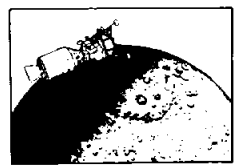




QUEEN FOR A YEAR—Jane Anne Jayroe of LaVerne, Okla., 1967 Miss America, March 14 visited MSC. Among the facilities she visited were the crew training simulators in Bldg. 5, the Crew Systems Laboratory and Mission Control Center.



Mortensen Talks To ISA Section On Laser Use

Robert L. Mortensen, Spectra-Physics marketing manager, March 22 will address the Apollo Section of the Instrument Society of America. His topic will be "The New Gas Lasers." The meeting will be at 6:30 pm at the Holiday Inn on NASA Road 1.



Since its recent invention, the laser has been surrounded by predictions ranging from James Bond-type fantastic fiction to the often incomprehensibly complicated proposals of serious scientific investigators.

Mortensen will discuss the new gas lasers and describe some of their practical applications, ranging from vaporizing of material to holography to precision alignment of large construction equipment.

Mortensen also will demonstrate holography using lasers. Holography is a new field of lensless photography which produces a true three-dimensional reconstruction of an object.

Non-ISA members are invited to attend the meeting. For reservations and information, call Larry Lockwood at HU 8-0850.

Lunar Sample Test Scientists Selected

NASA yesterday selected 110 scientists from the United States and six other countries to conduct experiments upon the first lunar surface samples returned to Earth by Apollo crewmen.

In all, the scientists will conduct 122 experiments with the lunar samples since some scientists will make more than one experiment. Thirty-three of the experiments will be carried out by 27 scientists in laboratories of other countries.

It is planned that the two crewmen who first land on the moon in the Apollo program will return approximately fifty pounds of lunar material to earth. The samples will be studied by scientists of a variety of disciplines to determine the composition of the lunar surface and to search for evidence of its origin.

The four major investigative areas are mineralogy and petrology, chemical and isotope analysis, physical properties, and bio-chemical and organic analysis.

The US principal investigators represent 21 universities, two industrial firms, three private institutions, and 10 government laboratories.

In England, the principal investigators represent nine scientific institutions. In Germany, three are represented and in Canada, Japan, Finland and Switzerland, one each.

Most of the investigations will be made by scientists in their

own laboratories but time-critical experiments will be conducted in the Lunar Receiving Laboratory at MSC in the period of quarantine which is anticipated to last about 30 days.

The Lunar Receiving Laboratory, now nearing completion, will be a central complex where lunar surface materials will be received, quarantined, and processed for distribution to principal investigators.

Fifty pounds of samples will arrive at the Laboratory in two vacuum-sealed containers weighing a total of 80 pounds.

The samples will be stored under vacuum and most of the operations with the samples in the laboratory will be performed under vacuum to keep the collected material in an environment similar to the moon. All of the operations with the samples in the laboratory will be performed behind biological barriers to eliminate organic and inorganic contamination and to insure that earth quarantine is not violated.

Some 130 proposals for scientific studies of the lunar samples involving more than 400 scientists were received by the June 15, 1966, deadline.

Selection of investigators was made by NASA's Associate Administrator for Space Science and Applications, Dr. Homer E. Newell, upon the recommendation of the Space Science Steering Committee.

Share Buyers 'Flock' to CU

Response to the MSC Federal Credit Union's campaign for additional \$5 shares through monthly drawings for entertainment tickets has been quite encouraging. Credit Union officials say that new and old Credit Union members "have been flocking" to the Credit Union offices in Bldg 2 to take advantage of the campaign to foster savings while getting free chances on tickets.

The first monthly drawing will be held March 31 at 2 pm and the winner will be able to select tickets to one of five Houston events during April. Even the date may be selected, provided tickets remain for that date.

- Events offered are:
- Opera *Faust*, Jones Hall, April 11, 14 and 16.
 - Peter, Paul and Mary, Music Hall, April 9.
 - *The Great Sebastian*, Alley Theater, starts April 5.
 - Baseball at the Astrodome.
 - Soccer: Rio Madre vs. United of England, April 16.

Buying a \$5 share a month (or as many as the pocketbook will stand) is a painless way to build up a nestegg of savings and at the same time gain a chance to free tickets to top-drawer entertainment. Give it a try.

MAC to Study Orbital Station Nine-Man Ferry

A \$300,000 contract has been awarded to the McDonnell Aircraft Corporation, St. Louis, Mo., for feasibility and conceptual studies for the development of an advanced nine-man post-Apollo advanced type logistic spacecraft for support of earth orbital space stations. McDonnell was awarded the contract following competitive bidding. Four other aerospace companies submitted bids on the study project.

Under the contract McDonnell is asked to furnish all necessary materials, equipment, personnel and facilities, and shall perform all investigations, studies, calculations, design and engineering services necessary to recommend and substantiate the definition of space operations, techniques and subsystems to identify their requirements for a logistic/ferry resupply system.

The Space Station Study Office of the Advanced Spacecraft Technology Division of the Engineering and Development Directorate will monitor the contract.

"Then they light the ascent engine . . ."



PIONEER THREESOME—Aviatrix Jacqueline Cochran is briefed on the Lunar Module staging sequence by Alan B. Shepard, first American to make a space flight, and MSC Director Dr. Robert R. Gilruth during her March 9 visit to MSC. Miss Cochran holds or has held women's aviation records for altitude, speed, 500-km closed course, 100-km circular course. She was the first woman to fly faster than the speed of sound and first woman to fly a jet across the Atlantic. (New Orleans to Hannover, Germany with stops at Gander and Shannon) She received the Harmon International Aviatrix Trophy in 1938, (the year she won the Bendix Trophy cross-country race), 1939, 1940, 1953 and 1962. In 1953, she won the *Federation Aeronautique Internationale* Gold Medal, was named to membership in the International Academy of Astronautics in 1963, and was named to the International Aerospace Hall of Fame in 1965.

Dornbach Earns Clark University Geography PhD

John Dornbach, chief of the Mapping Sciences Branch of Lunar and Earth Sciences Division, June 4 will receive his doctorate from the Clark University Graduate School of Geography, Worcester, Mass. Dornbach will receive his PhD *in absentia* in the field of cartography after successfully defending his doctoral dissertation, "An Analysis of the Map as an Information Systems Display."

He holds a Masters in geography from Washington University, St. Louis, a BA in geography and a BS in education (chemistry major) from Southern Illinois University, Carbondale, Ill.

Prior to joining NASA in 1961, Dornbach for nine years was a cartographer with the USAF Aeronautical Chart and Information Center, St. Louis.

