picture Transmission).

APT was designed for the second generation weather satellite, Nimbus, which is scheduled for launch into a polar orbit early next year. The relatively simple and inexpensive new system will undergo extensive testing aboard TIROS in preparation for the major part it will play in project Nimbus.

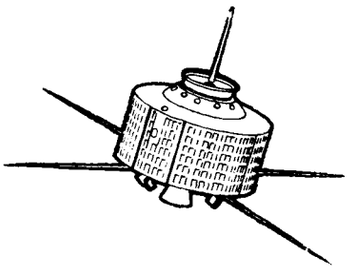
A regular television camera is to be on board, identical to those which have operated on the last seven consecutive successful TIROS spacecraft. However, no infrared experiment is included. The reliable Delta, managed by Goddard, will be looking for its 21st straight success tomorrow.

Unlike the television subsystem carried on the early TIROS satellites, APT transmits pictures on the slow-scan principle similar to that used to send radio photographs.

Thus, meterologists can observe cloud-cover photographs of their area as the image forms on the facsimile machine at their station. Each APT ground station can receive up to three photographs during one pass, depending on the distance and angle of elevation of TIROS.

The APT subsystem in the spacecraft consists of four major elements: the sensory housing which contains the camera, vidicon and vidicon electronics; the video electronics module consisting of the video detector and the timing and switching circuitry; power converters; and the FM transmitter. The entire subsystem weighs only 24 pounds.

The 108-degree lens used in the system can photograph an area of approximately 775 miles on a side (600,625 square miles) when the satellite is looking directly toward the earth.



TIROS

A timer in the APT subsystem programs the equipment for continuous cycles of prepare, expose, develop, and direct-readout for approximately 30 minutes of each orbit. This complete cycle takes place the first eight seconds of each 208-second picture cycle.

The remaining 200 seconds is used to readout the photograph at a scan rate of four lines per second.

There is no noticeable physical difference in the appearance of this TIROS with APT as compared with previous "standard" TIROS spacecraft.

APT Ground Stations

The simplicity of the APT system makes it appealing to meterologists. A typical ground station consists of a manually tracked 13 db helix antenna, a commercially available radio receiver, and a standard photo facsimile machine.

A five watt transmitter broadcasts the signal for the spacecraft to the ground in the 136 Mc space telemetry band. Spacecraft frequencies, using the FM bandwidth, make a large variety of standard mobile communication equipment adaptable.

For approximately two or three days after launch, only seven key stations will participate in the evaluation of the APT system. These sites are:

- Goddard
- RCA's Astro-Electronic Products Division, Princeton, N. J.
- Wallops Station, Wallops Island, Virginia
- U. S. Weather Bureau, Suitland, Md.
- U. S. Army Electronics R & D Laboratory, Ft. Monmouth, N. J.
- Fairchild Stratos Corp., Bayshore, Long Island, N. Y.
- Air Force Cambridge Research Laboratory, Hanscom Field, Mass.

The tests will be conducted in two phases: During the first phase, scientists and engineers will be interested primarily in the initial engineering checkout of the APT system. The first phase will continue until it has been determined that APT photographs can be acquired and processed by the APT network.

Phase two will also include an operational evaluation of the total system with all of the world-wide APT stations being programmed for cloud photographs.

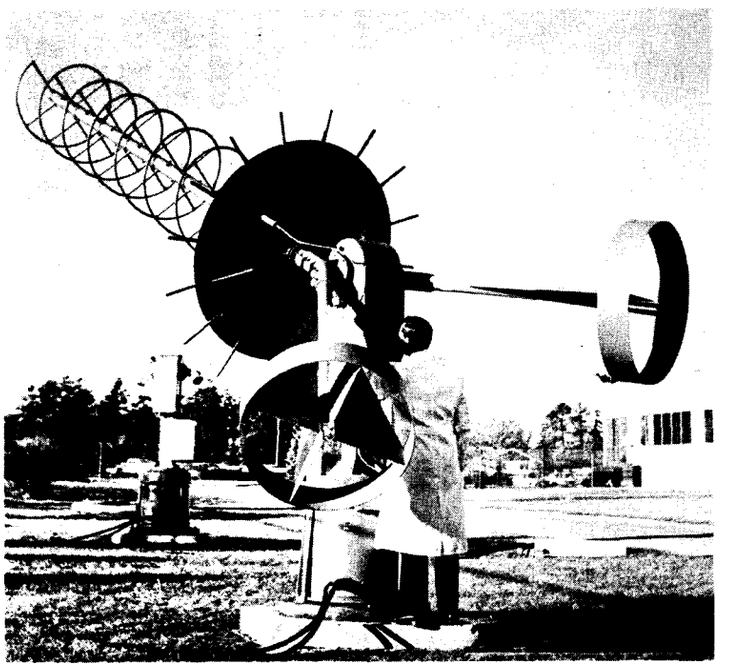
To acquaint station personnel with the tracking techniques of a TIROS, stimulated data were mailed to APT stations November 25, 1963. These messages provide data in the exact format to be used on this TIROS launching.

TIROS will journey into space atop the 90-foot, 57-ton three stage Delta which has logged the most outstanding record in American rocketry. The slender rocket netted its 20th straight success November 26 as it orbited Goddard's IMP.

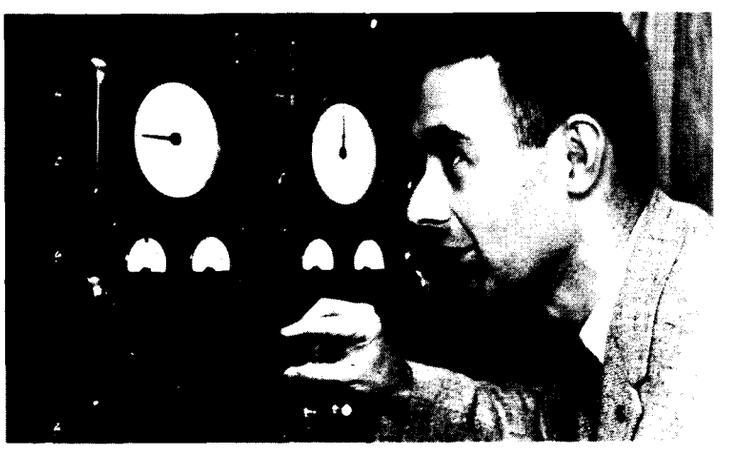
The TIROS project is under the overall supervision of Goddard's aeronomy and metrology division, headed by William Stroud. TIROS project manager is Bob Rados.

