

SPACEPORT

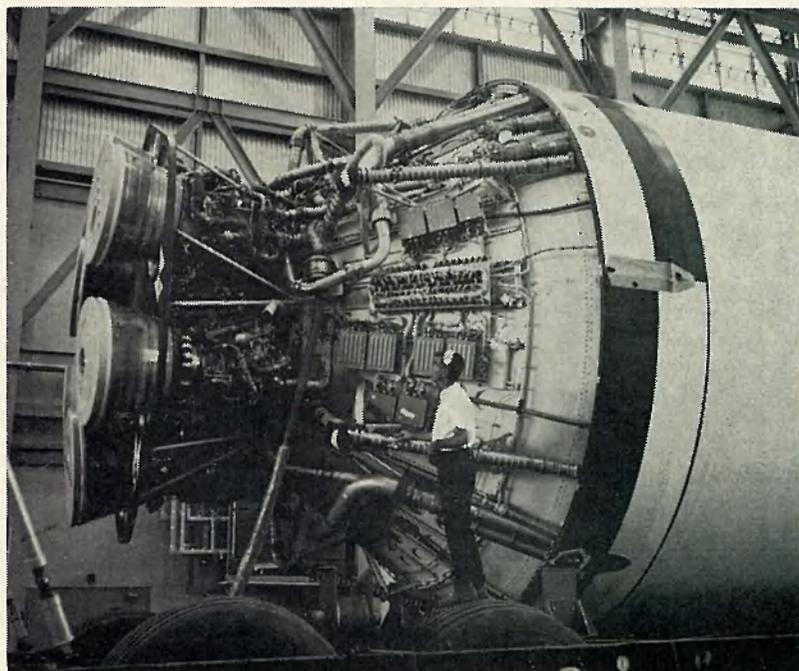


NEWS

Volume 2, Number 42

NASA Launch Operations Center, Cape Canaveral, Florida

October 17, 1963



BUSINESS END of the S-IV second stage of the SA-5 is checked by a technician prior to being mated with the booster last week at Complex 37's Pad B. Launch of the SA-5 is scheduled later this year.

NASA ORLANDO EXHIBIT TO OPEN NEXT TUESDAY

NASA's largest space exhibit will open at Orlando's Exposition Park Tuesday.

The exhibit will be a week-long highlight of a "Salute to Space Sciences Achievement," sponsored by seven central Florida counties and the Orlando Industrial Board.

UNITED FUND DRIVE BEHIND 1962 PAGE

NASA employees contributed \$2,115 or 14 per cent of their overall United Fund goal of \$15,000 during the first 11 days of the month-long campaign.

"Last year at this point we were much further along," said NASA-UF Campaign Chairman Paul Siebeneichen, Chief of LOC's Community Development Office.

The money collected to date was contributed by a total of 190 employees. This averages out to about \$11 per person.

"If we can maintain that average," Siebeneichen said, "we will more than meet our goal."

Three offices, Regional Audit, Community Development and Public Information, have already attained 100 per cent participation.

Starting next week, Spaceport News will carry a com- (See UNITED, Page 8)

LOC Deputy Director Albert F. Siepert will kick off the week's activities with a keynote speech at the Cherry Plaza Hotel in Orlando Monday night.

The NASA exhibit will be the same as the one displayed at the International Air Show in Paris.

It will include a 4,000 square foot display on manned space flight, Astronaut Scott Carpenter's Aurora Seven spacecraft, models of space boosters, scientific satellites, scientific application satellites and an exhibit on advanced research and technology.

There will also be a NASA spacemobile which will give pre-exhibit briefings to central Florida school children. Invitations have been sent to more than 60,000 students.

Aerospace contractors will also have displays. The exhibit will run through the 29th. There will be no admission charge.

Three MILA Bids Sought For Construction Projects

Canaveral District of the Army Corps of Engineers has issued a call for bids on three more construction projects in the Merritt Island Launch Area and also announced that a \$20 million bid opening has been rescheduled for the Canaveral area Nov. 5.

The three new jobs, with an estimated cost of \$1,525,000, are for work in support of NASA's manned lunar landing program. Bids are also being sought on a fourth NASA project, costing \$1.5 million, at Cape Canaveral.

The \$20 million bid opening, which had been scheduled for Jacksonville next Wednesday is for construction of Pad A at Launch Complex 39, and for construction of the Crawlerway between the Vertical Assembly Building and the pad, and the installation of utility systems for the lunar launch area.

The four new jobs for which bids are being sought are:

* Two buildings for use by NASA's Manned Spacecraft Center at MILA, one a supply (See THREE, Page 8)

DRINKING IN SPACE TO BE COSTLY

The price of a fifth in space will be about \$400—a fifth of water, that is.