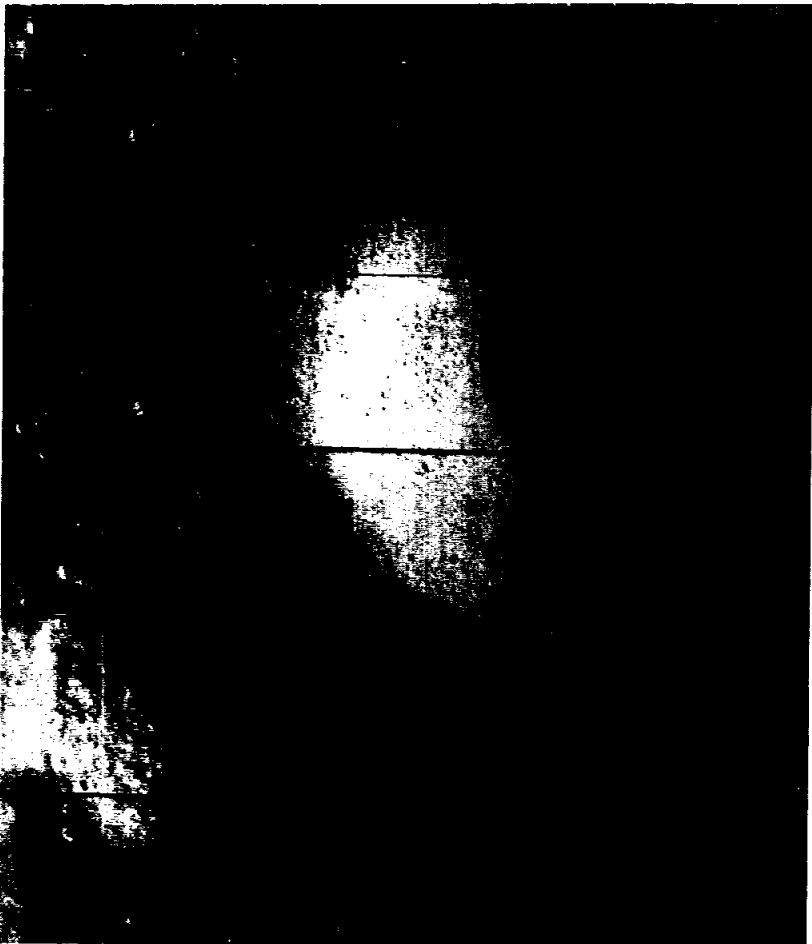
Lunar Orbiter III Settles Down to Job of Mapping Apollo Landing Sites



KEPLERSVILLE—Lunar Orbiter III's wide angle lens shot this low-angle view of the Kepler crater complex in Oceanus Procellarum. The prominent crater near the center is Kepler, approximately 20 miles in diameter and more than a mile deep. The smaller, almost perfectly formed crater at right is Kepler A — nine miles in diameter and one-half mile deep. Kepler is located at 8° NLat by 38° WLong. Lunar Orbiter III, built by Boeing Company, was launched from Kennedy Space Center February 4 at 7:17 pm CST atop an Atlas-Agena launch vehicle. The Lunar Orbiter program is managed by the NASA Langley Research Center.



MOONSLIDE—A portion of one of Lunar Orbiter III's telephoto photos shows an unusually well-defined crater about 500 feet across in Oceanus Procellarum. The double-walled appearance is caused by a continuous landslide around the crater's circumference. Blocks and boulders averaging about three feet in diameter were ejected from the crater to form a symmetrical pattern of rays. From top to bottom the photo covers about 3600 surface feet.



CRATER CLOSEUP—Covering approximately three-quarters of a mile on a side, this blowup from a Lunar Orbiter III telephoto picture shows a portion of Site 3P-1 centered at 35°11' ELong by 2°35' NLat. This particular photo was shot at 4 am CST February 15 and transmitted to the Goldstone, Calif., Deep Space Network station at 12:36 pm CST the same day. Sun angle at the time the photo was taken was 14.5° above the horizon.



ROCKS AND RILLES—The crater Hyginus and two branches of the Hyginus Rille are the dominant features in this Lunar Orbiter III photo. Hyginus is approximately 6.5 miles in diameter and 2600 feet deep and is located between Sinus Medii and Mare Vaporum near 8° NLat by 6° ELong. An area called the Schneckenberg Uplands is at upper left. When this photo was made at 8:40 pm CST February 16, Lunar Orbiter III was 49 miles southwest of Hyginus at an altitude of 39 miles on its 56th orbit of the moon. A direct relationship between rille width and crater diameter is suggested by close inspection of the two rilles and of the smaller rille extending to the southwest from Hyginus.

FIVE AT A TIME—

Multiple Docking Adapter Added To Apollo Applications Hardware

The NASA-Marshall Space Flight Center will design and build in-house the Apollo Applications multiple docking adapter—a structure which will allow five payloads to be joined together in orbit.

The multiple docking adapter (MDA) is one of several new pieces of equipment being developed for the Apollo Applications effort.

Four Payloads

NASA plans to launch four Uprated Saturn I payloads—a mapping and survey system, the orbital workshop, a resupply mission and the Apollo telescope mount—in the initial Apollo Applications missions. These payloads will be locked on to the MDA's docking ports to form a "clustered" embryonic space station. In addition to performing several scientific experiments, NASA will study man's reactions to long term weightless space flight in this "cluster."

The MDA project is part of MSFC's Saturn/Apollo Applications Office.

Marshall plans to build the docking adapter "in-house." The MDA, now in the preliminary design stage, will be a cylindrical tube approximately 10 feet in diameter and 11 feet long with a conical section on the forward end, bringing the total length to approximately 15 feet. Located around the cylindrical section, near the conical front end will be four 36-inch diameter tunnels. A fifth tunnel is located at the apex of the conical forward end. Each tunnel is about one foot long and contains a docking collar and a sealing hatch to permit orbital docking of the various vehicles and experiment carriers.

The lower end of the MDA's main section will be rigidly attached to the forward end of the Orbital Workshop's airlock module. The MDA will be carried aloft in the S-IVB spent stage and airlock combination.

NASA is planning the initial Apollo Applications effort to begin as soon as the launch vehicles are no longer needed for the Apollo program. Elements of the Apollo Applications "cluster" are being developed for use in late 1968 or 1969.

The objective of the Apollo/Uprated Saturn I "workshop" flights is to gather information and experience in orbital docking and working in space. Another objective is to confirm that man can function in this type of space environment for longer than two weeks. This information is needed for planning longer lunar and planetary space flights.

Uses Existing Hardware

Dr. George Mueller, NASA associate administrator for Manned Space Flight, said the use of the Saturn upper stage would give "us a large volume in which to work."

"I think it is a good example of getting a large amount of information from a relatively

small investment and utilizing the flexibility and capability of basic Apollo systems for new and exciting things.

Another major new piece of equipment that is needed for the missions is a large airlock which can allow the space travelers to go in and out of the stage's pressurized hydrogen tank, which is 21.7 feet in diameter and 29 feet in length. The airlock unit will also contain all the additional equipment—life support devices and experiments—needed for the mission.

MSC last year selected McDonnell Aircraft Corp., St. Louis, Mo., to develop the airlock. McDonnell will receive some \$9 million for developing this device. The firm will use existing Apollo and Gemini spacecraft hardware for the airlock and its equipment so there will be very little new research on this phase of the project.

The airlock, which is to be about 15½ feet long and 65 inches in diameter, will lock onto the top of the upper rocket stage where the lunar module is located on Apollo missions. During the launch the airlock extends through the center of the launch vehicle's instrument unit. Oxygen for pressurizing the depleted liquid hydrogen tank will be carried in liquid form on the airlock structure. So will the liquid hydrogen and oxygen needed to power the fuel cell in the Apollo which will supply electricity to both the Apollo and the workshop. Tools and experimental gear to be used during the flight will also be stored on the airlock.

Basically the orbital workshop flight plan calls for launching the three-man Apollo spacecraft into an elliptical orbit some 81 by 170 nautical miles with the two-stage Uprated Saturn I. The crew will then disconnect their Apollo spacecraft, turn around and dock with the airlock.

Month in Space

A first burn of the spacecraft's service module engine will place the Apollo S-IVB combination into a circular orbit of about 170 miles. Once the orbit becomes circular, the crew is expected to remain in orbit for up to a month.

Early in the mission, commands from the ground will disarm the S-IVB stage destruct system—a system used only if the vehicle during launch should go astray near an inhabited area. Pre-programmed commands from the vehicle's instrument unit will open valves so the propellants remaining in tanks will vent.

The time required to vent the propellant tanks will vary between 4½ and 24 hours and will depend on the amount remaining in the vessel and the location at cutoff.