The launch vehicle is managed by this Center also, with Bill Schindler assigned the post of Delta project manager. Bob Gray heads Goddard's field projects branch at the launch site, Cape Kennedy.

Both the TIROS project and the Delta project have received NASA's group achievement award during 1963.



The TIROS APT antenna is shown here ready for action.



Chuck Hunter is shown at the TIROS APT console here.

News About Space & Aeronautics

● NASA and the India Department of Atomic Energy have announced the first rocket launching from a site which will be an international rocket launching facility at Thumba near the southern tip of India. India has offered to make this facility available to other nations for scientifically worthwhile space research projects.

In this successful launching, sodium vapor released from the rocket payload formed a cloud enabling ground observers to plot the direction and speed of the upper atmosphere winds. Four launchings of such sodium vapor payloads are planned in this series.

• • •

● ". . . Think of this: 10 years ago, utilizing an aeronautical technology which could exploit the atmosphere only up to twice the height of his mountains, man grappled with a shrunken and bipolarized world. Less than 10 years from now, he will have stood on the moon and surveyed the earth, while confidently preparing a voyage to nearby planets. . . ."

James E. Webb, NASA Administrator, in a speech to the National Association of Counties.

• • •

● Douglas Aircraft Co. has been selected by NASA for negotiations leading to a follow-on study contract for refinement and evaluation of a manned orbital laboratory.

Douglas and Boeing were selected in June from 11 aerospace firms responding to requests for study proposals performance during this period. Douglas was selected for the additional work.

• • •

● The new Thrust-Augmented Delta launch vehicle (TAD) will be used for the next Syncom communications satellite to be launched into a true stationary orbit—synchronous, equatorial and circular. Both the TAD and Syncom are Goddard projects.

Previous Syncom launches by the Delta vehicle were inclined to the equator because the Delta did not have the more powerful thrust necessary for stationary orbiting.

Scheduled for the second quarter of 1964, the next Syncom will be boosted into a looping 22,300 mile eccentric orbit from Cape Kennedy.

Then, at apogee, about 22,000 miles above Sumatra, the kick motor in the spacecraft will fire to place the satellite in circular orbit.

The equatorial orbit will be achieved by a change of the orbital plane—once as the third stage fires, and again as the kick motor (fourth stage) fires at the equatorial injection point.

Syncom will then move to its on-station position at 180 degrees longitude over the Pacific Ocean. There it will be stopped by gas jets and be ready for communications between U. S. and Asia.

• • •

● A Marshall engineer, Paul P. deFries, spent two weeks at the South Pole recently evaluating operations under inhospitable conditions similar to those that astronauts might expect when they land on the Moon.

The bespectacled, scholarly specialist in lunar operations departed carrying only binoculars, a special camera and a good supply of notebooks. He was to be issued survival gear in New Zealand.

Mr. deFries is in charge of the Marshall Space Flight Center's effort in the lunar logistics support area. In Antarctica, he will gather data on practical means and ways of exploiting the experience gained in the maintenance and logistics of small Antarctica bases and use it as a guide to supporting astronauts on the Moon.

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.

Whether or not one embraces the Christian religion, there is no escaping the impact of Christmas on our society. The holiday—the celebration—is here to stay, along with all it represents.

Some complain that Christmas is too secularized. They hold that since man has chosen to make it a showcase of materialism and greed, it has lost its value.

Others feel that it is unfair to grant purely religious holidays, such as Christmas and Easter, since not all citizens hold like beliefs.

However, anything worthwhile stirs controversy. Any idea which can revolutionize a society or an individual will be controversial. It has to be to create action.

Perhaps Christmas falls within the confine of this thought. Putting aside whatever can be said for or against Christmas, we must agree that the Christ of Christmas can and has changed things. Christ said that He came that we might have life, and have it more abundantly. Christ equated Himself with God. Some interpretations of Christ are controversial, others are unifying.

Christmas is the celebration of His birthday. Our calendars measure the years since His advent. He has revolutionized societies and changed individuals. His birth, death on the cross, and resurrection were predicted in the Old Testament thousands of years before that momentous night in a humble manger in Bethlehem.

St. Paul is an example of a changed individual. Formerly Saul of Tarsus, he was the leading persecutor of early Christians. They were accused in the Book of Acts of being "those who have turned the world upside down." Saul, until his conversion to Christianity on the road to Damascus led the persecution of these "revolutionaries."

Saul's oft-recounted conversion gives mute evidence of the power of Christ to change both individuals and societies.

As this Christmas approaches, men throughout the world are searching for peace, understanding and goodwill. This search knows no geographical boundaries or secular division. The Christ child and Christmas carry a message for all who will listen. The Prince of Peace is historical fact. Only our reaction is the variable element.

Merry Christmas.—*The Editor*

GODDARD NEWS

"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.

Phone—Ext. 4141 or 4142

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

Fabrication Engineering Office Doubles as Spec Library

The sign at the door of room 118 in building 5 only tells part of the story! "Fabrication Process and Materials Engineering Office" is what it says. "Specifications Library" is a rightful part of the title not included.

Two walls in one of the office's two rooms are full of specifications files, technical documents, and commercial catalogues. The Goddard library now routes all requests for specifications there, according to Bernard R. Cantor, supervisor of the process development group which uses the two rooms.

The office's major duty is just what the name implies; they accomplish the necessary engineering work involved with fabrication materials and processes. For example, if a project scientist wants a particular metal used for a specific purpose, Cantor's group determines whether or not the specified material is suitable—and if so, what specifications (weight, density, alloy, etc.) apply to the job.

