

29 Major Flights Scheduled in 1968

NASA launch teams will be kept busy in 1968 with a total of 29 major launches scheduled from Kennedy Space Center, Fla., and the Western Test Range at Lompoc, Calif.

The year's activities will bring a number of firsts, but began with a "last," Surveyor VII, the last of the highly successful Surveyor series designed to photograph the lunar surface and analyze the lunar soil after a soft landing, was launched January 7 from Cape Kennedy.

Another last will come with the launch of the Orbiting Geophysical Observatory-E. This mission will mark the last scheduled flight of an Atlas Agena vehicle from Cape Kennedy. The hydrogen-fueled Centaur will take over from the Atlas Agena for the unmanned interplanetary probes and high altitude Earth orbital launches.

Apollo 5, scheduled for January 22 launch, will be the first test (unmanned) of the Apollo lunar module and will mark the beginning of an ambitious schedule for the Saturn launch teams. Two unmanned tests of the lunar module are scheduled for 1968, both to be launched by the Uprated Saturn I. The first manned test of the Apollo spacecraft will also be launched in 1968 by the Uprated Saturn I.

The 7.5 million-pound-thrust Saturn V, tested for the first time in November of 1967, is scheduled for three flights in 1968, all from the new spaceport complex at Kennedy Space Center.

KSC's Unmanned Launch Operations (ULO) teams will be kept busy moving between launches at Cape Kennedy and

the Western Test Range. Thirteen scientific satellites are scheduled for launch from KSC facilities at Cape Kennedy. In addition to the OGO and Surveyor already mentioned, the teams will launch four Intelsat communications satellites for the Communications Satellite Corp.: Applications Technology Satellite D (ATS-D); an Orbiting Astronomical Observatory and an Orbiting Solar Observatory; Biosatellite-D; HEOS (Highly Elliptical Orbiting Satellite), launched for the European Space Research Organization; Pioneer-D; and Skynet, a British communications satellite.

Interspersed with these Cape launches, ULO teams will travel to the Western Test Range for 10 launches in 1968, including four Tiros Operational Satellites for the Environmental Science Services Administration of the Dept. of Commerce, Orbiting Geophysical Observatory-F (OGO-F), Geodetic Explorer B (GEOS-B), Nimbus B, Interplanetary Monitoring Platform G (IMP-G), Radio Astronomy Explorer-A (RAE-A), and International Satellite for Ionospheric Studies (ISIS), a joint U.S. and Canadian program. ULO will continue to rely on the Delta and Thrust Augmented Delta (TAD) as the workhorse for Earth orbital missions with the Centaur playing an increasingly important role in interplanetary and high Earth orbit launches.

In addition to the 29 major missions in space, about 250 sounding rockets and scientific probes of the upper atmosphere will originate at NASA's Wallops Station off the Virginia coast.

Apollo CM Fire Tests Run in 'Enriched Air'

A mixture of oxygen and nitrogen was used in a new round of Apollo command module fireproofing tests which got under way this week at MSC.

This mixture, simulating a cabin atmosphere for operations on the pad, will consist of 60 per cent oxygen and 40 per cent nitrogen. (Air on the ground contains 21 per cent oxygen and 78 per cent nitrogen, plus traces of other gases).

The tests to begin about Wednesday and run 10 days to two weeks, follow by some three weeks a similar series of 38 tests conducted in a nearly pure oxygen environment at 6 pounds per square inch of pressure. In the new series, the oxygen nitrogen mixture will be kept at 16 pounds.

Tests using the specific mixture oxygen-nitrogen or "enriched air" were ordered by the Apollo Flammability Review Board in a January 13 meeting. The Board is headed by MSC Director Robert R. Gilruth.

Prior to the meeting, it had been planned that the next round of command module fireproof testing would be at 16 pounds

per square inch in essentially pure oxygen.

"Based on medical, operational, and engineering data, the 60-40 mixture of oxygen and nitrogen is one we definitely want to investigate," said Apollo Spacecraft Program Manager George Low. "This is not to say that we will suspend investigations of other mixtures at various pressures. It is all part of a major effort to make the spacecraft as safe and efficient as possible."