After an acceptable orbit has been achieved and most propellants have "boiled away," two crewmen will climb out into space and begin the many tasks

necessary to make the S-IVB's hydrogen tank—a container of nearly 11,000 cubic feet—a livable area.

One of the first jobs will be to connect a cable to activate a "passivation panel" located on the support module. Switches on this panel will allow the men to vent the cold helium storage bottles and any gases remaining in the main propellant tanks. When the pressures have been released, the crew will set about removing a "dollar piece" in the end of the liquid hydrogen tank, a 43-inch circular cover at the apex of the dome. While one crewman remains in the Apollo spacecraft, the two men will work together to remove the cover.

The airlock tunnel and the tank will then be connected, allowing the huge tank to be pressurized. Outfitting the tank for living quarters will be another early task.

Plenty of EVA

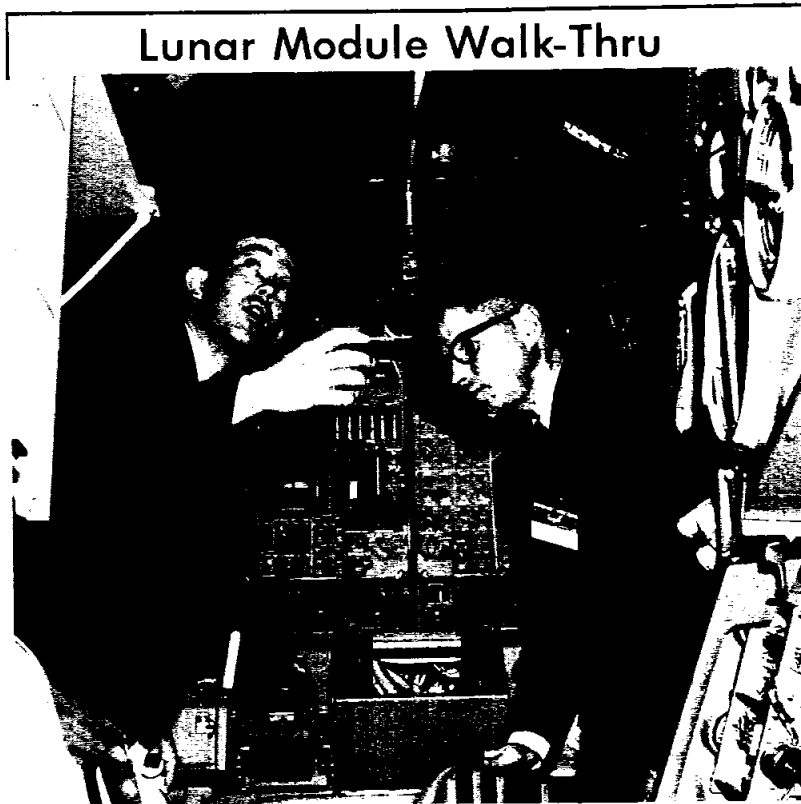
Extravehicular activities to be performed will include running electrical, hydrogen and oxygen lines from the airlock to the Apollo's fuel cell power system.

Plans call for the crew to place hand holds in the liquid hydrogen tank to aid them in maneuvering about.

When the preparations have been completed the tank will be pressurized and the men will have a "shirt sleeve" environment in which to live and work without their spacesuits.

Several experiments will be performed by the astronauts to see how well man can work and move about in a pressurized, but zero-gravity atmosphere. These experiments, still under study, will be provided by the MSC, MSFC and possibly other organizations.

The 30-day stay will also give NASA extensive information on food and water management, attitude control of large masses in orbit, and crew extravehicular activities equipment.



BRIEFING MR. SECRETARY—Secretary of Agriculture Orville L. Freeman, right, is briefed by Malcolm Brown of the Flight Crew Support Division Simulation Branch on the Lunar Module Mission Simulator crew station during the Secretary's March 6 visit to MSC.

Las Cruces AAS Meet Hears MSC's Fielder

Dennis Fielder, chief of the Advanced Planning Support Office of the MSC Flight Operations Directorate March 23 will be the featured speaker at the American Astronautical Society Symposium banquet at New Mexico State University. Fielder's topic will be "Future Support Requirements for the Manned Space Program."

More than 400 aerospace scientists and engineers are expected to attend the three-day AAS Rocky Mountain Section meeting at which 30 papers on the general topic "Future Space Programs and Impact on Range and Network" will be given. The meeting will be held on the University's campus at Las Cruces.

Other NASA presentations include Kennedy Space Center Future Studies Office chief J. P. Claybourne who will speak on "Launch Operations Requirements for Future Space Programs", and Goddard Space Flight Center deputy assistant

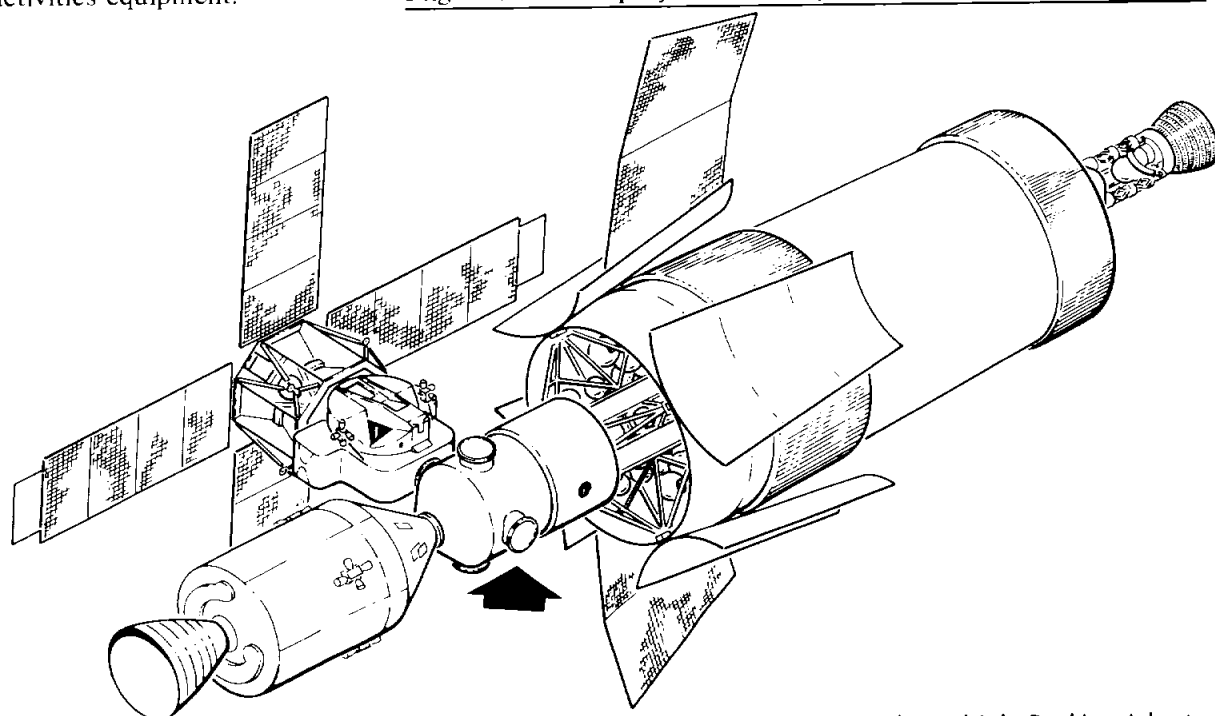
director for Tracking and Data Systems Ozro M. Covington who will discuss "Trends in Ground Support Systems for Space Flight."

Symposium delegates will tour facilities of the MSC White Sands Test Facility near Las Cruces, and WSTF Manager M. L. Raines will chair an evening symposium session of documentary films of range and space mission operations.