In addition to Cantor, an aerospace engineer, there are four persons in the group. John H. Overton is a physicist; James A. Munford specializes in metallurgy; Howard Herzig is a chemical engineer; and the newest member of the staff is Samuel S. Katsef, an engineering technician.

The division of skill enables the office to keep "on top" of any engineering or material problem which may turn up. Organizationally, the group is under the fabrication division. Under the division is the fabrication process and materials engineering office, headed by Abraham Piltch. Piltch is Cantor's supervisor.

The bonus service offered to the Center by the process development group's specifications file grew naturally from the major mission of the five-man team. In each of their special fields, the men needed to have specifications and technical information at their fingertips.

A natural outgrowth of the need was the formation of the files. While the process development group is the most consistent user of their own information, it is available to the whole Center. As mentioned before, the library routes special requests there also.

Cantor says that he and his group are willing to explain the working of the filing system to the information seeker. If necessary, they will even assist him in his search.

For example, if a searching scientist knows what spec he needs by number, Cantor would point him in the right direction and let him go into the files and

(Cont'd on p. 5)

Surrounded by file cabinets, Bernard R. Cantor looks for a specification. The spec files are a "bonus" function.

Happy Holidays

Miss Goddard, Merhlyn Pickett decorates for the holiday season.

INSIDE GODDARD

GODDARD SPACE FLIGHT CENTER / GREENBELT MARYLAND

DECEMBER 16, 1963

Christmas Bureau

Again the Christmas season is here, bringing with it that warm, wonderful feeling which comes with the joy of giving.

The less fortunate families of Prince Georges County will have additional foods, gifts and toys this Christmas through the annual program sponsored by the Goddard Employees Welfare Association.

Contributions from Goddard employees may be placed in special boxes in the lobbies of all buildings prior to December 19. The boxes then will be delivered to the County's Volunteer Christmas Bureau for proper distribution.

Principal items sought include food packaged in cans or glass, new or used toys in good condition and clothes. Gifts should not be wrapped. This allows the recipient to select the desired items.

The Christmas Bureau plan of giving eliminates the disadvantages of giving directly to families. The later approach has resulted in duplication, misdirected charity, and embarrassment to parents in the eyes of their children. Bureau giving allows the mother to make selections for her own family.

Santa Is Coming To Goddard

The second annual employees children's Christmas party will take place this year in the Center's new auditorium in building 8 on December 22.

Mr. and Mrs. Santa Claus are scheduled to arrive at 2 p.m. with gifts galore for the kiddies from ages 0 to 12 years. Price per child is $1.00, this is to defray cost of Santa's present only.

Refreshments will include cookies, punch and candy canes—all the kind of goodies the little ones like.

The idea of Goddard sharing Christmas with their employees and their children is sponsored by the Employees Welfare Association.

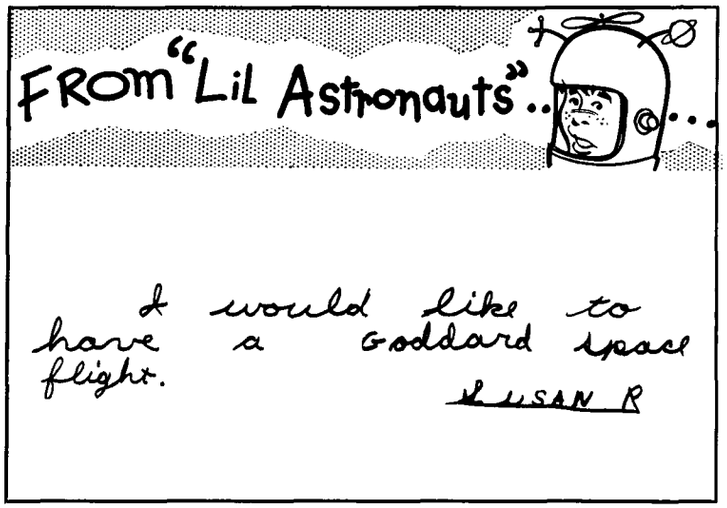
A Reminder — About that Extra Annual Leave

The Leave Act of 1951, as amended in July 1953, permits employees to accumulate 30 days annual leave. The same amendment provides that employees who, as of the date of the amendment, had more than 30 days accumulated by the end of that leave year could retain that amount. Additional leave may not be accumulated. Therefore, all leave in excess of an individual's maximum accrual will be forfeited.

As a reminder — the 1963 leave year ends on January 4, 1964.

Credit Union Is At Your Service For Christmas

- Need cash for Christmas? Check with your Credit Union about a small loan before Christmas and pay cash for those gifts.
- During the November meeting the board of directors of the NASA-Washington Federal Credit Union voted a 4.6 percent dividend for shares on deposit during the period July 1 to December 31, 1963.
- Credit Union collection points have been established in the University and Beltsville Buildings. Transactions may be made at these locations on the Monday following payday at the following times: University Bldg., Room 126, 9:30 a.m. to 11:45 a.m.; Beltsville, Room 14, ext, 5967, 1:15 p.m. to 3:15 p.m.
- The Credit Union at Goddard has moved to new quarters in the basement of building 8, Room N-4, ext. 4545. Hours are 9 a.m. to 3 p.m. every day of the week.



'Radiological Monitoring' Course To Start

Goddard's civil defense planning office is sponsoring a sixteen hour course in "Radiological Monitoring" in January-February 1964. The course will be given in 8 sessions, held every Tuesday morning from 9 a.m. to 11 a.m. and Wednesday afternoons from 2 p. m. to 4 p.m.

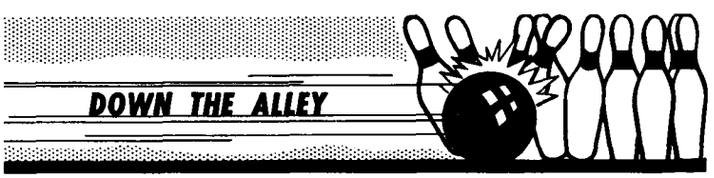
The Wednesday session will act as a backup for persons missing the regular meeting on Tuesday.

The course is being given by the Center's radiological safety office, headed by Charles Hamilton.