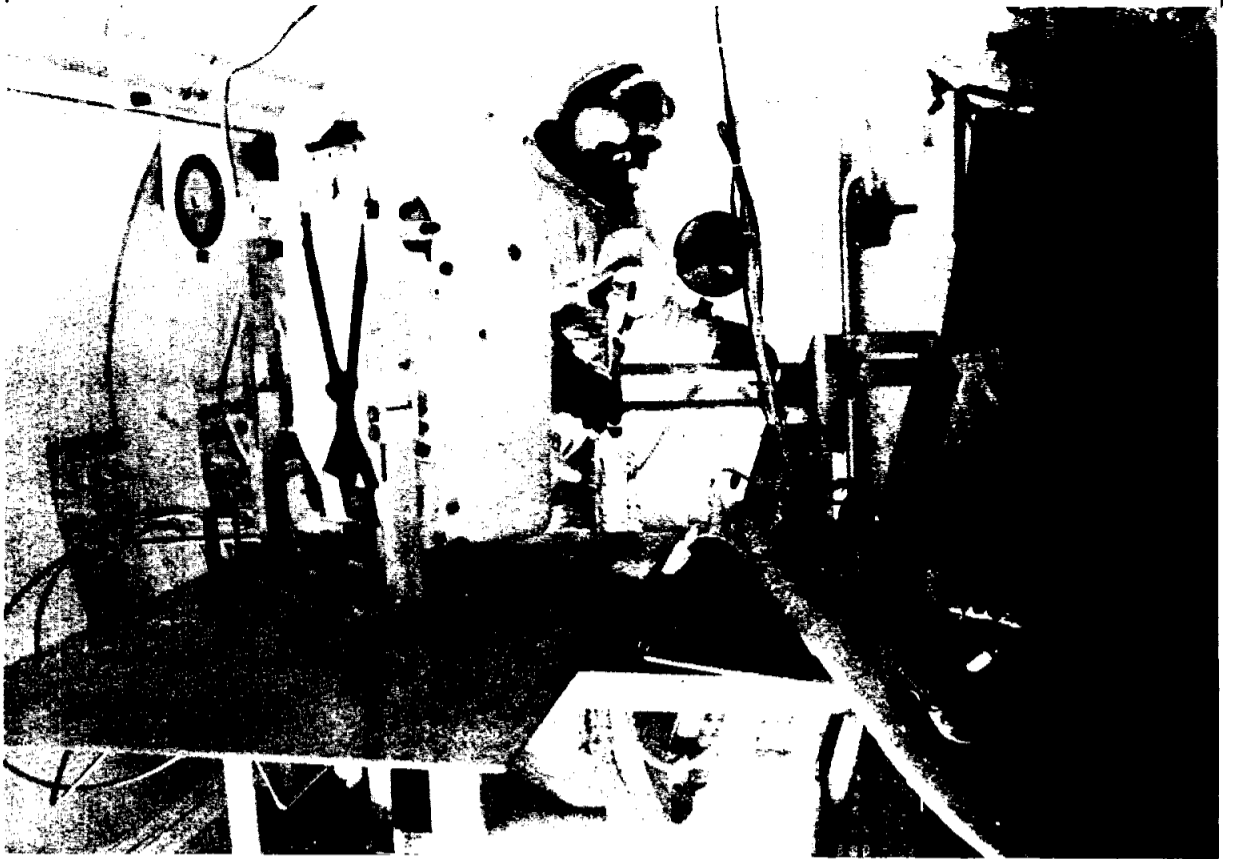
On that point, Gilruth emphasized, "We retain three major options. They are: Launching with (1) regular air on the pad, or (2) enriched air of some blend of oxygen and nitrogen, or (3) pure oxygen." The spacecraft oxygen resupply system would replace in orbit the air or enriched air atmosphere used on the pad in either of the first two options cited by Gilruth.

Mercury and Gemini spacecraft operated with pure oxygen atmospheres at all times.

Flammability testing consists of purposely short-circuiting or overloading wires at strategic points throughout the spacecraft

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The Moon-Walker's New Clothes



PASSES TEST—The redesigned Apollo pressure suit January 13 underwent a three-hour altitude verification test in the Crew Systems Division 8-foot altitude chamber. MSC space pilot James Irwin performed work tasks simulating transfer from the command module to the lunar module. The test was run at a chamber altitude of 240,000 feet with the suit loop on 100 percent oxygen at 3.7 psi. Further tests of the lunar suit will be run prior to the manned tests later this year in Lunar Test Article 8 (LTA-8) in which Irwin and John Bull will take part.

ROUNDUP

NASA MANNED SPACECRAFT CENTER

HOUSTON, TEXAS



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Apollo V Lunar Module Test Planned for Monday Launch

The first test in space of the Apollo spacecraft lunar module is scheduled to take place no earlier than January 22.

The unmanned Earth-orbital test flight, designated Apollo V, will be launched from Complex 37 at NASA Kennedy Space Center Fla., by an Uprated Saturn I launch vehicle. The LM will not be recovered.

The Apollo command module and service modules have been successfully tested in space in previous unmanned missions and will not be flown in Apollo V.

The lunar module, weighing 31,700 pounds with propellants, is made up of two stages. The descent stage powers the module from lunar orbit to the Moon's surface. It also serves as a launching pad for the ascent stage, which lifts the module from the Moon back to the command and service modules in lunar orbit.

Objectives of the Apollo V flight are to verify operation of the descent and ascent propulsion systems including restart and lunar module structure; evaluate lunar module staging and evaluate launch vehicle performance.

Major events and maneuvers of Apollo V:

About 54 minutes after launch the lunar module will separate from the second stage of the Saturn and will coast in an orbit of 120 by 93 NM. During this

and other coasting periods the lunar module reaction control system will maintain vehicle attitude and settle main engine propellants to the bottom of tanks.

The second stage of the launch vehicle will perform a propellant dump test about one revolution after separation from the lunar module. The test is designed to remove the remaining liquid hydrogen and liquid oxygen propellants through the engine.

The descent and ascent propulsion systems in the lunar module will be ignited two times each.