Symposium registration fees are \$10 plus meals for the three days. Further information can be had from general program chairman Austin Vick, Box 996, Las Cruces, New Mexico 88001.

Low Named UF Trustee

MSC Deputy Director George M. Low February 27 was elected to a one-year term as a member of the United Fund of Houston and Harris County board of trustees which meets four times a year.



SPACECRAFT TERMINAL—As many as five spacecraft can dock at one time into the Multiple Docking Adapter (MDA), arrow, which NASA Marshall Space Flight Center will design and build in-house. In the drawing, the MDA is attached to the S-IVB spent-stage orbital workshop, and docked to MDA docking tunnels are Apollo Command and Service Modules and the Apollo Telescope Mount. Between the MDA and the orbital workshop is an airlock now under development by McDonnell under contract to MSC.



BIG NOISE IN BOONDOCKS—Test engineers in the S-IC test stand control room, left, monitor systems displays during the countdown for the March 3 static firing of a Saturn V first stage test article. At right, many decibels of noise rumble out across the southern Mississippi

slash-pine swamps as the five F-1 LOX/kerosene engines generate 7.5 million pounds thrust upward on the test stand structure.

MISSISSIPPI MILESTONE—

Saturn V Test Stand Operational After Static Firing of S-IC Stage

A ground test version of the rocket-engined first stage of the Saturn V vehicle March 3 underwent a successful captive firing at the NASA Mississippi Test Facility. The test marked the debut of the huge new S-IC test stand and full operational status for the unique test facility.

The five engines of the stage (S-IC-T) were fired for a scheduled 15 seconds, beginning at 5:23 pm CST. Conducting the test was the Launch Systems Branch of The Boeing Co., prime contractor to NASA's George C. Marshall Space Flight Center for S-IC stage development.

A primary purpose of the static firing was to prove the operational readiness of the new S-IC test stand and support facilities and of the test team. The first position of the 407-foot-high dual-position test stand was completed last month. Preliminary indications are that the test was a success.

The prototype S-IC-T, like the actual S-IC flight stages which will launch Saturn V vehicles from the Kennedy Space Center beginning this year, is 138 feet long, 33 feet in diameter and weighs 4.7 million pounds when fully fueled. Its five Rocketdyne F-1 engines burn kerosene and liquid oxygen to produce a total thrust of 7.5 million pounds, equal to 160 million horsepower in flight. The normal "burn time" of the S-IC stage's engines in flight is two and one-half minutes.

The S-IC-T static fired at MTF had been previously fired 15 times for a total of 867 seconds in developmental tests at NASA's Marshall Space Flight Center in Huntsville, Ala. The Mississippi Test Facility is a part of the Marshall Center.

About 850 measurements of the stage's performance and of the test stand were recorded during the test, including such aspects as stress, engine temperatures and thrust, propellant tank temperatures and pressures,

vibrations, and propellant flow rates. The great volume of test data will be processed and analyzed to permit detailed evaluation by engineers. The test stage will be static tested at MTF at least one more time.

The checkout of the S-IC test stand permits the Mississippi Test Facility to assume its full role as the national rocket testing center and a major Apollo program resource.

Construction in the current development of the test center is virtually complete and its test range facilities, including data

processing, propellant handling, laboratories and shops, are fully operational.

A research and development unit and one flight model of the smaller second stage of the Saturn V vehicle, designated the S-II, have been successfully tested in one of two S-II test stands at MTF. A second flight stage, the S-II-2, is now undergoing tests there. During the next several years, preflight acceptance testing of at least 12 S-IC and 14 more S-II stages is scheduled at the NASA Mississippi proving ground.

Management Realigned For Voyager Program

Management responsibilities for the Voyager Planetary Flight program have been established within NASA. The move was made in order to proceed with the work funded in the 1967 Budget and to prepare for the expanded work recommended by President Johnson in his 1968 budget now before the Congress.

The announcement was made February 28 by NASA Administrator James E. Webb in an appearance before the House Committee on Science and Astronautics. "These arrangements," he said, "are designed

to make the best possible utilization of the proved capabilities of the Jet Propulsion Laboratory and of our field centers and laboratories."

The Voyager program, which has been under the NASA Headquarters Division of Lunar and Planetary Programs since 1964, will be established as a separate division in the Office of Space Science and Applications (OSSA).

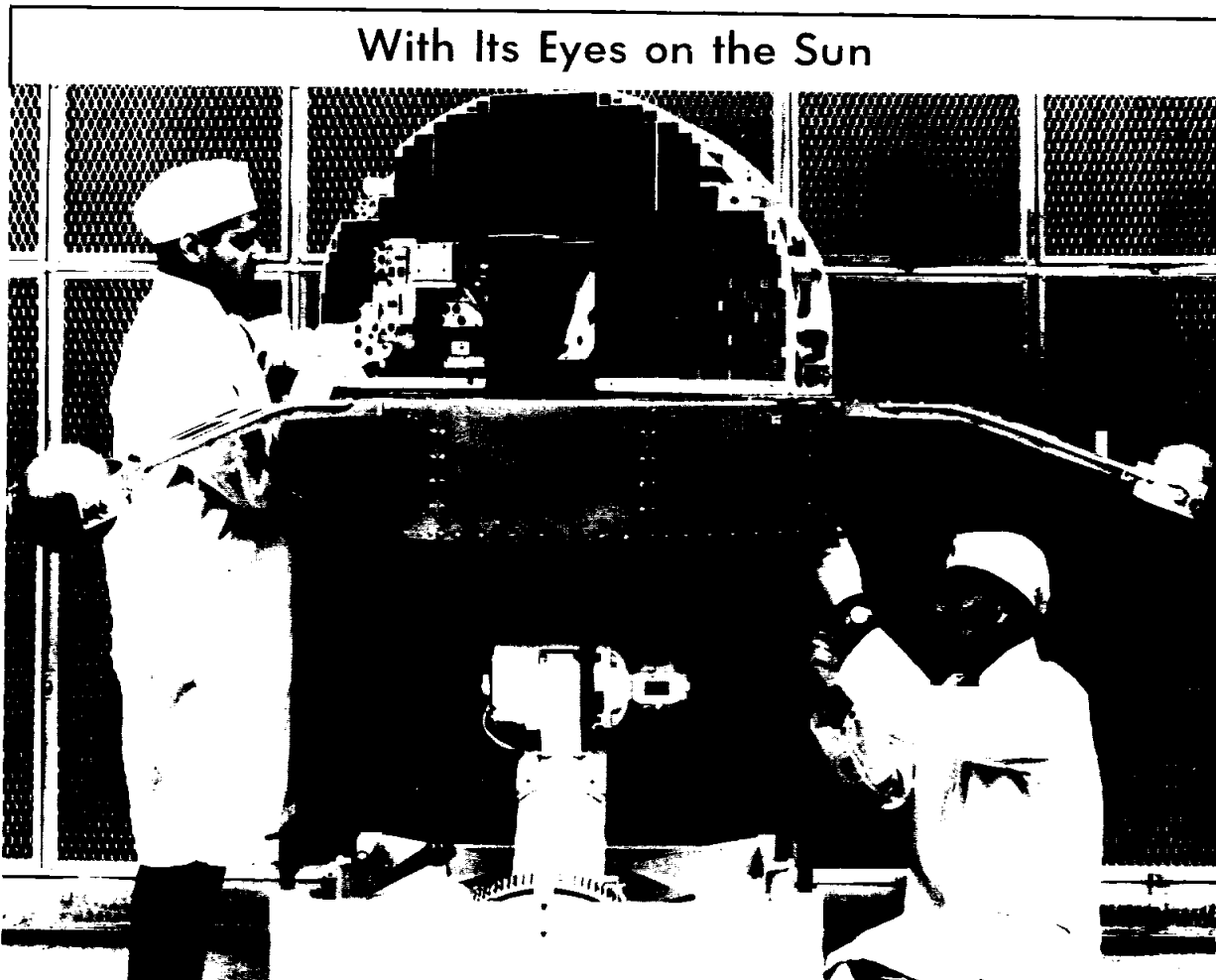
In addition, an interim project management office consisting of OSSA personnel will be established at Pasadena, Cal., for project management.