That's the estimate based on a NASA-financed study being made by the Boeing Co. Scientists speculate that each astronaut, on a long space flight, will need just under a gallon of water a day. The price tag on getting that gallon, which weighs eight pounds, into orbit is about \$2,000.

With a prohibitive cost, plus the fact there is a restrictive limitation to what can be orbited regardless of cost, Boeing is emphasizing study on ways to recover, process and recycle water in a space capsule.

Even so, the conveniences of home will still be a long way off. Each man, woman and child uses about 50 gallons of water daily on Earth for cooking, drinking, washing, and, of course, watering the lawn.

Gray Speaks Tonight To Tech Societies

Robert H. Gray, Chief of Goddard's Field Projects Branch at the Cape, will speak tonight on NASA's unmanned spacecraft program at the joint Cape Canaveral Technical Societies meeting.

The meet is to be held at the Patrick AFB Officers Club and will take the place of other member society meetings in October.

Dinner is at 7:30 p.m. and the program begins at 8:30. For reservations, call UL 3-2817.



A CHANGE TO LEND A HAND

Once again we have the privilege and opportunity to lend a helping hand to our less fortunate fellow men through the United Fund of Brevard County. In addition to the charitable organizations, who receive support from the United Fund, many health research and youth organizations also benefit from our gifts.

All of us know the basic principle of the United Fund is to support health, welfare and youth organizations by making **one gift, once a year**, to the United Fund. The Fund in turn distributes our gifts to these agencies.

We of NASA have an enviable record in our support of the United Fund. Last year, for example, the NASA goal was \$5,000 and our gifts at the end of the campaign totaled \$10,000.

Based upon NASA's outstanding record in the past we have been allocated \$15,000 out of the overall Brevard County goal of \$307,500. Our "Fair Share" is urgently needed to ensure that these worthy organizations receive at least this minimum support.

Our last year's total contribution of \$10,000 meant an overall average of \$10 per person. This year just to reach our goal will take an average of \$10 per person. A fair enough share when you consider the good it will do.

SIMILAR VOYAGES

Last Saturday marked the 471st anniversary of Columbus' trip to the Americas.

When he set sail, he was looking for the Indies and the treasures of the East. He failed to find those treasures.

Instead, all he found was oil and steel and factories and wheat fields and skyscrapers and hundreds of millions of productive people.

In NASA's Apollo program we are shooting for the moon, but in so doing, we develop tools and minds and strength for future and greater enterprises.

How much is this worth? History indicates that where the potential of scientific and technological breakthroughs are concerned, the tendency is to err on the conservative side.

It has been said that we live in a dynamic civilization in which some aspects of technology must always lead the others. Failure to press these technological differentials will bring technology to a halt.

Beyond this, in satisfying man's primitive aspirations to conquer the unconquered, we spur him to greater effort.

Columbus set quite an example.

A FINE EXAMPLE

Few of us at Canaveral have ever heard of NASA employee John Thacker, but he set an example of devotion to duty that can be admired by all, whether we knew him personally or not.

An aerospace technologist at the Goddard Space Flight Center, Thacker died last week of leukemia. He was 27.

Although he had learned two years ago that he had the disease, he continued with his work.

Even after being admitted to the hospital, he finished a wiring diagram of the minitrack system of tracking satellites—just a week before his death.

It will be hard to find a replacement for such a man.



MICHAEL MAINGUTH, left, area manager of the U.S. Treasury's Savings Bond Division, presents a citation to **John Donovan** of LOC's Community Relations Office for his work during the recent NASA bond drive. LOC Director, **Dr. Kurt H. Debus**, was chairman of the drive, and also received an award.

DR. SHEA TO DIRECT APOLLO DEVELOPMENT

NASA has named Dr. Joseph F. Shea to head its Apollo Spacecraft Development effort at the Manned Spacecraft Center in Houston.

Dr. Shea, Deputy Director (Systems) in NASA's Office of Manned Space Flight since March 1963, was named to the position of Program Manager, Apollo Spacecraft.

Comet Experiments Launched At Wallops

The second of two man-made comet experiments has been launched at NASA's Wallops Island, Va., station. The launch vehicles were two-stage Nike-Apaches.

Purpose of these experiments, conducted for NASA's Lewis Research Center, was to test theories of comet formation which might lead to information about conditions in the universe at the time our solar system was formed. It is believed that natural comets are composed of the materials of the solar system during its formation.

The chemical payload in the experiments produced visible flames at an altitude of about 95 statute miles.

He will have responsibility for the development of the Apollo Command and Service Modules, as well as for the Lunar Excursion Module.

Before joining NASA in early 1962, Dr. Shea was Space Program Director at Space Technology Laboratories, Los Angeles, Calif. From 1959 to mid-1961, he served as Director of the Advanced System Research and Development Division and Manager of the Titan Inertial Guidance Program with A. C. Spark Plug Division of General Motors, Milwaukee, Wisconsin.