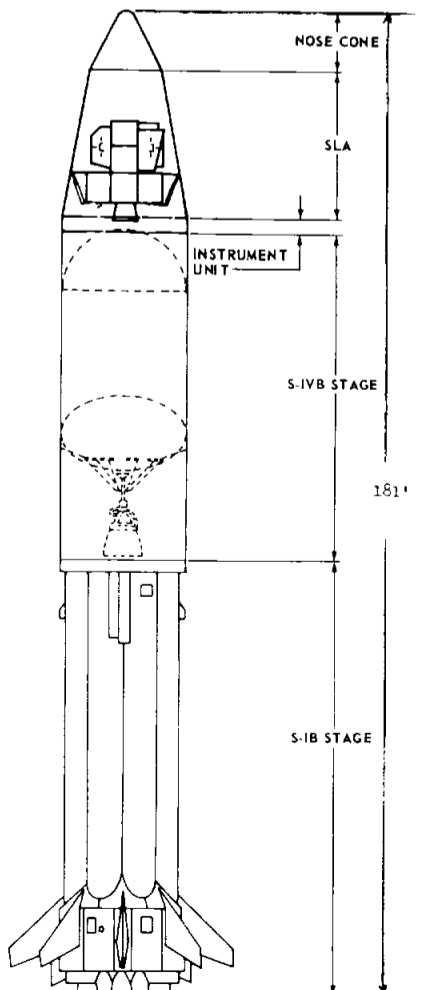
The first firing of the descent propulsion system will be about 4.5 hours after lift-off, and will consist of a 26-second burn at 10 per cent of rated thrust of 10,500 pounds and then a build-up to 92.5 per cent. The total burn time, 38 seconds, will change the orbit of the lunar module to 178 by 116 NM.

The first burn of the descent propulsion is to simulate the Hohmann (minimum energy) burn to be used in the lunar mission to transfer the lunar module from a circular orbit about the Moon to a trajectory toward the lunar surface.

A second descent propulsion system burn takes place some 36 minutes later to simulate the thrust levels planned for the powered descent portion of the lunar landing mission. The system will burn for a total of 12.5

minutes including 10 seconds each at 10, 50, 30, 40 and 20 per cent thrust levels and finishing up with the 92.5 per cent rated thrust level. This burn will place the lunar module in a 172 by 166 NM orbit.

(Continued on page 2)



Lunar Travel Agency Formed at NASA Hq

A unified office is being established in NASA Headquarters to coordinate the United States' exploration of the Moon.

The purpose is to increase the effectiveness of direction of Apollo lunar exploration and the planning of scientific exploration of the Moon beyond the initial Apollo landing.

The Apollo Lunar Exploration Office was announced by NASA Administrator James E. Webb. The new unit will be part of the Apollo Program Office of the Office of Manned Space Flight (OMSF) but will be staffed by personnel from both OMSF and from the Office of Space Science and Applications (OSSA).

The initial program of lunar exploration with unmanned spacecraft concluded in OSSA with the flight of the last Surveyor spacecraft January 7. The new office will bring together OSSA experience in scientific lunar exploration with Apollo mission management responsibility in OMSF.

Mr. Jones Regrets . . .

Mr. Jones regrets he cannot keep his appointment today—tomorrow—maybe next week? So, another scheduled appointment is broken.

This doesn't affect just Mr. Jones, but results in considerable administrative work, inconvenience to other employees, constant interference and disruption in attempting to reschedule examinations, and often inability to accommodate all eligible employees for any one month.

Schedule for what? What appointment? Voluntary health screening examinations for MSC employees are scheduled at the MSC Dispensary as close to date of birth as possible. The appointments are spread evenly throughout each week and month to equalize the workload throughout the year and allow each employee the advantage of such health screening.

If an employee wishes to take advantage of this opportunity, keep his appointment as scheduled. To preclude confusion, dispensary employees have been instructed that no rescheduling will be made for missed appointments, other than for reasons of sickness or for official travel.

Employees missing appointments, other than under the circumstances mentioned, will not be given the opportunity for an examination until the following calendar year.

Apollo Fire Tests

(Continued from page 1) to start fires. Once the fires are started, engineers study their self-extinguishing characteristics.

The spacecraft is normally tested prior to launch at a positive internal pressure of about 16 pounds to assure spacecraft sealing integrity, and to overcome the 14.7 pounds of normal sea level atmosphere pressing on the spacecraft at launch.

East End Y Has Family Program

MSC and contractor employees and their families are invited to take part in the varied program of activities at the East End YMCA, including two Class A handball courts nearing completion. The courts will be ready for use in early February.