Field center assignments for Voyager are:

- Jet Propulsion Laboratory, Pasadena, Cal. — Surface Laboratory, Tracking, and Mission Operations Systems.
- Marshall Space Flight Center, Huntsville, Ala. — Orbiting Spacecraft System and Saturn V Launch Vehicle System.
- Langley Research Center, Hampton, Va. — Landing Capsule Bus System.

Voyager is NASA's program for long-term exploration of the planets. It is planned that the first Voyager missions will be to Mars, starting in 1973. Two identical spacecraft will be launched by a single Saturn V to orbit Mars and make scientific studies. Each spacecraft will carry a surface laboratory to land on Mars and to study the surface, and to search for evidence of extra-terrestrial life.

The new management arrangements for Voyager are the result of NASA's desire to bring the full capabilities of the agency into the project. The tasks assigned to JPL, permit the Laboratory to continue with the highly successful Mariner program as well as to carry out those parts of the Voyager which best match its strong technical capability. The assignments to Marshall and Langley likewise use the capabilities of those centers to the optimum degree.



SUN WATCH—Technicians prepare the Orbiting Solar Observatory III for a pre-launch spin balance test. In orbit the bottom wheel section spins while the upper sail portion locks onto the Sun and points its instruments in that direction. OSO III was launched at 10:12 am CST March 8 from Kennedy Space Center after a near-perfect countdown, atop a Delta launch vehicle. Spin-up rate after separation of the satellite from the launch vehicle third stage was 39 rpm. OSO III is in a near-circular orbit with a 298-nm apogee, 292.3-nm perigee, 96-minute period and an inclination of 33°. All nine experiments aimed toward determining the Sun's effects upon the Earth's atmosphere were scheduled to be operating by March 14. The OSO program is managed by the NASA Goddard Space Flight Center and prime spacecraft contractor is Ball Brothers Research Corporation, Boulder, Colorado.

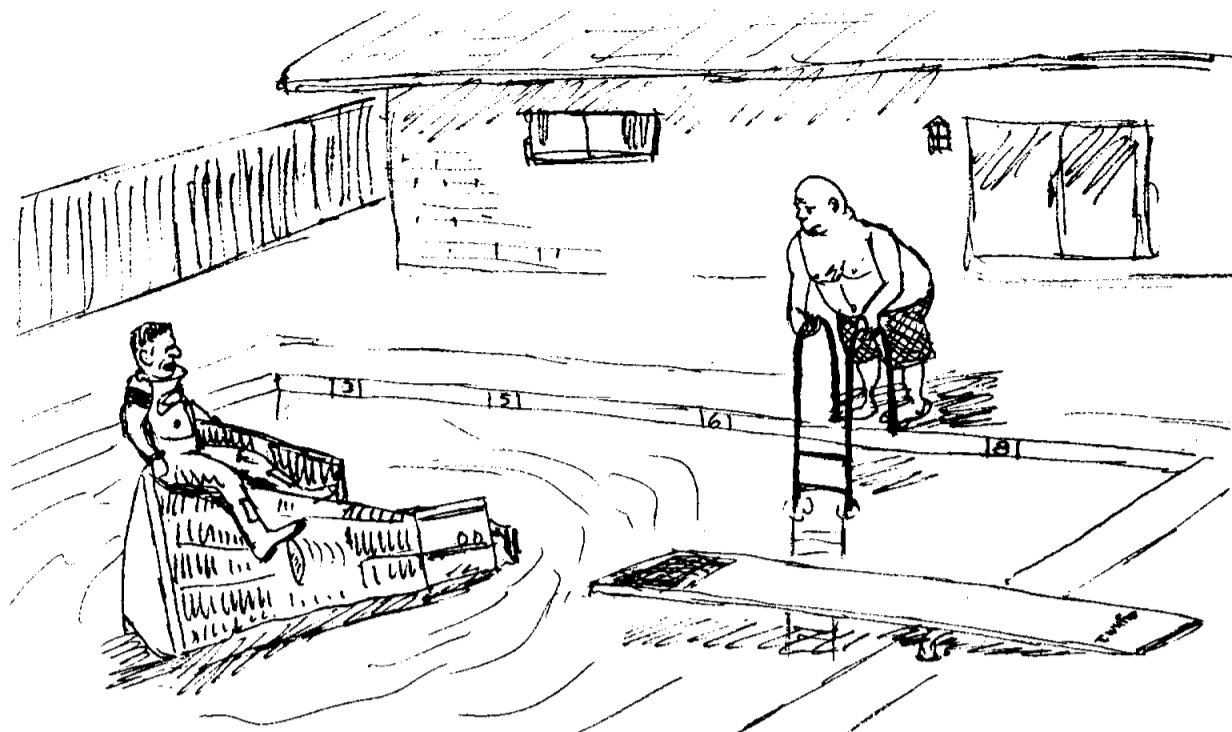
There's More to Skating Than Meets the Ice



ICETRONAUTS—Skate-shod youngsters and parents turned out for the March 5 MSC Youth Ice Skating Party at Winterland Ice Rink. Skating abilities ranged from expert to not-so-expert, but the whole idea was to have fun—and it was a fun time. Two Ritas—Rapp and

Sommers—who were party volunteer chaperones showed the younger set what skating was all about. The young fellow in the center photo cheated a bit with double-bladed skates and a parent on each side. (Photos by Pat Patnesky)

On The Lighter Side



May we use your telephone?

The *Roundup* is an official publication of the National Aeronautics and Space Administration Manned Spacecraft Center, Houston, Texas, and is published every other Friday by the Public Affairs Office for MSC employees.

Director Dr. Robert R. Gilruth
Public Affairs Officer Paul Haney
Editor Terry White
Staff Photographer A. "Pat" Patnesky

Space News Of Five Years Ago

March 17, 1962—Vanguard I began fifth year in orbit, having traveled 543,195,264 miles in 15,712 orbits and still transmitting. Its rotation had slowed from three revolutions per second to one revolution in 23 seconds due to dampening effect of the earth's magnetic field.

March 20, 1962—Spacecraft 19 was delivered to Cape Canaveral in the orbital-manned configuration, but this mission was cancelled after the successful six-orbit flight of Schirra.

March 23, 1962—D. Brainerd Holmes, NASA's Director of Manned Space Flight, speaking before the Explorers Club in New York, listed one of the NASA organizational accomplishments of recent months as "the establishment of a liaison office with the Department of Defense, particularly with the Air Force Systems Command."

March 26, 1962—USSR submitted information on 16 Soviet space flights for inclusion in the UN registry on space launchings. Included were the manned orbital flights by Maj. Yuri A. Gagarin and Gherman S. Titov. US submitted a similar list to the UN on March 5, covering US space launchings to February 15, 1962 that were still in orbit.

March 28, 1962—US submitted to the UN a supplemental list of US space launchings,

covering the period of February 15 to March 15, 1962, updating the coverage of the first US list submitted March 5, 1962. This second official list did not include John Glenn's three-orbit flight, since the US contended that the UN roster was supposed to contain only those space objects still in orbit, not those that had already reentered. USSR listed all its space flights in its report to the UN on March 26. Although MA-6 flight was not registered, the US submitted information on the Glenn flight to the UN on April 3.