The purpose of the course is to familiarize students with the use and maintenance of civil defense radiological equipment as well as the techniques involved in radiological monitoring, surveying, reporting and decontamination. Graduates of the course will be technically qualified to act as radiological monitors and will be assigned as members of radiological teams.

Interested persons who have not previously volunteered for this training should contact the civil defense planning office, ext. 5421.

Since the course will take place during regular working hours, it is necessary to obtain approval from ones immediate supervisor prior to registering for the course.



GODDARD MIXED DUCKPIN LEAGUE STANDINGS

Tuesday (As of Dec. 4, 1963)

	W	L
Alley Catz	26	13
Cole's Coolies	25	14
Stargazers	24	15
Comets	24	15
Bob Cats	23	16
Bluffers	21	18
Quicksilvers	21	18
Alley Nauts	20	19
Toppers	18	21
Vagabonds	18	21
Ducklings	16	23
Dukes & Duchesses	16	23
Moonshiners	12	27
Possibilities	9	30

Thursday (As of Dec. 9, 1963)

	W	L
Tick Tocks	26	13
Safety Pins	24	15
Wood-choppers	22	17
Wombats	22	17
Bob Cats	22	17
Moon Pilots	21	18
Astronauts	21	18
Meteorites	20	19
Starliters	18	21
Thor Heads	18	21
Syncoms	17	22
Satellites	15	24
Space Katz	14	25
Strikers	13	26

GODDARD MEN'S TENPIN LEAGUE STANDINGS

Wednesday (As of Dec. 4, 1963)

	W	L
Bandits	32	20
Rabs	30	22
Outcasts	29+	22+
Quiet Ones	27	25
The Junto	26+	25+
Gubaths	26	26
Keglers	25	27
Rackets	25	27
Rattfinks	24	28
Vibrators	24	28
Boxcars	22	30
Snakeyes	21	31

All bowling standings should be submitted one week prior to publication.

GODDARD MIXED TENPIN LEAGUE STANDINGS

Tuesday (As of Dec. 3, 1963)

	W	L
Twiggits	34½	17½
Apaches	34	18
Orbiting Elements	33½	18½
Alley-Cats	31½	20½
Elites	30	22
No-Names	29½	22½
Mor-Wood	29	23
Ichi-Bans	28	24
Full-House	27	25
8-Balls	27	25
Spouses +	25	27
Scatter Pins	24	28
Alley-Oops	24	28
IMPS	22	30
Split-Fits	21	31
Lucky-Five	19	33
Zooms	18	34
Team No. 17	12	40

Tuesday (As of Dec. 9, 1963)

	W	L
Longshots	30	6
Team No. 5	26	10
Team No. 7	24	12
Mystics	22½	13½
Fireballs	22	14
Pin Rattlers	20½	15½
Clippers	17	19
Four Lorns	15	21
Photo Multi-pliers	12	24
Rookies	8	28

Goddard Welcomes

Peter Leo Luppino
Network Engineering Operations Div.

Maxine Lutz
Data Systems Div.

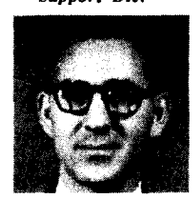
Elizabeth Montgomery
Spacecraft Systems & Projects Div.

Olga A. Sweeney
Financial Management Div.

Robert R. Stanley
Manned Space Flight Support Div.

David James Graham
Manned Flight Operations Div.

Bernard J. Rugg
Org. & Personnel Div.



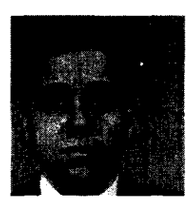
Charles J. Hayes
Org. & Personnel Div.

William N. Keeley
Procurement Div.

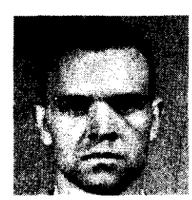
Jeanette J. F. Wiley
Space Sciences Division

Mary G. Conley
Procurement Div.

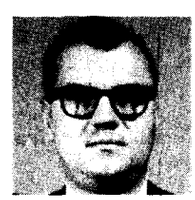
Lois M. Cuppett
Procurement Division



Roger Fitzpatrick
Office of Chief Counsel

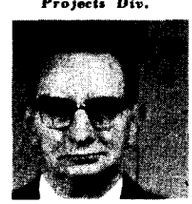


John A. Hrastar
Spacecraft Systems & Projects Div.



David George Lewoe
NASA Communications Div.

Hiram Lopez
NASA Communications Div.



Robert Louis Mitchell
Project Resources Office

Mary Louise Shuck
Manned Flight Support Office

Robert C. Smaldore
Program Support Div.

Marguerite Thacker
Spacecraft Systems & Projects Div.

Thomas P. Timer
Data Systems Div.

Specs *(from page 5)*

get the necessary document. If he knew his need only by subject, then help would be necessary from the process development group—and it would be given gladly.

A familiarity with technical terminology is a prerequisite to a successful search using the Uniterm system, under which technical documents are filed. Therefore, the availability of competent technical personnel in close proximity to the files is a time-saving plus for Goddard.

Only the specifications which have direct application to NASA are filed, but even with this limitation there are several sources of specifications which must be kept in store.

There are several *hundred thousand* documents listed by type in the *Dept. of Defense Index of Specifications and Standards.* A large precentage of these are useful to NASA engineers, and are in the files in building 5.

In addition to D.O.D. specs, there is a listing of *Federal Standards and Specifications,* many of which have been useful to NASA. These are included also. An extensive set of specifications from Marshall S. F. Center is on file, and partial sets from other NASA centers.

All specifications are indexed both numerically and alphabetically. Cantor says that any specs that are needed and not on file in this office can be procured within a week in most cases.

His office also has a Rekordak machine which prints fact sheets on certain often-used documents. These documents are filed on special cartridges which can be "fed" into the machine, which in turn does the printing.

Remember, when you see a sign in building 5—"Fabrication Process and Materials Engineering Office"—there is more inside than even that generous mouthful of words indicates. There is a complete specifications and standards library: And, its at *your* service along with the rest of the fabrication division facilities.