He is a member of the American Institute of Aeronautics and Astronautics and the Institute of Electronics and Electrical Engineering.

Dr. Shea is married to the former Beverly Price. They have five daughters.

SPACEPORT



NEWS

Published each week by the National Aeronautics and Space Administration's Launch Operations Center, Cape Canaveral, Florida.



MIKE FRIEZE and Harald Saakvitne, both standing, conducted a seminar on Incentive Contracting for NASA personnel last week. Its purpose: to improve working relationships between offices and between NASA and its contractors.



EXECUTIVE COMMITTEE members of Florida's Junior Chamber of Commerce toured Cape-NASA facilities last week escorted by Jaycee Sam Beddingfield, left, of MSC. Kneeling in center is Ty Tarby, past president, and standing behind him is this year's president, Cody Bailey.

INCENTIVE SEMINAR HELD TO IMPROVE WORK RELATIONSHIPS

An Incentive Contracting Seminar was held at the Cape last week by Michael Frieze and Harald Saakvitne of Harbridge House, Inc. Its purpose: to gain a better working relationship between technical and procurement personnel; to improve overall NASA—contractor operations, procurement processing and contractor performance.

The course included basic types of incentive contracts, such as fixed price incentive, cost plus incentive fee and award fee types, cost, time and performance parameters and provisions, multiple incentive provisions, and problems in administration in incentive contracts.

In Attendance

Among those attending from LOC were Raymond Daley and John Thomas of the Base Operations Division; Arthur Gerstenfeld of the Resources Office; Donald Bailey, Travis Buchanan, Francis Demchok, Leo Libbey, Edward Manning, Robert Nead and Dean Wood from the Procurement and Contracts Office; Robert Elrod from the Chief Council's Office; Charles Hall from the Facilities Engineering and Construction Division; James Russo and Leo Walsh from the Technical Information Office; Charles Brumbaugh from the Launch Support Operations Division; and Elmer Horton from the Manned Spacecraft Center.

Causeway Opening Meets With Approval

Opening of the new Cape Causeway has met with enthusiastic response from NASA employees who have traveled over it.

Edward Sheldon of Networks said, "It normally takes me 45 minutes to get to work. On the new causeway I make it in less than 30. I live at the foot of the causeway on the mainland side, and I can get home now in 15 minutes after I hit the main gate. It used to take me 35 to 40 minutes from there."

Sandra Corbin of Master Planning and Real Estate, lives in Sharpes. "I save 45 minutes going home now and

a good half hour coming to work," she said. "I don't care about the 15 cent toll since the saving in gas more than offsets that."

"I live at North Audubon Road on Merritt Island," said Tony Revells of Facilities, Engineering and Construction Division. "I can get home now in 12 minutes instead of the usual 45 minutes at peak traffic times."

Bob Gorman, Director of the Launch Support Operations Division, commutes from Eau Gallie. "It takes me about the same amount of time by coming up US 1 and taking the new causeway," he said,

"but it's much better traveling. I can avoid the traffic stackup and standstill from Eau Gallie to Patrick, and I don't have to worry about a bridge going up."

Dick Murphy of Photographic Operations, said, "I love it. For six years it has taken me at least 40 minutes to get to work. I can now make it in half that time. I have no trouble whatsoever cutting in to 401 from the causeway."

Ruth Weber of Scheduling, lives in Port St. John. "I can make it home now in about 25 minutes," she says. "That's about one-third the usual time."