March 29, 1962—McDonnell Aircraft Corporation first showed Gemini spacecraft mockup at St. Louis plant.

Six Inventors Receive Cash Awards

NASA has awarded a total of \$4,200 to six inventors, all employed by industrial contractors, for advancements in space technology.

They are Charles R. Peek and Lewis E. Boodley, of the Radio Corporation of America, Princeton, N. J.; G. Richard Blair and Paul A. Jensen, employed by Hughes Aircraft Co., Culver City, Cal.; and Kenneth A. Ruddock and Robert G. Rempel, of Spectra-Physics Inc., Mountain View, Cal.

The awards were made under provisions of the National Aeronautics and Space Act of 1958, authorizing monetary awards to any person making a significant scientific or technical contribution to aeronautical or space activities.

Peek and Boodley received \$1,000 for their invention of "Connector Strips — Positive, Negative and T Tabs." This is a new type of interconnector for the hundreds of tiny solar cells which power orbiting satellites. These ties will tolerate the expansion and contraction caused by the extreme temperature changes experienced in space. They are used on the Nimbus weather satellites.

Blair was given \$1,000 for his "Inorganic Thermal Control Pig-

ment." Used as a passive heat protective coating on the Surveyor spacecraft, this material is credited with extending Surveyor's useful lifetime to about five weeks. It is primarily a mixture of white clay and potassium silicate. Previously available coatings could have limited Surveyor's useful period on the Moon to about one week.

Ruddock and Rempel were awarded \$1,000 for their "Three-Component Optically Pumped Magnetometer." Located at NASA's Goddard Space Flight Center, Greenbelt, Md., this 22-ft. device (coils and magnetometer), housed in a non-magnetic frame building, measures the Earth's magnetic field with much greater speed and precision than is otherwise possible.

Physically, it consists of three and a rubidium light beam source. The three coils measure three vectors of the Earth's magnetic field—vertical, north, and east-west, and all three vectors can be accurately measured in sequence in about 60 milliseconds. The Earth's magnetic field varies from moment to moment, due to magnetic storms, diurnal changes and seasonal changes. An average could be assumed but it would not accurately measure the very small intensities found beyond the magnetosphere.

Jensen won \$1,200 for his "Low-Noise Single Aperture Multi-mode Monopulse Antenna Feed System," while employed by Hughes Aircraft Co., Culver City, Cal. This system is now used in all NASA Deep Space Network stations, where its advantages in lower noise and greater distance capabilities are put to use in tracking and obtaining data from lunar and planetary probes.

In space communications systems, large parabolic dish antennas are used to focus radio energy in communication with spacecraft. To enable maximum

energy to be focused toward the spacecraft and increase the distance, the feed must be designed to illuminate the dish fully, while minimizing the amount of energy which spills over its edge.

Jensen invented a new feed design which improves antenna efficiency by a special microwave circuit to reduce spillover and environmental noise. He uses waveguides in an arrangement known as a four-port bridge circuit and multi-mode matching network to direct the radio energy to and from the dish. Noise is further reduced by a control network which cancels the spillover portions of the primary radiation pattern with one or more secondary patterns.



1.



2.



3.



4.

You meet the nicest people when you buy U.S. Savings Bonds

MV Retriever Gets Haul-Out For Maintenance

The NASA Motor Vessel *Retriever*, used by MSC for Galveston Bay and Gulf water egress training and post-landing spacecraft testing, March 20 will be hauled out for maintenance and minor modifications by Bludworth Shipyards, Brady Island, Houston.

The converted Landing Craft Utility (LCU) will be dry docked for about 21 calendar days under a \$30,142 contract to Bludworth. The *Retriever* is operated by the Operational Evaluation and Test Branch of Landing and Recovery Division. *Retriever's* skipper is Frank Gammon.

ATTACK IMPERFECTION

KEEP THE SYMBOL OF EXCELLENCE MANNED FLIGHT AWARENESS

Optimists Organize MSC Area Club

The Pasadena Noon Optimist Club yesterday met at the King's Inn in the first of a series of meetings to discuss formation of a Clear Lake area Optimist Club.

Men who are interested in youth work are invited to attend the organizational meetings each Thursday noon at the King's Inn. Meals are \$2.

Pasadena Noon Optimist Club member H. W. Mann can be reached at HU 4-7411 (office) or GR 2-6357 (home) for further details.

Roundup Swap-Shop

(Deadline for classified ads is the Friday preceding Roundup publication date. Ads received after the deadline will be run in the next following issue. Send ads in writing to Roundup Editor, AP3. Ads will not be repeated unless requested. Use name and home telephone number.)

FOR SALE—REAL ESTATE

1 and 1/2-acre sandy, high-ground country lots within sight of MSC, good drainage, reasonable. Mac Owen, 877-1689.

4-2/2-2 in Clear Lake City, separate family and dining rooms, fenced, landscaped, drapes, extras. Near school and parks. Refinance FHA. \$25,500 loan available with \$2700 down including closing. James Gray, HU 8-0415.

3-bdr 1 1/2-bath brick, 2-car garage, central air/heat, large paneled den, living room, kitchen with dining area, large walk-in closets, 80x120-ft lot, backyard fenced, schoolbus available. Take \$1500 for \$3000 equity; \$110/mo payments include everything. James Weaver, 1506 Webster St., League City, 932-2371.

3-bdr 2-1/2-baths brick in Clear Creek Woods, Friendswood; living room, dining room, paneled den w/fireplace, all-electric kitchen with breakfast area, detached garage, 1980 sq ft living space, heavily wooded area. \$21,700. Charles Shoemaker, 1206 Timber Lane, HU 2-7874 or 591-3300 Ext 3182.

FOR SALE—AUTOS

1966 Chevy Caprice station wagon, 3 seats, all power, air, radio w/rear speaker, luggage carrier, trailer hitch, 2-tone, undercoated. Make offer and take up payments, will trade. R. E. Pryor, GR 4-2350.

1962 Rambler Classic station wagon 4-door delux 400 series, factory air, reclining bucket seats, headrests, vinyl interior, radio, autotrans. Original owner who ordered it from factory. \$875. Financing can be arranged; consider trade. Floyd Turner, RE 3-7667

1961 Pontiac Catalina. L. R. Sutton, 932-2791.

1964 Rambler 2-door Classic hardtop, V-8, autotrans, radio, reclining seats, low mileage, xclnt condition, extras. Bernard Cox, HU 4-6077.

1961 Pontiac Catalina 2-door hardtop, all power, air, xclnt condition, original owner. Michael Radde, 877-2152.

Race-prepared Mark I Sprite, blanced hi-compression pistons, reground cam, oil cooler, close ratio gears, all other legal SCCA Class H mods, spares and trailer included, not suitable for street use. Frank Stafford, HU 4-3528.

1966 Mustang hardtop, red w/white interior, 289 V-8 stick, radio, heater, whitewalls, 15,000 miles, xclnt condition. \$1895 or \$400 and assume Credit Union payments. G. R. Kimball, HU 8-3145 after 5.

1967 Mustang 2+2 GTA, 390 V-8, sportshift, air, discs, sportdeck rear seat, wide ovals, tach, many extras, reasonable, 44,000 miles of warranty remain. J. W. Colburn, MI 9-6361.

1964 9-passenger Pontiac station wagon, power steering/brakes, air, clean, swap or trade equity for late-model VW. Luther Palmer, 877-1269.

1966 VW sedan, 10 mas old, 13,000 miles, radio, leatherette. Dan Maynard, 8001 Easton Apt 19 evenings and weekends; Ext 4444 days (no home phone).

1965 Chevy 396 SS Impala, 4-speed, power, new tires and brakes, one owner, like new \$300 and assume payments. Bill Drewes, HU 4-7632 after 4:30.