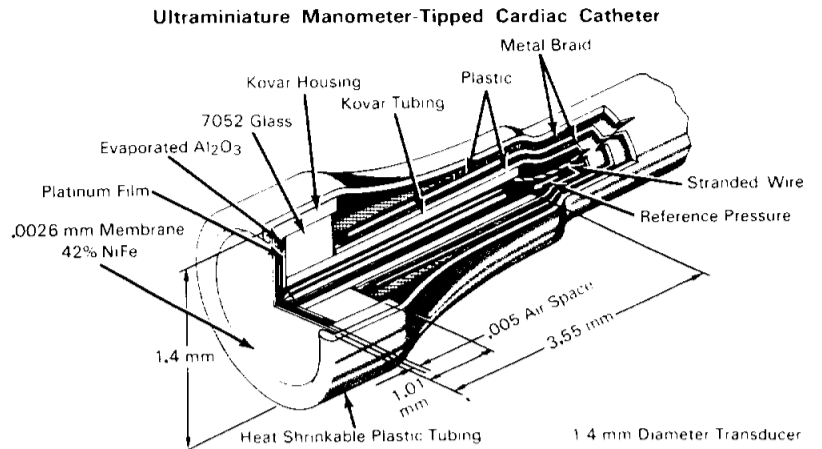
Membership includes the use of the swimming pool, gym, weight room, steam bath, sauna bath, showers, game room and pool tables. "Run for Your Life," a run-and-exercise class, is offered on Tuesday and Thursday nights.

Guest passes are available for persons wishing to try out the Y's facilities and activities.

In addition to active memberships, sponsor memberships are available which insure that no youngster is turned away from YMCA activities because he does not have the price of a membership.

To become an active or sponsoring YMCA member, call Jim Bodmer at 4426, Lee Reutz at 5591, Wiley Beale at 5437, Joe McMann at 4726 or Joe Trombley at 3141.

Ames Scientist Invents In-Heart Microsensor



Blood-pressure sensors so small they can pass through a dog's artery into the heart have been developed by NASA. Now used on research animals, they show great promise as a diagnostic and monitoring instrument for humans.

The smallest of the miniature probes, less than five one-hundredths of an inch in diameter, is used by life scientists at NASA's Ames Research Center near San Francisco to make measurements on anesthetized dogs.

It is inserted through an ordinary hypodermic needle into an

artery and maneuvered into the left ventricle on the end of a thin flexible tube to make measurements inside the artery and the heart without disturbing the flow of blood. Its small size is expected to make the instrument particularly useful in treating babies.

The sensor is a diaphragm-type capacitance transducer mounted on the end of a cardiac catheter. It was invented by Grant W. Coon of the Ames Center, based on transducers originally designed to measure pressures on flight models in wind tunnel tests.

A similar device developed at NASA's Electronics Research Center, in Cambridge, Mass., has measured blood pressure with unprecedented accuracy inside a dog's artery and heart in tests conducted with Harvard Medical School. The tests gave promise of combining the sensor with a transmitter so that it could be permanently implanted in a human body for continuous monitoring while the subject moved about freely.

The Ames instrument is described in NASA Tech Brief B-67-10669, the 2,000th of a series of technical bulletins issued by the Agency's Office of Technology Utilization to announce innovations resulting from space research to industrial firms, medical and educational institutions and others who may be able to use them in non-aerospace work.

Tech Briefs are based on information collected by technically trained reporters stationed in major NASA field installations. Their reports are evaluated by independent research institutes for potential industrial usefulness. The most promising innovations are summarized in the Tech Briefs, which include the names and addresses of sources of additional information.

Apollo V Launch Set Monday

(Continued from page 1)

The ascent propulsion system engine operation will begin simultaneously with termination of the second descent burn—a "fire-in-the-hole" burn during which stage separation will occur. After this 5.25-second burn the descent stage will be in a 172 by 166 NM orbit while the ascent stage will orbit at 172 by 167 NM.

The ascent propulsion system will be fired one revolution later. During this burn a test will determine reaction control system operation using propellants from the ascent propulsion system tanks which are interconnected to the reaction control system tanks. The second ascent propulsion system burn will be for

GET Hrs. Min. Sec.	Event	Propulsion System	Duration of Burn	Orbit. NM
00:54:00	Separation from Second Stage	Reaction Control	15 Sec. total in two firings	120 by 93
4:00:02	First DPS Burn	Descent	38 Sec.	178 by 116
4:37:12	Second DPS Burn	Descent	12.5 Min.	172 by 166
4:49:25	First APS Burn	Ascent	5.25 Sec.	172 by 167 (Ascent Stage)
6:13:35	Second APS Burn	Ascent	7.5 Min	440 by 170 (Ascent Stage)

450 seconds to simulate ascent from the Moon's surface in a lunar mission and will place the ascent stage in an orbit of 440 by 170 NM.

The two operations of the descent and ascent propulsion

systems will complete the primary mission of Apollo V but additional tests may be conducted in the remaining seven-hour lifetime of the lunar module systems. The ascent stage is expected to remain in orbit about two years, and the descent stage about three weeks. The launch vehicle second stage will orbit only about 18 hours.