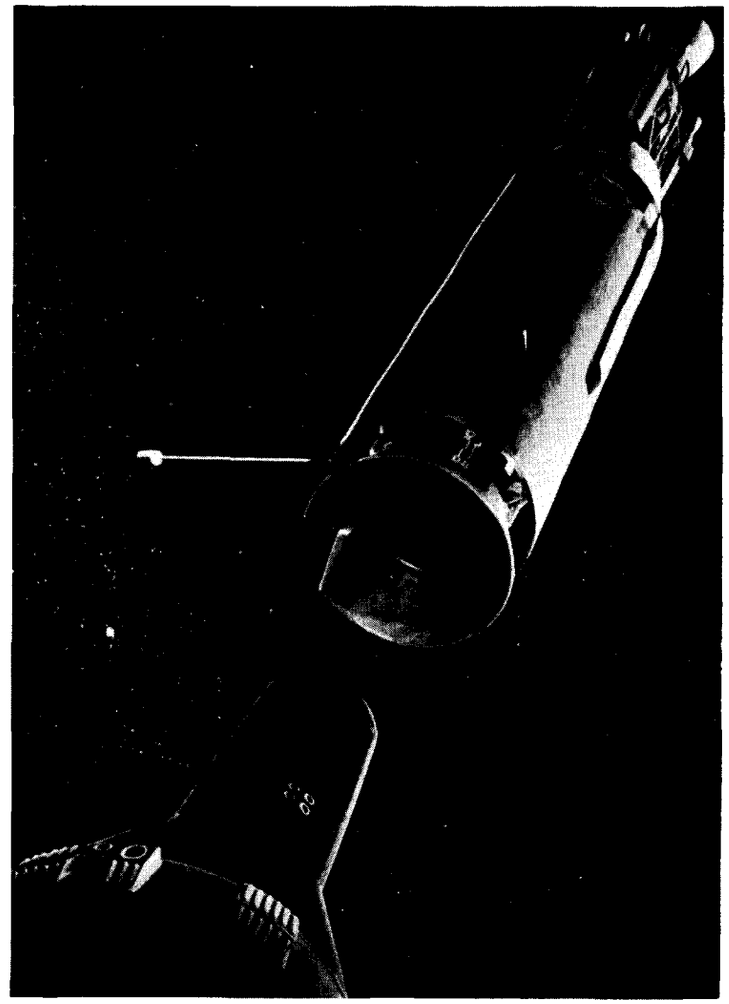
The Recordak machine shown here produces a printed copy of a document from a small cartridge. It is also available.

GODDARD COMING EVENTS

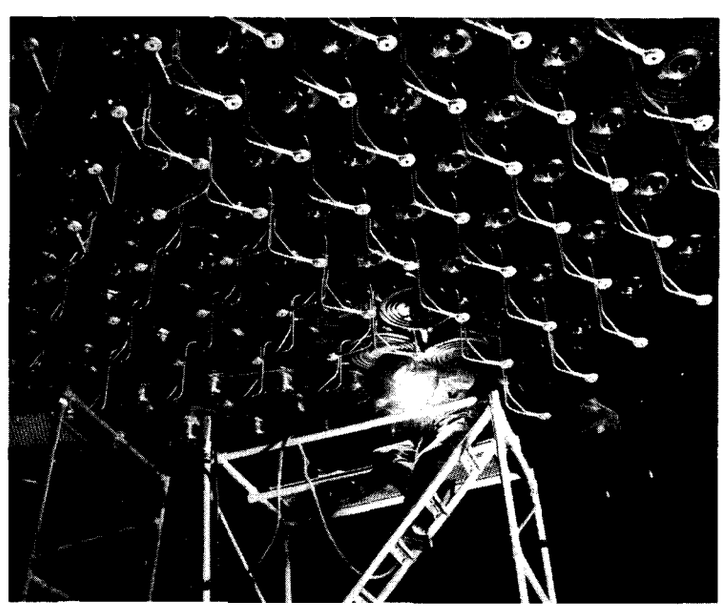
Goddard colloquium lecture:

- **December 17, 3 p.m. Auditorium, Bldg 3—Dr. Lawrence Cahill, Department of Physics, University of New Hampshire, Durham, N. H., "Boundry of the Magnetosphere."**

Space Shots — PICTORIAL REVIEW



This artist's rendering shows how the Agena target vehicle will mate with the two-man NASA Gemini spacecraft. The illustration shows the nose of the Gemini spacecraft at left, as it approaches the Agena. A pin in the spacecraft nose, hidden in this view, keys into the slot in the docking adapter on the Agena. The antenna extending vertically from the Agena is for the L-band radar used in "homing" the spacecraft on the Agena, and in controlling the Agena from the spacecraft prior to docking.



Work continues on the solar simulator in building 10. It will be ready for use in the near future.

(from page 1)

Relay's Year in Space

all NASA communications satellite programs.

There was relief when Johannesburg and Woomera, down under the equator, pronounced Relay right on her path, and when this was verified by frostbitten Fairbanks and East Grand Forks. When the test and command station on the stark Mojave Desert announced that the signal from Relay's transponder was loud and clear, everyone looked forward to the following morning, when a public demonstration would show Europe a television report of the Christmas preparations at Rockefeller Center and on the Ellipse in Washington, and in turn bring a television report to America of the Christmas festivities in various European countries.

No Christmas Demonstration

It never happened, that television demonstration. In the cold, gray December dawn along the Atlantic Coast—at Greenbelt, Nutley and Andover —Relay was discovered to be suffering from a severe power drain, too severe to risk her transponders. The dismal message to "scrub" was transmitted to Pleumeur-Bodou and Goonhilly on the Atlantic's opposite cold gray shore.

Those were frantic days when telephone queries about the spacecraft's condition couldn't be satisfactorily answered at first. They were days devoted to a frenzied search for the cause of the power loss. The problem turned out to be a transistor, overly affected by temperature, which would turn neither completely on nor completely off, but instead steadily drained away battery voltage.

During these difficult days and weeks, engineers from STL, NASA and RCA worked around the clock, gave up their Christmas and New Years holidays, while the rest of the celebrating world forgot for the time being all about communications satellites.