1961 Volkswagen, xclnt mechanical condition, 49,000 miles, one owner. \$600. Jim Peacock, 932-4458.

1963 4-door Chrysler New Yorker, air, all power, 6-way seat. \$1000 or best offer; will trade if necessary. Carl Brunelle, 932-4269.

1965 Volkswagen. \$995. Susan Joerns, HU 8-1270 Ext 438.

FOR SALE—MISCELLANEOUS

Zeiss Ikonflex I twin-lens reflex camera, shoots 12 2 1/4x2 1/4 pix on 120 film, f/3.5 Zeiss Novar lens in Compur shutter, ever-ready case. \$25. Terry White, 932-4472.

1966 Ducati Motorcycle, 160cc, 70-75 mph, 90 mpg, 1500 actual miles, xclnt condition. Also helmet, tinted bubble, cable lock w/keys tarpoulin \$300 for all. J. M. Walker, RI 8-5910.

Six registered standard poodle puppies: four black females \$50 each, two black males \$65 each. Available March 1. Lynn Gripon, 932-3256.

70x54x17 Broyhill walnut bookcase cabinet, finished both sides to use as room divider. \$110. J. P. Kerwin, 591-3930.

Antique furniture, clocks, guns, telephones, marble-top tables, dishes, 1928 Model T Ford. R. E. Pryor, GR 4-2350.

Full-ton window air conditioner, 220-volt. \$50. Twin-bed box spring, \$12.50. 24-inch boy's bicycle, \$10. Milton Reim, HU 4-3795.

Early American love seat, red, one month old. \$85. Karla Garnuch, MI 3-2190 after 5.

Set of Doug Ford golf clubs: 9 irons, 3 woods, bag, big-wheel cart—\$45. Solid plywood ping-pong table with wooden legs, set of paddles and balls—\$35. Boy's bicycle—\$10. Daisy BB pistol, 10 pkgs BBs—\$5. Carl Busch, RE 3-8286.

Agfa camera, tripod, flash; 19-inch Silver-tone TV console; miscellaneous baby items (playpen, bassinet, etc). Barbara Scherr, HU 8-1494.

Omega P-2 4x5 enlarger, like new—\$100. Sunfish-style sailboat, dacron sail—\$250. R. L. Jones, MI 4-4036.

Black dinette set with fruitwood Formica top, 4 chairs with red seats—\$95. Two step tables and coffee table, walnut with Formica tops—\$45. Two wrought-iron bar stool, swivel seats, wooden backs—\$25. Sealy Posturepedic extra-long double mattress and box springs—\$60. B. J. Ebner, HU 4-1578 or HU 8-2557.

Omega Speedmaster chronograph, so-called "astronaut" model, keeps 30 seconds a week time accuracy. Best offer. Fred Pearce, RI 7-4447.

1966 Honda S-90, red. \$275. Sayers, 591-2395.

Gentle quarter-type mare, xclnt child's horse, well-trained for shows or general riding. Jane Lindsay, 932-3341 after 5.

Two wooden bar stools with backrests, 2 months old, \$10 each. Carol Teal, MI 4-3937.

Gulbransen all-transistor organ, walnut, 3 years old, like new, cost \$1600—sell for \$995. RCA home entertainment center, phono/AM-FM/6-spkr stereo/25-in TV, perfect condition, sacrifice for \$125. Warren Glenn, 591-2901 after 5.

Sunbeam electric lawnmower, runs well—\$10. large seascape "Breakers at Sunset" by Rossi—\$15. Spanish 3-candle wrought-iron candelabra and matching wall sconces—\$10. 12-inch Sears portable TV, like new—\$40. New diamond engagement ring and wide matching wedding band, white gold w/Florentine finish—\$50. Stu Vanderoef, HU 2-7540.

RCA Estate gas range, electric clock, timer, oven, broiler, griddle. \$70. Carl D. Scott, HU 2-3011.

Raytheon 24-inch TV console (1952-3), continuous variable tuner. \$25. M. A. Amato, MI 9-5482.

Deluxe Kenmore coopertone gas range—\$75. 220-volt 14,800-BTU Coldspot window air conditioner—\$50. Both new in 1963, in xclnt condition. 30-in fan—\$15. James McCoy, HU 4-5574.

17-ft aluminum cabin boat with 40-hp Mercury, trailer. \$375. Richard Courtney, 2014 Shasta (Glen Cove Park) Kemah, 877-2083.

Top-quality slalom-type waterskis—\$10. 10-piece set redwood porch furniture: lounges, chairs, large table, benches, etc. \$75. Carl Busch, RE 3-8286.

16-inch push-type lawnmower, xclnt condition. \$10. Bob Handley, HU 2-7014.

220-volt 18,500-BTU Coldspot window airconditioner, cools up to 5 rooms, used 5 months; folding high chair; 19-inch portable TV, needs pic tube. J. M. Huff, HU 4-7261.

Couch, matching chair, two end tables, coffee table. All for \$50. Carol Yeager, GR 3-3825.

Sampan Chinese fishing boat; be first on your block to own one of these sturdy, unusual craft. New paint, reconditioned, 6-hp Mercury outboard, Conestoga-style "cabin". \$325. Berthed at Taylor Lake. Call Eugene Horton, 877-4102 for demo cruise.

WANTED

Car pool or will pay from 2607 Cedar Drive, La Marque to Bldg 419, 7:30 a.m. to 4 p.m., Evelyn Villeneuve WE 5-3878.

Car pool from Baytown to Bldg 4 7:30 to 4. LeAnne Bible, Ext 3606 (no home phone).

Car pool from 1119 2nd street, LaMarque to Bldg 2, 8:30-5. Mary Lee Boudreaux, WE 5-2912.

Girl to share 2-bdr 1 1/2-bath bayhouse apartment, 2 carpools, Connie Critzos, HU 8-2193 days; 591-2271 after 5:30.

Ride from Southmore and Richey to MSC 8:30 to 5. Christine Richards, Ext 2397.

Want beginner's clarinet in good condition. H. F. Erickson, MI 9-0396.

NOTICE

Clear Lake Lodge No. 1417 AF&AM meets 7:30 pm second Tuesday of each month at LaPorte Lodge Hall. W. M. Otto Perkins; Sec. Tom Parker, 932-3927 or HU 8-3530 Ext 2254.

Center's Growth Recalled



CO-OP CONFAB—MSC Director of Administration Wesley L. Hjernevik outlines for 80 Co-Op employees MSC's growth over the years from the Space Task Group days at Langley through the move to Houston and the Center's construction. The group met March 8 in the third-floor Mission Operations Control Room viewing room in the Mission Control Center.

MSC BOWLING MIMOSA MEN'S LEAGUE

As of March 16

TEAM	WON	LOST
Chizzlers	65 1/2	38 1/2
Fabricators	59	45
Whirlwinds	58	46
Alley Oops	57 1/2	46 1/2
Technics	56 1/2	47 1/2
Road Runners	56	48
Real Timers	54	50
Strikers	53	51
Foul Five	53	51
Weightless Wonders	48	56
Agitators	38	66
Hustlers	25 1/2	78 1/2

High Game: Jim Grimwood and Bill Whipkey 275. Bob Lacy 273.

High Team Game: Chizzlers 1093 and 1086. Technics 1080.

High Series: Bill Horton 728, Bob Lacy 700.

High Team Series: Chizzlers 3122 and 3084. Whirlwinds and Road Runners 3077.

Volleyballers Meet

Volleyball team managers are urged to attend the March 24 league organization meeting at 5:30 pm in Room 747A Bldg 2. There is no charge for entering a team and no team rosters will be required at the organizational meeting.