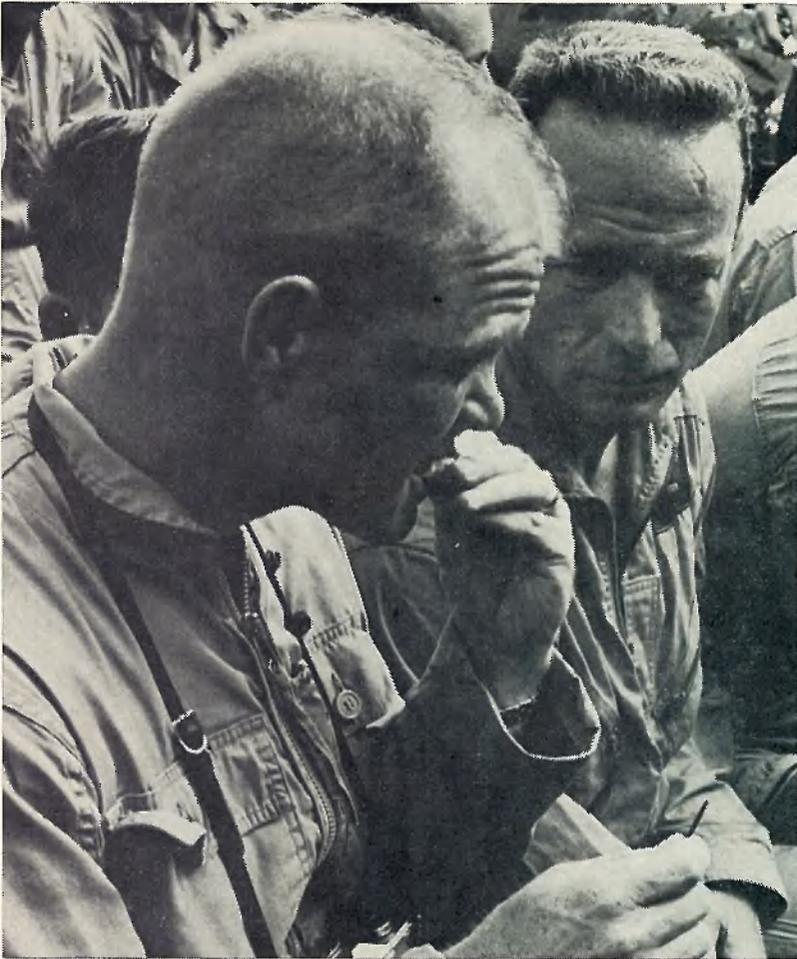
Lunar Earthshine?

America's first Apollo-nauts may have to explore the moon's surface by earthlight — the lunar equivalent of moonlight.

With a temperature range of 270 degrees between its 15-day-long night and its equally lengthy day, scientists believe the fridity of the dark will be more bearable than the blistering heat of daylight.

Should the space travelers by chance set up a still on the lunar surface, perhaps they would have to call their product — earthshine!

SPECIALLY-TAILORED PHOTO CUTLINES . . .



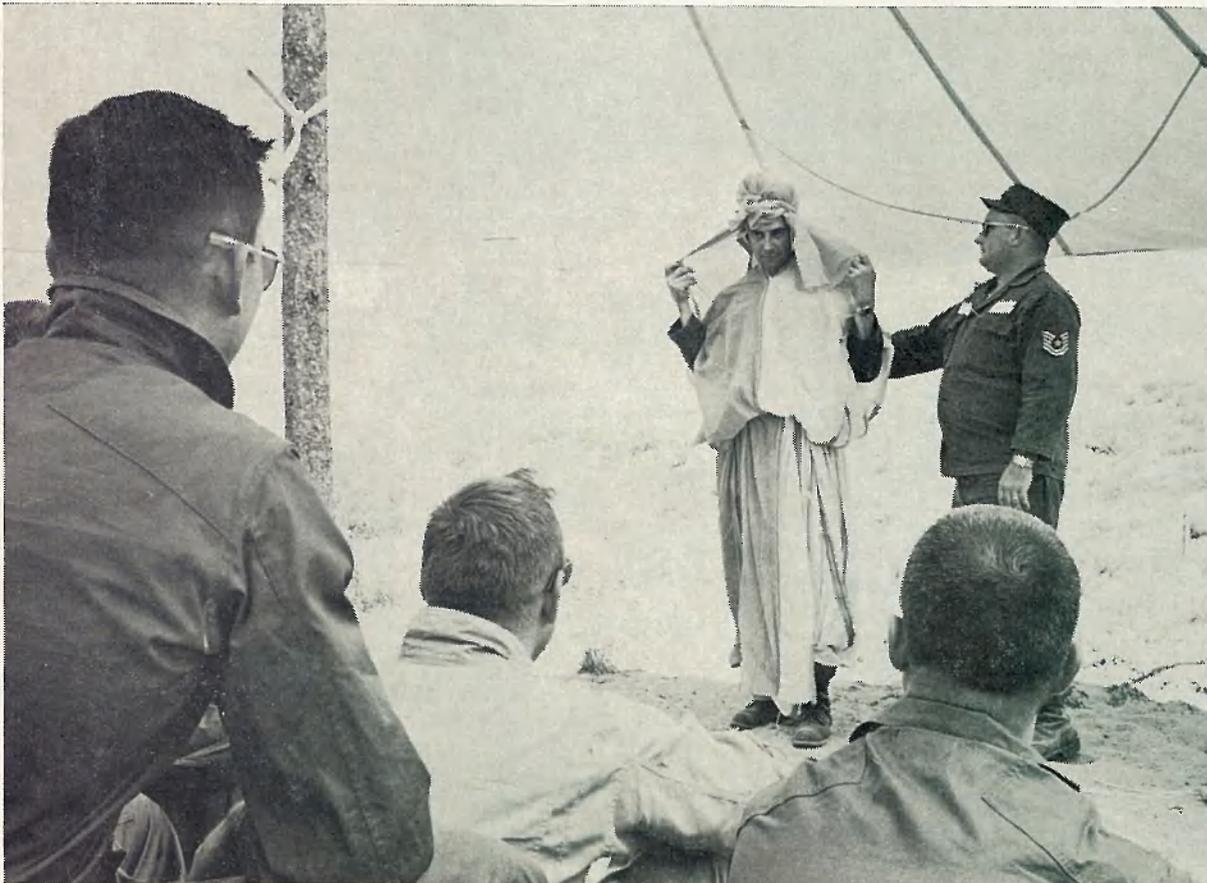
"YOU DON'T LOOK so good John. Are you sure that's the non-poisonous lizard you're eating?"