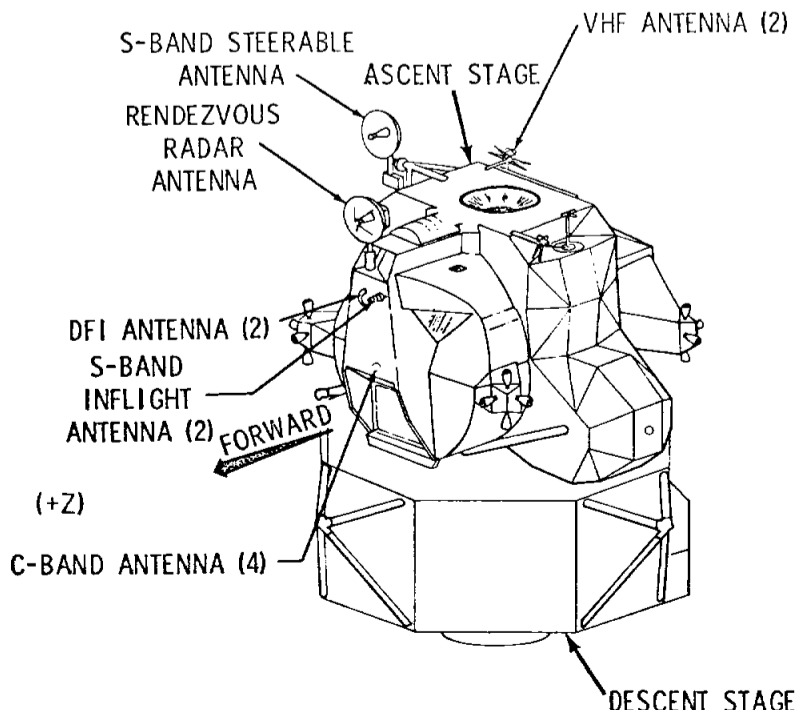
At the end of their orbital lifetimes the launch vehicle second stage and the ascent and descent stages will reenter the Earth's atmosphere and disintegrate.

Launch vehicle for the Apollo V mission will be the Uprated Saturn I (AS-204) originally scheduled for the first manned Apollo mission in February 1967. Following the fire in which prime crewmen Virgil I. Grissom, Edward H. White, II and Roger B. Chaffee were killed, the launch vehicle was demated and removed from Complex 34 and re-erected on Complex 37 for this flight.

The launch vehicle consists of the first (S-IB) stage which develops 1.6 million pounds thrust at lift-off, the second (S-IVB) stage of 200,000 pounds thrust in space, and an instrument unit.

APOLLO 5 MISSION

LUNAR MODULE (LM-1)



Wouldst Believe A Hole-in-One?

Cy W. Biggers of Philco Ford Corp scored his first hole-in-one on January 6 while playing Brock Park Golf Course.

Bigger's "ace" came on the 185-yard par-three 16th hole. He used a four iron. Playing in the foursome with Biggers were Bob Gordon, Bill Nunnery and Bob Reaves.

Apollo Parachutes Fail In El Centro Air Drop

A test of a modified Apollo parachute system failed January 11 at the Naval Air Facility, El Centro, California.

The cause of the failure has not been determined at this time. A failure review board is being established to review the test and determine if correction action is needed.

The test was to have demonstrated the structural integrity of the two drogue chutes used to slow and stabilize the Apollo Command Module prior to main

chute deployment and to verify the main chute system using only two of the three main chutes and deploying them in a staggered or non-simultaneous fashion.

The parachutes were deployed from an instrumented 13,000 pound Parachute Test Vehicle (PTV) dropped from an aircraft at an altitude of about 50,000 feet. In addition to the drogue chutes and main chutes used in the Apollo Earth Landing System, the PTV used in the test was equipped with two programmer chutes which enable the test vehicle to attain the aerodynamic pressure and velocity environment similar to that of an actual spacecraft, and a 49-foot diameter emergency chute. Test films and data indicate that the failure may have originated in a programmer chute rather than in Apollo hardware.

The January 11 test was one of a continuing series aimed at checking out parachute modifications to handle the increased weight of the Apollo Command Module. The parachutes had previously been tested successfully, both individually and as a system in a test program which began late last summer.

The major changes being considered for the Apollo Earth Landing System include using 16.5 foot diameter drogue chutes in place of the previous 13.7 foot diameter drogues and adding an additional stage of reefing to the main chutes, opening them in three stages instead of two.

LRD Checks Out New Gear During Apollo V Mission

Mission assignments for Landing and Recovery Division during Apollo V will include people for four Air Force Air Rescue and Recovery Service aircraft which will track the LM spacecraft during the second through sixth revolutions. Two of the pararescue carrying aircraft will be out of Hawaii and two out of Bermuda and the LRD people will be testing and evaluating electronic gear used on these HC-130 aircraft, utilizing the S-Band signal from the spacecraft for tracking purposes.

LRD Prepares Apollo CM 007A For Sea Tests

Apollo Spacecraft 007A, a test spacecraft that will provide data in support of the first manned Apollo flight, was delivered to MSC January 13. The spacecraft was shipped January 12 from North American Rockwell Corporation, Downey, California, aboard the "Guppy" aircraft.

The spacecraft, 007A, is being prepared by MSC engineers in the Landing and Recovery Division for manned flotation tests that will qualify the Apollo Spacecraft 101 post landing systems. These are the systems that will be used for crew survival and location and recovery of the Apollo command module on ocean impact following mission completion.

Spacecraft 007A was put through similar tests in 1966 that qualified the postlanding systems of earth orbital mission spacecraft. It was returned to Downey following the test program and reoutfitted for its new mission.

The spacecraft is equipped with those subsystems required for complete post landing operations. This includes the post landing environmental control systems, the uprighting and communications systems, affected main display panels and Spacecraft 101 configuration crew couches.