A ladies' league is also being organized in which wives of MSC employees would be eligible.

Want 4-wheel tandem trailer capable of carrying 2500 lbs at sustained high speed; must carry medium sized car approx 7x14, with runners at least one foot wide. Jon Farbman, WA 6-7192.

Car pool or will pay from 2123 Chestnut Lane, Pasadena to Bldg 9 7:30 to 4. Lucy Stafford, GR 3-8024.

Want 14-16-ft trihedral design open fishing boat and trailer, glass or aluminum, prefer Boston Whaler. Marlo Krisberg, MI 4-3147.

Want girl to share 1-bdr furnished apartment located on NASA Road 1. HU 8-0080 Ext 265.

ROUNDUP EMPLOYEE NEWS

Congress Extends Health Benefits

Several laws affecting Federal employees were passed by the 89th Congress and signed into law by the President.

Among these was an amendment to the Federal Employees Health Benefits Act which extends the maximum age limit for health benefits coverage of an employee's eligible children from 21 to 22. The amendment

also increased the Government's contribution toward the cost of employee health insurance by a maximum of \$.38 biweekly for a self-only enrollment and by \$.98 biweekly for a self-and-family enrollment.

An amendment to the Classification Act authorizes hazardous duty pay for those who perform irregular or intermittent duties involving unusual physical hardship or hazard not involved in the usual duties or classification of their positions.

The Civil Service Commission is currently establishing instructions and a pay differential schedule.



Fulton M. Plauche
Propulsion and Power Division

Spanish Starts Today

Today is the starting date and enrollment deadline for the second 10-week cycle of EAA-sponsored conversational Spanish courses.

To enroll, call instructor Nick Reyes at HU 8-1600 Ext 147 or OX 4-5042 nights. MSC and contractor employees are eligible to take the course.

1967 MSC/EAFB Basketball League

Standings as of March 3

American Division				National Division			
TEAM	WON	LOST		TEAM	WON	LOST	
FCD	10	—		IBM (Gold)	9	1	
MPAD-RAB	9	1		USCG	9	1	
P&PD	8	2		Philco	8	3	
IBM (Blue)	8	2		IESD/LEC	7	3	
TRW	8	2		Univac	7	4	
ANG	5	6		MPAD-Red Roaches	6	4	
NAA	4	6		Link	6	4	
CSD	4	7		G&CD	4	6	
ISD	3	7		LRD	4	6	
FSD	3	7		MI	2	8	
ASPO	2	8		Grumman	2	8	
747th.	2	8		MPAD-Hawks	1	9	
CAD	—	10		FCSD	1	9	

Congressional Visitors



CONTROL CENTER BRIEFING—Members of the House Subcommittee on Manned Space Flight are briefed on Apollo Systems Console operations in the second-floor Mission Control Room March 3 by Director of Flight Operations Christopher C. Kraft, Jr. Front row, left to right are James G. Fulton (R-Pa), Robert C. Eckhardt (D-Tex), Earle Cabell (D-Tex), Guy Vander Jagt (R-Mich), Jerry L. Pettis (R-Cal), J. Edward Rousch (D-Ind) and Kraft. At rear are John E. Hunt (R-NJ) and Subcommittee Chairman Olin E. Teague (D-Tex).

Orbiting Solar Observatory Carries Nine Experiments for Sun Study

The Orbiting Solar Observatory (OSO III), latest scientific satellite orbited by NASA, is working well in its task of studying the Sun. (See related photo page 4.)

OSO III carries nine experiments designed to aid in the

study of the Sun and its influence on the Earth's atmosphere. They will continue and extend the work of the two previous flights in the OSO series by collecting data on solar x-rays, gamma rays, ultraviolet radiation and other solar activity.

Project officials at NASA's Goddard Space Flight Center, Greenbelt, Md., tested or turned on all but one of the experiments by 10:15 am CST March 9. Satellite spin rate, power level, charge rate and temperatures are normal. Both tape recorders are working.

Details of the flight of OSO III are, apogee — 298 nm; perigee — 292.3 nm; period — 96 minutes, and inclination — 33 degrees.

The ninth experiment, the Massachusetts Institute of Technology's celestial gamma ray detector, was not to be turned on until the 28th and 29th orbits March 10. This experiment is located on the wheel section of the spacecraft.

The components of the Goddard solar spectrometer, requiring low voltage, had been turned on but the high-voltage portions of this pointed experiment were not put in operation until the 87th and 88th orbits last Tuesday.

OSO III was launched by a three-stage Delta rocket from Cape Kennedy at 10:12 am CST, March 8. All three stages of the vehicle performed normally. The Delta has had 42 successes in 46 launch attempts.

ROUNDUP EMPLOYEE NEWS

Boeing, Douglas Study Ways to Cut Jet Noise

The Boeing Company and Douglas Aircraft Company have been selected by NASA to undertake 32- to 36-month coordinated research programs aimed to achieve significant reductions in the noise generated by commercial jet airplanes.

Acting on behalf of the Government's Inter-Agency Aircraft Noise Abatement Program, the NASA Langley Research Center, Hampton, Va., will negotiate cost-plus-fixed-fee contracts with both companies. Total value of the Boeing contract is expected to be about \$7.5 million. That with Douglas will amount to approximately \$3 million.

This first step in the inter-agency program is directed specifically at minimizing fan-compressor noise radiation. The contract calls for engineering studies, design analyses, fabrication, ground run-up and flight testing to determine the effectiveness and feasibility of modifying front-fan jet engines.

Contract provisions will provide that Boeing and Douglas will make available without restrictions the results of their internal programs in noise research. Thus, in effect, the work done under government contract will add an important element to the much larger total effort of the aerospace industry in noise abatement.

The Douglas effort will be aimed to reduce the fly-over noise level on the ground of seven to 10 decibels by acoustic treatment of fan inlet and discharge ducts. This is the equivalent of moving the noise source about three to four times as far away.

The Boeing work will be aimed to reduce by 15 decibels, below present levels, equivalent to moving the noise source about five times as far away. Boeing will attempt this by adapting principles of choking the air flow to the engine inlet in order to prevent the noise generated by the fan and compressor from propagating forward.

All methods that produce aircraft thrust, unfortunately, involve airflow processes that generate noise.

Douglas and Boeing will develop, fabricate and test modified engine nacelles suitable for operational aircraft.

Boeing and Douglas responded to invitations by Langley in September 1966 to submit proposals for the NASA research program which has been fully coordinated with the Federal Aviation Agency and the airline and aircraft industries. NASA scientists believe it is of major importance to the potential total solution of aircraft noise problems.

These contracts are a part of NASA's responsibility under the inter-agency program for research and development to reduce engine noise, and to provide information upon which judgments can be made for the most effective overall approach to solving this problem.

Information will be developed on the extent to which jet engine noise can be reduced (in practical, full-scale applications) and the cost of these reductions in terms of hardware and aircraft operating expenses.

NASA is continuing studies with small-scale compressors and inlets to see how geometric details of components affect noise generated from the front of jet engines, and is developing ground test equipment for full-scale studies of acoustically-treated engine nacelles.

Boeing Renews Michoud Tooling

NASA, in a continuing effort to maintain the efficiency of its operating equipment, has authorized the Boeing Co., to modify, rehabilitate or replace some 360 tools or pieces of equipment used in the assembly of Saturn V space vehicle first stages at NASA's Michoud Assembly Facility in New Orleans.

The \$1,895,195 contract modification, awarded by the NASA-Marshall Space Flight Center, Huntsville, will continue in force through June 30, 1967.

The majority of Michoud tooling and equipment, which averages 20 years in age, was procured at substantial savings from government reserves.

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cost
money**

prevent them



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