Dozens of photos cross the Spaceport News desk every week and although the great majority get their message across with ease, some inevitably seem to just miss the mark.

We've culled a few of these, mostly involving astronauts, and with tongue-in-cheek, added specially-tailored cutlines that somehow seem more appropriate.



"AND TO THINK I passed up the basketweaving course in college!"



"AND FOR THE LATEST from the house of Dior, we have . . ."



"I TOLD YOU what'd happen at midnight."

. . . . TELL ANOTHER SIDE OF THE STORY



"HURRY UP, there's a \$100 fine for littering."



"WAKE UP GORDON, before the King sees you."



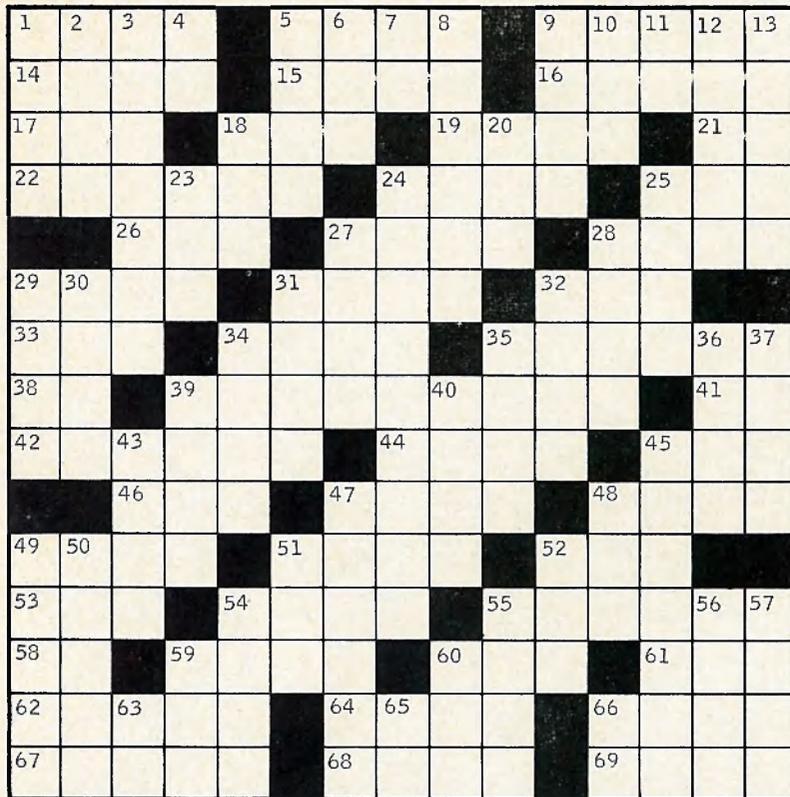
"YOU CAN KEEP your # \$ / *, apple, I don't care to go up again."



"SILLY THING, says he wants to see our leader."



"ARE YOU SURE this is the causeway?"



Try Your Luck On This Space-Related Puzzle

Here's an original crossword puzzle with the words geared to the space program. Try your luck.

ACROSS

- 1. Nearest planet
- 5. Some missiles are launched from this
- 9. Launch vehicle upper stage
- 14. Plastic derivative
- 15. Semite
- 16. Pertaining to the moon
- 17. Body of water
- 18. Land measure
- 19. British school
- 21. Didymium (abb.)
- 22. Ethiopian coin
- 24. Bird
- 25. Falsehood
- 26. People or things of a kind
- 27. Love to excess
- 28. Road surface
- 29. Space agency
- 31. Mild epitaph
- 32. Away
- 33. Food morsel
- 34. Abound
- 35. Auto racing organization
- 38. State (abb.)
- 39. He travels in space
- 41. Negative
- 42. Farewells (Hawaii)
- 44. Subject of discourse (Grammar)
- 45. Trim
- 46. Discarded mode for reaching moon (abb.)
- 47. Throw
- 48. LOC's future home (abb.)
- 49. Associate
- 51. Adhesive
- 52. Bird's beak
- 53. By way of
- 54. Chair
- 55. Moon rocket
- 58. Type measure
- 59. Consider
- 60. 55 Across will be checked out here (abb.)
- 61. New Guinea port
- 62. Mature
- 64. Ring
- 66. Ship's officer
- 67. Spirited horse