Turning Point for Relay

By letting the spacecraft cool down, it was possible to turn one transponder off, thus using only one transponder. The Relay theories of redundant systems and ample power had paid off.

From then on, Relay was a huge success. A special telecast to France on January 9 showed President and Mrs. Kennedy unveiling the Mona Lisa in the National Gallery of Art in Washington.

Relay set a new record in communicating with four continents—South America, Europe, Asia and Africa. The latter was a telephone conversation from Lagos, Nigeria, to Rio de Janeiro, via Nutley and Lakehurst, New Jersey. The demonstration included Relay's stablemate, Syncom II.

The first Asian telecast was on the tragic day of the death of President Kennedy. On Relay's next orbit, the first television tapes dealing with the event were telecast to Japan. Eight telecasts in ensuing days were made abroad, witnessed by Japan, eighteen countries in Western Europe and seven behind the Iron Curtain.

Relay I made the first satellite communication contact with South America, with Italy and Germany. It telecast to the United States a Russian military parade in Moscow's Red Square.

Relay performed spectacular missions, like transmission of encephalograms (brain waves) from England to the United States; and setting type in Scotland, England and Brazil, from computerized data from Camden, New Jersey, which was generated in Chicago.

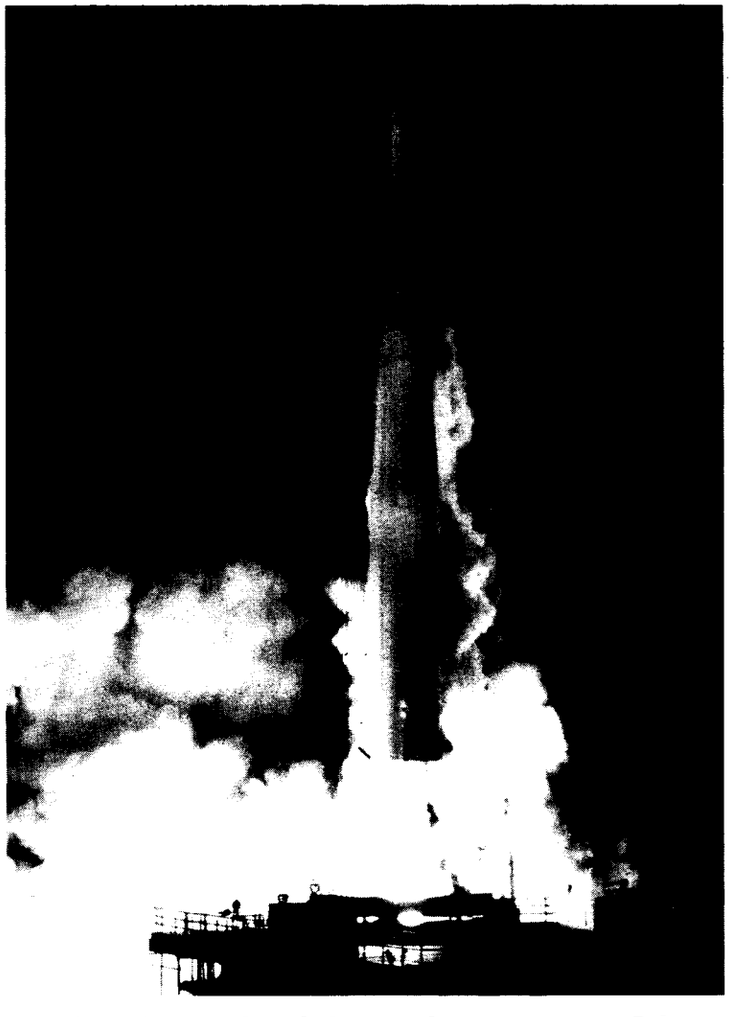
Relay's Greatest Achievements

Her greatest achievements have been scientific tests recorded by Goddard. These include Relay's capabilities for handling wideband and narrowband transmission, noise measurements, non-linearity distortion, linear waveform, steady-state characteristics, intermodulation, insertion gain, band-pass characteristics, interference and cross talk.

ered information about the en-

The little COMSAT also gath-

vironment of outer space, in particular the effect of radiation on intermediate altitude satellites.



Relay rode into orbit a little more than a year ago on Delta 15 shown at liftoff.

In early fall, Relay moved out of the earth's eclipse, in which it had been for a while. When a satellite spends much of its time in the shadow of the earth, it stores less solar power and their is less mutual visibility time between earth stations and the satellite to use such power as it stored.

Such a satellite may become sluggish, like a man who does too little physical work to have an appetite. They may tend to store little power even in full sunlight. Relay responded in this way.

Her masters, the project engineers, figured out a way to snap her out of her laziness. In a series of maneuvers, they drained her batteries deeply. Relay responded like an athlete out of training, who is suddenly exposed to brisk workouts. Muscles grew, appetite grew. She stored more solar power, enough for hour-long transmissions on several consecutive passes.

At the end of her "life," the twin-transponder, active repeater communications satellite was actually functioning better than ever.

That is why it is misleading to say the project's worldwide crews were "amusing" themselves by making pools on the time of Relay's actual cutoff.

They were not amused. They were something more than wistful. For one thing, it would have been good to work with both Relay I and Relay II to be launched early in 1964, for comparison.

It would have been interesting to know just how long Relay I would have lasted.

And, again, these Relay project men have become downright fond of the old shingle-covered, nine-sided, gambrel-roofed satellite they have worked with so long.

They are mostly young men, these communication pioneers who worked with Relay I, yet they are not without a sense of history.

When they are old and retired, one may expect them to pay nostalgic visits to space satellite communications stations. Perhaps they will listen to the wierdly musical signals of intercontinental traffic. To them it will be a requiem for Relay.

Centaur, IMP, Continue in Orbits

Centaur, launched from Cape Kennedy on November 27, now is orbiting the Earth with several objects varying in size. IMP, launched November 26, increases its perigee and thus its effective lifetime, with each orbit.

The objects around Centaur were observed by ground tracking cameras of the Smithsonian Astrophysical Observatory in the vicinity of the second stage.