The flotation tests will be conducted in the Gulf of Mexico from the deck of the NASA Motor Vessel *Retriever*. MSC engineers will serve as crewmen for the tests which are expected to begin in early March.



WESTERN DINNER—Saloon Show committee members are briefed on the proper headgear to be worn at upcoming GO-TEXAN doings by committee chairman Paul Haney. From the left, seated, are Betsy Bednarcyk, Corinne Morris, Ann James and Jan Haney in appropriate hat. Standing from the left, Dennis Fielder, Ben James, Haney and John Bednarcyk.

MSC-AREA 'HAPPENINGS'—

Dust Off the Stetson and Boots; It's Go-Texan Time Again, Y'all

A month-long series of Texas-thumping "happenings" gets under way in the NASA-Clear Lake area this week—all calculated to make the 1968 Houston Livestock Show the biggest ever.

A trail ride, western dance, old-timey saloon show and dinner, plus a western style show are some of the events planned for the Clear Lake area, according to Area Chairman Waymon Armstrong.

"We're hoping to break last year's attendance records," Armstrong said. "And why shouldn't we! The whole thing is held to promote Texas and raise money for scholarships for underprivileged farm children."

Between now and the stock show, Feb. 21 through March 3 in the Domed Stadium Stock Pavilion, Armstrong said western garb will be the uniform of the day and night at all western doings.

The opening event for NASA area people comes January 20 when Armstrong will lead an area group of up to 100 on

official call on the city of New Orleans. They will fly to Mardi Gras Town on a reserved National Airlines flight departing Houston at 7:45 am, breakfast at Brennan's, spend the afternoon with New Orleans Mayor Victor Schiro at the Fair Grounds racetrack and return that evening.

"The facts are," Armstrong said, "that the Houston Stock show has gotten bigger than even Texas. It's now a Gulf-coast event, in which Louisiana naturally figures prominently."

"Think of it this way," Armstrong told the *Roundup*, "the stock show is to Houston what Mardi Gras is to New Orleans."

February 21 has been established as GO TEXAN day for the area, with everyone beyond the age of six months encouraged to dress in Western garb.

Tickets for the various area events will be sold on an at-cost basis.

Here is a complete rundown on the NASA area events:

January 20 — New Orleans Day. Up to 100 persons may go. Air fare will cost \$47.99 round-trip. Contact Miss Wanda McDaniels for details and reservations at 591-3000.

January 24 — Fashion show and luncheon at the Nassau Bay Hotel. Tickets are \$2.75 per person. Fashions from The Cowboy Store of LaPorte. For tickets or information, call Martin Gracey, 591-4606 or HU 8-1600.

January 27 — Old-fashioned trail ride. Open to all starting at 8 am in League City. Chuck wagon lunch included. Horses and wagons available. Prices vary according to needs. For information, call Tom or Mary Benson at GR 4-3269 or 591-2371 or Martin Gracey at 591-4606 or HU 8-1600.

February 3—Western dance at 7 p.m. Buffet included. Tickets are \$3.75 per person. For information, call Jackie or Sam Sanborn at 591-3049 or HU 3-5491.

February 7 — Saloon show. Traditional western dinner of steak and beans. And some very special entertainment. All for \$3 per person. Cash bar available. Call either Paul or Jan Haney at HU 3-3671, HU 3-2253 or 946-6327.

February 21 — Go TEXAN Day in NASA-Clear Lake area. Everyone urged to dress western style.

February 25 — NASA-Clear Lake Day at the rodeo. Goal is the sale of 3,000 tickets. They are \$2 each. For tickets, call John or Betsy Bednarcyk at HU 3-4588, 591-3300 ext. 3233 or 591-4184.

Bay Chorus Seeks Requiem Soloists

Bay Area Chorus director Paul Harrison Sunday will hold auditions for solo parts in the Chorus' April performance of the Mozart *Requiem*. The auditions will be at 7 pm at the Clear Lake City Recreation Center. Soloists may obtain musical scores from Mrs. Jesse Deming at HU 8-4134.

Harrison said that the Chorus has a few openings. Experienced choral singers at MSC are urged to attend the Sunday night rehearsal. No tryouts are necessary.

Now in its fourth year, the 60-voice mixed choir is rehearsing each Sunday evening at 7:30 in the Recreation Center for the April memorial concert for MSC space pilots who have died.