- 68. Satisfy desire
- 69. Not new

DOWN

- 1. Obligated to
- 2. Expanse
- 3. One who accepts reality
- 4. South America (abb.)
- 5. Indian garment
- 6. Anger
- 7. Note of musical scale
- 8. German "father of rocketry"
- 9. Below (naut.)
- 10. Firing piece
- 11. Type measure
- 12. Opposite of zenith
- 13. International satellite
- 18. Biblical boat
- 20. Pedal digit
- 23. Wing
- 24. Russian version of 39 Across
- 25. NASA Research Center (abb.)
- 27. Man of accomplishment
- 28. Ship's spar
- 29. Launch vehicle of the future
- 30. Russian sea
- 31. Obtains
- 32. Roman dietary, half man and half goat
- 34. Russian ruler
- 35. Nautical (abb.)
- 36. Dyestuff
- 37. Roster
- 39. Greeting (naut.)
- 40. Organ of smell
- 43. Ewer
- 45. Leg bones
- 47. Fasteners
- 48. Accosted
- 49. States
- 50. Extent
- 51. Command to horse
- 52. Arrest (slang)
- 54. Transmit
- 55. Bargain event
- 59. River (Scot.)
- 60. Container
- 63. Probable error (abb.)
- 65. Each (abb.)
- 66. Greek letter

U. S. Weather Bureau, NASA Seek Long Life Satellite

Further obligation of Weather Bureau funding for an operational meteorological satellite system, based on the current Nimbus weather satellite configuration, is being discontinued, the Department of Commerce and NASA have announced.

However, the Weather Bureau will continue its cooperative program with NASA for the development of an operational satellite of long life that will meet coordinated national meteorological requirements ultimately at a considerable annual savings.

The desired system will be based on a spacecraft specifically designed for use in a continuing operational system with the reliability and lifetime required to assure low annual cost of collecting weather data from satellites but at the same time to provide sufficient data for weather-forecasting.

It is planned that the future operational system will evolve from one based on an improved version of the already tested and highly dependable TIROS satellite to one that will give complete global coverage from satellites having a lifetime of the order of several years.

TIROS, at present, does not give the scope of global coverage desired and the current configuration of Nimbus does not include a design lifetime of more than one year.

The NASA meteorological satellite research and development program will continue and will play an important role in the development of the technology which will enable the eventual achievement of the long life required for an operational system at low cost.



NASA research pilots Milton Thompson and Air Force Captain Joe Engle prepare to start pressure suit checkouts at NASA's Flight Research Center in preparation for their first flights in the rocket powered X-15.

New Personnel

Simonne B. Cameron of the Administrative Section, Personnel Office, had an eight-pound, three and a half ounce baby boy, Mark Clyde, October 6th.



TOP BOWLERS in the Pan Am summer league, members of the winning Hootenanny team made up of Cape supply department employees, display trophies they won. Left to right are Ken Sandidge, who had the third high series in the league; John Riffe, second high series; Chuck Gadov, Van Haycock and John Smyth.

Saturn V's Roar To Equal 8,000,000 Hi-Fi Sets



ARTIST'S CONCEPT shows size comparison of the Saturn V to Niagara Falls. The falls are the only thing in the country which will even approach the Saturn V in output of low frequency sound.

TRAVEL INSURANCE DEADLINE EXTENDED

An extension of the enrollment date for the NASA travel accident insurance plan has been announced by NASA headquarters in Washington.

The new effective date, and the extended deadline for enrollment, is November 1.

A spokesman said the extension is a result of distribution problems in promotional materials and the short amount of time allotted in the initial enrollment period.

The insurance plan was specially designed for NASA personnel who travel on official business. The plan offers "portal to portal", all-risk protection while personnel are on travel orders or official business. This means that insurance protection begins when the employee leaves his residence and continues until he returns, either to his home or office, at the end of his trip.

All risk coverage means insurance against accidental death, falls, explosions, drownings, falling objects, homicide—or by any other violent external means. There are no limits on the number of trips covered or on the duration of the trips.

Personnel are covered on NASA-owned or operated aircraft, non-scheduled, private, contract, non-contract and military aircraft, as well as on any type of conveyance. Coverage is world-wide.

This protection is far more extensive than any that can be purchased from usual common carrier insurance companies, the spokesman pointed out.

Costs of the insurance are \$50 per year for the \$100,000 policy and \$25 per year for the \$50,000 policy. Personnel are covered on Saturdays, Sundays and legal holidays.