Because all flight objectives have already been achieved, the Centaur telemetry system, by design, operated only a matter of hours and cannot be used to study the present situation.

Centaur project officials believe that the objects are insulation panels and the nose fairing of the Centaur stage.

They believe that after control of the vehicle's attitude was discontinued in orbit, the stage began to tumble because of the venting of gaseous hydrogen and the panels and nose fairing were separated from it.

In future lunar missions, Centaur will reach the Moon by direct ascent and the fairing and panels will be jettisoned shortly after the vehicle leaves the Earth's atmosphere.

Goddard project scientists said the far-ranging IMP space physics laboratory reached its second apogee at 10 p.m. EST on December 2, at a distance of 122,800 miles from Earth. The perigee of Explorer XVIII was then about 119 miles.

As Explorer XVIII continues to orbit, the gravitational effects of the Earth, the Moon and the Sun will gradually make its path rounder. Its perigee will move farther and farther from Earth resulting in an increase in the effective lifetime of the satellite, as it will move away from radiation belts near the Earth.

Goddard Speech and Paper Presentations

(Technical presentations approved as of December 9, for period of December 16 through December 29. Requests for copies of speeches and papers should be made directly to the author.)

SPEECHES

W. N. Hess, Carnegie Institute of Technology, Physics Dept. Colloquim, Pittsburgh, Pennsylvania, December 16, ***"The Radiation Belt and Particles from the Sun."***

Henry H. Plotkin, American Association for the Advancement of Science, December 28, Cleveland, Ohio, ***"Satellite Experiment Using Lasers."***

PAPERS

William Nordberg, Third Western National Meeting of the American Geophysical Union, Boulder, Colorado, December 26-28, ***"Inferences of Stratospheric Temperature Variations from Radiation Measurements with the TIROS VII Satellite."***

G. Mead, Third Western National Meeting of the American Geophysical Union, December 26-28, Boulder Colorado, ***"A Spherical Harmonic Analysis of the Deformation of the Geomagnetic Field by the Solar Wind."***

Joseph C. Cain, Third Western National Meeting of the American Geophysical Union, Boulder, Colorado, December 26-28, ***"The World Magnetic Survey."***

C. Reber, Third Western National Meeting of the American Geophysical Union, December 26-28, Boulder, Colorado, ***"Preliminary Results Regarding Neutral Atmosphere Composition from the Explorer XVII Satellite."***

L. H. Brace, Third Western National Meeting of the American Geophysical Union, Boulder, Colorado, December 26-28, ***"Geophysical Implications of Explorer XVII Electronic Probe Measurements."***

G. Newton, Third Western National Meeting of the American Geophysical Union, December 26-28, Boulder, Colorado, ***"First Direct In Situ Measurements of Atmospheric Density from Explorer XVII (1963 Data)."***

K. Maeda, Third Western National Meeting of the American Geophysical Union, Boulder, Colorado, December 26-28, ***"Origin and Propagation of Auroral Zone Infrasonic Waves."***

N. W. Spencer, Third Western National Meeting of the American Geophysical Union, December 26-28, Boulder, Colorado, ***"The Concentration and Temperature of Molecular Nitrogen and Electrons in the 120-350 km Region,"*** by ***N. W. Spencer, L. H. Brace, D. R. Taeusch, G. R. Cariganan, H. Niemann.***

Francois V. Dossin, American Astronomical Society, December 26-28, Washington, D. C., ***"New Spectra of Symboitic Stars."***

Lloyd H. Carpenter, American Astronomical Society, December 26-28, Washington, D. C., ***"Computation of Planetary Theories."***

Chushiro Hayashi and Robert C. Cameron, American Astronomical Society, December 26-28. Washington, D. C., ***"Evolution with Neutrino Loss of a Massive Star Until the Onset of Carbon Burning."***

B. Donn, American Astronomical Society, December 26-28, Washington, D. C., ***"The Origin and Structure of Icy Cometary Nuclei."***

Recent Technical Publications Authored by Goddard Staff

R. A. Hanel, L. E. Richtmyer, R. A. Stampfl, and W. G. Stroud, "Experiments from a Small Probe which Enters the Atmosphere of Mars," NASA Technical Note D-1899, December 1963.

Kaichi Maeda, "Aoustic Heating of the Polar Night Mesosphere," NASA Technical Note D-1912, November 1963.

Harold E. Evans and Thomas W. Flatley, "High Speed Vacuum Performance of Gold Plated Miniature Ball Bearings with Various Retainer Materials and Configurations," NASA Technical Note D-2101, December 1963.

THE NIGHT BEFORE UP-SHOOT

'Twas the night before up-shoot, and all through the base,
Not a programmer stirring could face the disgrace:
The tapes were all hung up! and everyone's prayer
Was hopes that repairmen would be there.
GS's were snuggled so tight in their dreads
That visions of grade-drops danced in their heads.
So there we sat shaking and graying our hairs,
Chewing our fingers and saying our prayers—
When out at the front gate there arose such a roar
That we all rushed at once and got stuck in the door.
So away to the window I flew in a flash,
Threw open the shutter and fell in the trash.
The guard's little flashlight on IBM's wagon
Showed the weird little auto lacked security taggin'.
Like the helpful, suave, righteous persons they are,
The security men wouldn't let him get far.
Then what to our wondering eyes should appear—
The little car FLEW, and we let out a cheer!
The little fat pilot was so unrealistic
That we knew in a wink that it must be a mystic.
O'er the antennae he was pulled in his chariot
By eight tiny satellites that barely could carry it.
More rapid than U-2's, the satellites came,
And he whistled and shouted and called them by name:
"Now Echo, now S-3, now Rebound and Beta,
ON, Centaur, on, EGO, on Relay and Eta!"
From the top of the flagpole to the top of a tree,
He swung and he soared at about a Mach 3.
Then up on our rooftop without a dilemma
Was the beeping and tooting of each tiny antenna.
And as I pulled in my head and was turning to see,
Down through the heat duct he came at 2 G.
He was dressed all in Scotch plaid from his head to his toe,
And from whence came the space helmet, we'll never know.
His eyes—how they computed, his ears gave an out-put,
His nose was a button to a reader on each foot.
The stump of a cigar he held tight in his teeth,
(And said with a grin, "Look, Ma, no cavities!")
His mouth was a square—he had a round solar plexus,
That hummed in a manner that only could vex us.
He spoke not a word (of Fortran) but worked,
And fixed all the hang-ups and turned with a jerk,
And laying his finger aside of his nose—he Blew it—
And up the heat duct he rose!
And I heard him exclaim as he ran on his legs:
"Can you go to the farm now and get me some eggs?"