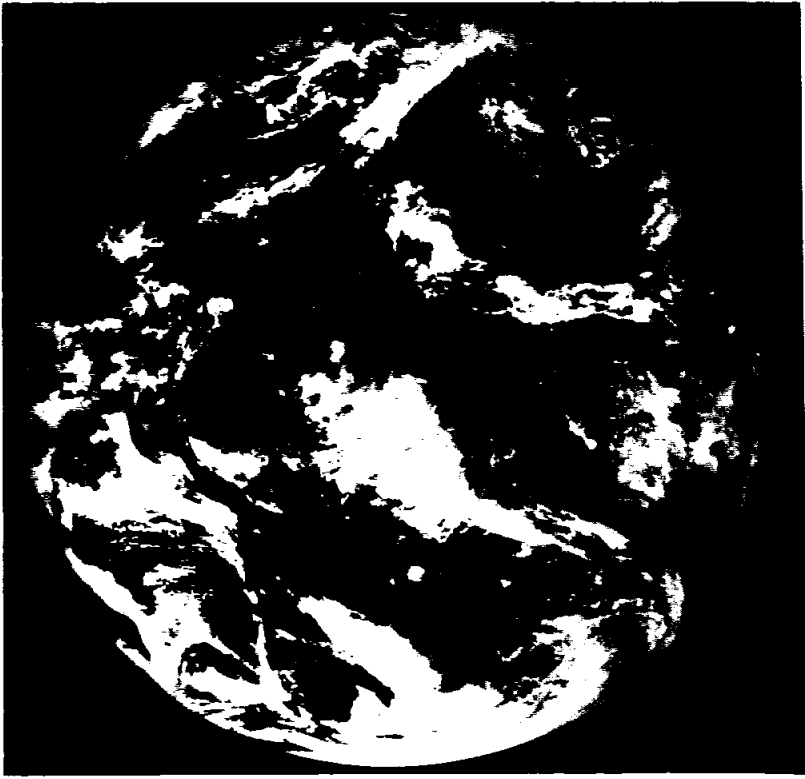
15 Year Service Awards at RASPO-Downey



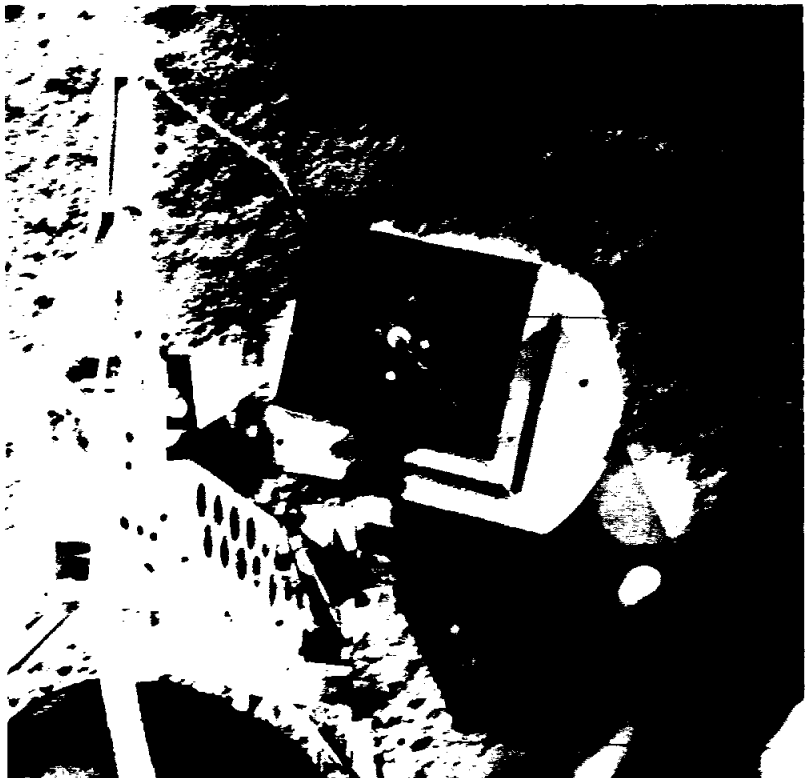
Jay. W. Anderson

Pamela Andreasen

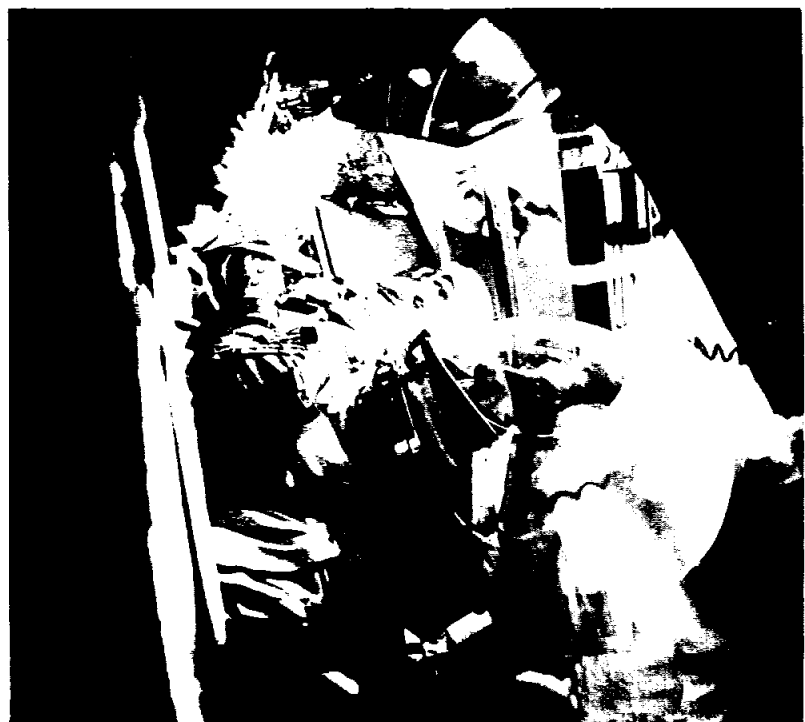
Jesse L. Turner



CLOUDY DAY ON EARTH—High-quality color photographs of the earth were relayed back from the 805-pound Applications Technology Satellite III. ATS-III carried communications, meteorological and navigation experiments into an equatorial synchronous orbit after launch on November 5, 1967.