As a noise source, nothing else in the world quite matches the Saturn V Apollo launch vehicle.

Its roar will equal the sound of eight million hi-fi sets. The only thing in this country even approaching this output of low frequency sound is Niagara Falls.

The Saturn sound "problem," however, is well in hand, after four years of acoustic research at the Marshall Space Flight Center. Acoustic research is a basic part of the center's noise control and sound suppression program.

Magnitude of the noise problem is illustrated by Saturn I which will be used to place the three-man command

SUPPLY ROOM TURNED INTO SUPERMARKET

Impressed by the efficiency with which America's housewives get their shopping done, a large laboratory at NASA's Marshall Space Flight Center has turned its supply room into a space-age supermarket.

Gone are the time-consuming multi-copy requisitions detailing specifications and quantity of each item. Absent also is the prior approval of higher authority.

Now the workers push regular supermarket carts past the 4,500 items on the shelves, pick up what they want, and check out, using their department charge plates.

The "store" manager stamps a pre-punched card that is used by a computer to update records, automatically replenish stocks, and keep track of costs and other matters.

THINKING MARTIANS

Are there thinking beings on Mars? At least one authoritative Russian, biologist Vasily Kuprevich, believes so.

Not only that, he feels Martians once visited the Earth, perhaps several thousand years ago.

He also believes the planet's "canals" resemble an oasis supplied with water artificially, and that the greenish-blue vegetation is actually cultivated plants.

module of the Apollo spacecraft into earth orbit for up to two weeks.

Only one-half of one per cent of Saturn I's power goes into the form of acoustic energy, but this amounts to nearly 40 million watts of acoustic power.

The Saturn V, the Apollo moon trip launch vehicle, is expected to produce 200 million watts of acoustic power in static tests. Ordinary output of a hi-fi set is about 25 watts.

Low frequency noise which does not dissipate as quickly as other sounds is an annoying byproduct of static firings. Research at Marshall has shown that under certain weather conditions sound waves are bounced back from upper air layers and are focused on communities as far as 30 miles away. This "bouncing" points out the need to recognize poor atmospheric conditions and to avoid firings on such days.

Sound Suppressor

Another approach to the noise problem is an effort to squelch the sound.

An experimental sound suppressor is being tested. Engineers have been able to reduce the noise of miniature scale rocket engines by a factor of 10, or 10 decibels.

Fritz Kramer, who is directing the sound suppressor studies, said that "if we can get a sound reduction of more than 10 decibels," this would be sufficient to prevent "annoyance to outlying communities."

The king-size test muffler in use at Marshall is a water-lined tank 126 feet long, 24 feet wide, and 24 feet high. An H-1 engine with 165,000 pounds of thrust, is fired into the tank.

Fast-moving rocket engine gases create a low pressure inside the tank that causes water on an upper level to be pulled into the jet stream at the rate of 9,000 pounds of water per second.

Steam and gases rise to the top of the closed suppressor and go through a water spray before escaping to the outside. The process suppresses sound generation by reducing the velocity of the jet stream as soon as it leaves the nozzle.

THREE MILA BIDS

(Continued from Page 1)

and ground support equipment building, the other an ordnance storage building. Estimated cost: \$600,000.

* Site preparation for the industrial water supply system for launch Complex 39. Estimated cost: \$225,000.

* A 115,000-volt substation for Launch Complex 39. Estimated cost: \$1.5 million.

* Three "explosive safe" buildings at Cape Canaveral for handling propellant fuels used in NASA's Surveyor, Ranger, Mariner and Voyager unmanned spacecraft. Estimated cost: \$1.5 million.

Bids on the first of these four projects — the ground support equipment building and the ordnance storage building—are scheduled to be opened Oct. 29.

The site preparation for the industrial water supply system consists mostly of excavation and fill work and installation of three drainage culverts. A pumping station will be built later in the area, about a mile northwest of Launch Pad A at Complex 39. Bids will be opened Oct. 31.

The 115,000-volt substation will include construction of a control house and the steel framework for both high and low voltage structures. Location of the work is on the west side of Highway A1A, about a half mile south of the Vertical Assembly Building. Bids are scheduled to be opened Nov. 6.

United Fund Drive

(Continued from Page 1)

plete tabulation of contributions by office and division. This will include the percentage of employees in each office who have given their fair share.