—Kathleen Tracy, 1962 summer student computer operations branch.

Dr. Goddard's Launch Platform Being 'Copied' Here

Almost 38 years ago, on March 16, 1926, Dr. Robert H. Goddard launched the world's first liquid-fuel rocket at Auburn, Massachusetts. Today, the launch stand that he used is in building 5 of the space flight center named in his honor.

The Smithsonian Institution backed the American rocket pioneer through the "lean years" when public opinions about moon flights and rockets in general ran from minor interest to overt public ridicule. They have had his launching platform on display in recent years, and along with authenticated technical drawings, have now loaned it to this Center.

The stand containing a model of its rocket is here for a purpose. Dr. Goddard has gained recognition (since his death) as the father of modern rocket propulsion. His name, and his work are finally beginning to receive the deserved public acclaim which never came during his lifetime.

In answer to public demand for more information about Dr. Goddard's work, Goddard's office of public information has asked the fabrication division to make full size models of the stand and rocket for historical and display purposes.

Some 1/8 scale models are also being made for smaller display areas.

James A. Lindell, leadman for the sheet metal shop, is in charge of the fabrication effort. Clifton Owen, sheet metal craftsman, is doing the bulk of the work on both the scale and full-size models.

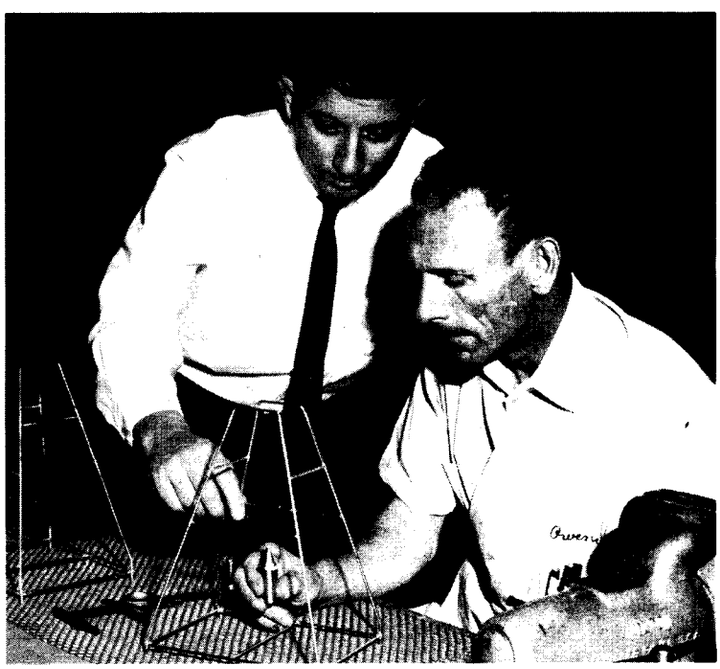
Heavy steel pipe, similar to that in the original, will be used for the full-size model frames. Brass wire is being used for the scale models.

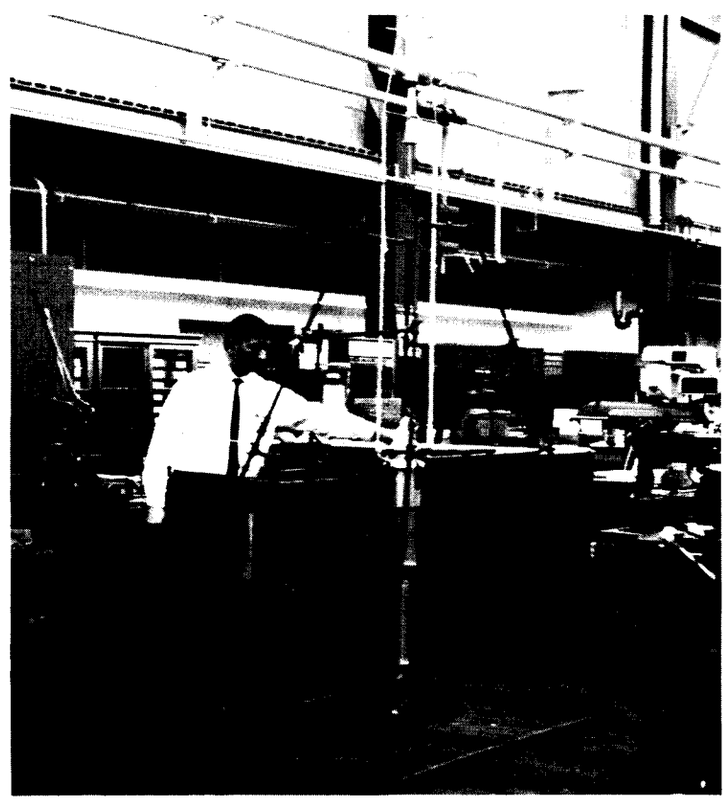
In the scale models, the rocket model will be turned from solid brass by the Machine shop. Each small model will be mounted on a stand.

The rockets for the full-size models will be made from sheet metal, and will resemble as closely as possible the detail of the original Smithsonian rocket.

When the job is done, the original will return to its display area at the Smithsonian, and the models—large and small—will be used to inform more people of the amazing work of Dr. Robert H. Goddard.

Dr. Robert H. Goddard is standing beside the first liquid-fuel rocket and its launcher, which is now here at the Center.





James A. Lindell, sheet metal, stands beside the launcher in Building 5. He is in charge of making the models. At left, Lindell and Clifton Owen, a sheet metal craftsman, are at work on one of the 1/8 scale models of the launcher.