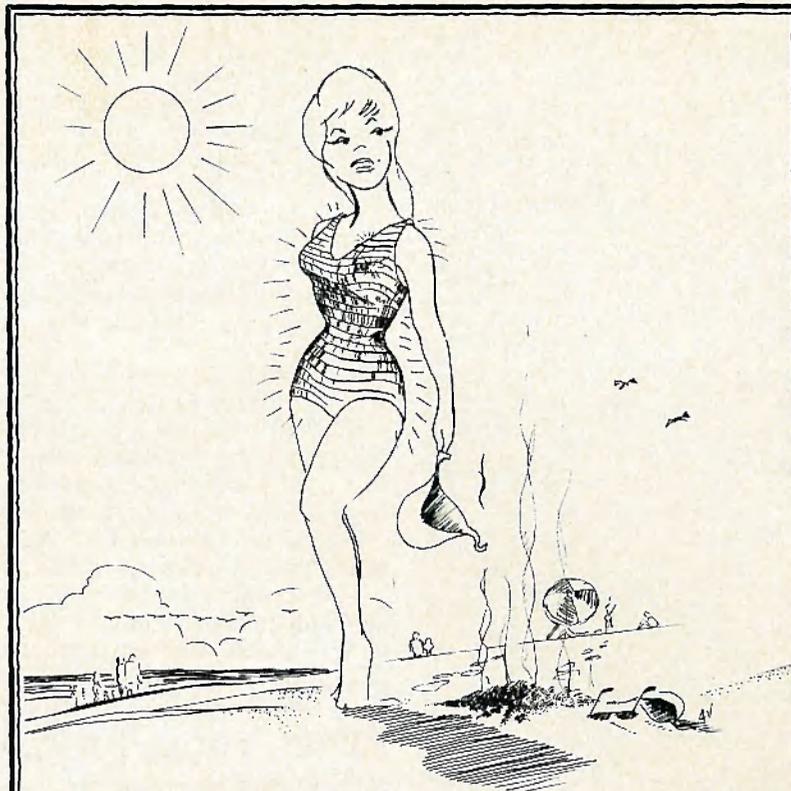
UF funds are distributed to 21 agencies in Brevard County.

Last year NASA doubled its \$5,000 goal.

Congratulations

The NASA-MILA Federal Credit Union joins the 564 other Florida Unions today in celebration of International C. U. Day.

There are 350,000 Credit Union members in the state.



STYLISH SPACE SWIMSUITS STOP SHOW

Couturiers at the end of their fashion rope with designs for disposable paper clothes for milady took new heart at a recent Outer Space Fashion Display held in San Francisco. The show featured literally out-of-this-world styles devised from materials normally associated with spacecraft.

The originator of the idea, a Los Angeles area space scientist really had some way-out ideas. Of a solar cell playsuit and a carbon cloth swim suit, he pointed out; "It is conceivable that on a good bright day, given certain conditions, the solar cell swimsuit could fry the adjacent model (in the carbon cloth, above) to a cinder!"

James E. Nelson, a master tool maker, who designed and "built" the playsuit, said, "There are 4,800 silicon solar cells on it," and he added proudly, "I wish I'd had time to polish it. It looks so much better when it has been polished!"

Other breathtaking features of the show were a seductive silver sheath of aluminized asbestos with red-lined capelet which came from the same bolt as insulating fabric used to protect cables on the launching pad, and a dress of Mylar (Echo satellite material) which is about 1,400-in. thick, weighs less than an ounce and can't be torn!



Dear Sir:

I would like to be an astronaut or a technician or designer — or somebody.

David V.
Tampa, Fla.

NASA NEWCOMERS

Eight new employees have ojoined N A S A in the past week. They are:

LOC: Lorenz G. Simpkins, George W. Ely, Henry W. Thayer, and Ellen Little.

MSC: James K. Legg.
Launch Support Equipment Engineering Division, Huntsville: Kirby K. Key, Alfred R. Raffaelli, and William I. Moore.

Protect classified notes and working papers.



How old is the average NASA employee, how many children does he (or she) have, and how much does he spend for groceries?

These and other interesting points were aired recently by MSC's Procurement Officer Dave Lang, in a speech at Rice University during the second annual Industry Assistance Symposium.

"The average NASA employee, "Lang said," is 30 years old." He has attended college, probably seen some military service, and is married.

He has three children, the oldest either school age or close to it. He is buying his own home in the \$15,000 range. If he rents a house while he is looking for his own, or waiting for it to be built, he is paying approximately \$135 a month for rent.

"He spends about \$40 to \$45 a week on groceries. He owns a late model car and occasionally can afford to buy a second, older model automobile.

"He attends church in his community, and occasionally belongs to a civic group.

That the space industry has truly become a nationwide endeavor, was clearly illustrated in the same speech by Lang.

"Each area seems to have its speciality," he said. "The New England-New York area has a large resource of engineering and development, particularly related to the electronic industry.

The mid-east's strong point is research and engineering, particularly in the field of communications.

The south contributes much in the way of research and development, especially at government agencies and colleges.

The mid-west is important in the development and manufacture of a broad range of scientific equipment.

The far-west has research, engineering and development with emphasis on spacecraft systems and electronics.