LUNAR CHEMISTRY SET—Surveyor VI carried with it to the moon's Sinus Medii a gold-plated alpha-scattering instrument that dropped down to sniff the chemical content of the lunar surface. The results supported Surveyor V's findings that the large dark areas of the moon chemically resemble basalt.



LOSS AND SETBACK—The first manned Apollo was scheduled for launch in February 1967, but a flash fire aboard Apollo spacecraft 012 during pad tests on January 27 took the lives of prime crewmen Virgil I. Grissom, Edward H. White II and Roger B. Chaffee. The accident brought about crew hatch redesign and replacement of flammable materials in the command module.

1967 - A YEAR OF SPACE ACHIEVEMENT, AND... SETBACK

FOR THE UNITED STATES in space, 1967 was a year of many significant achievements despite the setback suffered in the January Apollo fire. Major highlights of the year in the NASA space program were:

- Successful launch of Apollo spacecraft aboard the first Saturn V;
- Mariner V probed the atmosphere of the planet Venus;
- Lunar Orbiter completed photographing the Moon;
- Major discoveries by three Surveyors landed on the Moon;
- Explorer XXXV turned in new information about the Moon's environment;
- ATS-III gave the first continuous weather pictures of Earth in color;
- New world's speed record in the X-15 aircraft;

- An ultraviolet chart of the surface temperature of the Sun.

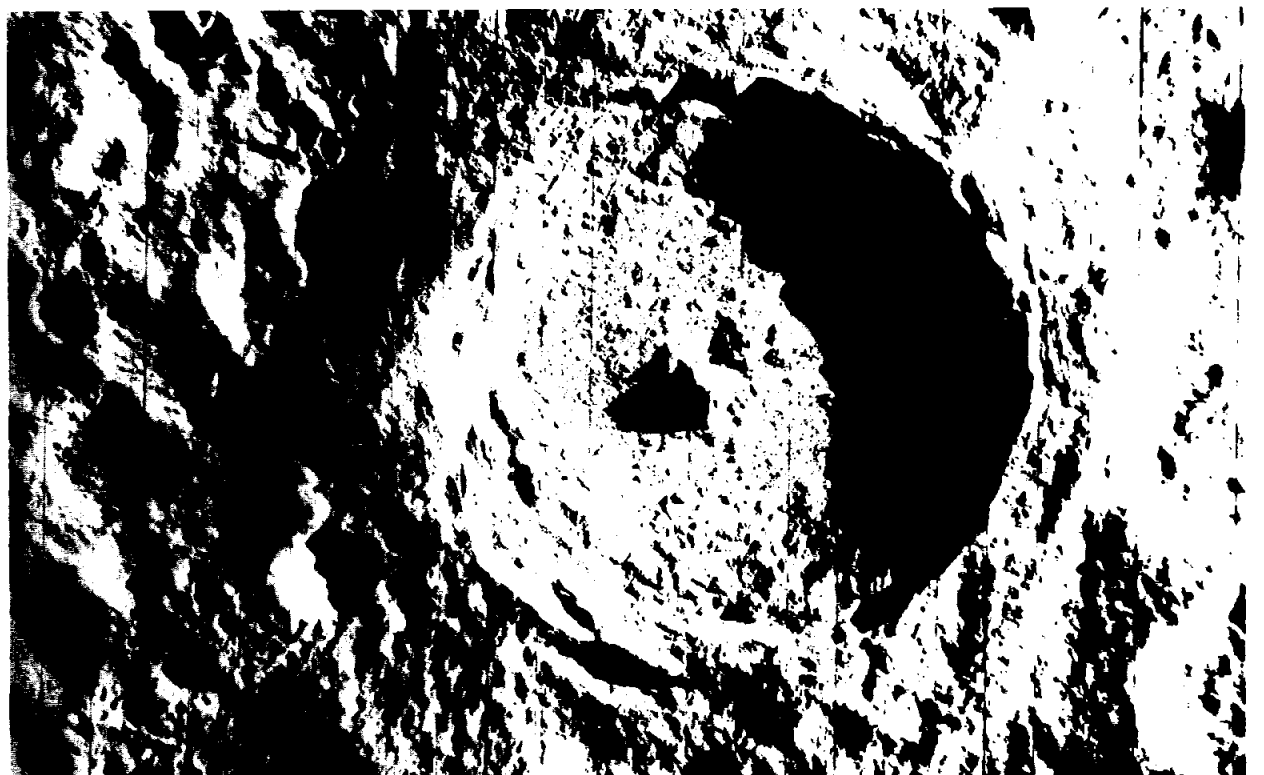
In a ground test of the Apollo-Saturn at Cape Kennedy, three crewmen, Virgil I. Grissom, Edward H. White II and Roger B. Chaffee died in a flash fire January 27. Intensive study brought important safety knowledge out of the disaster; nearly all combustible material was removed from the spacecraft and the hatch was redesigned for fast escape.

The Apollo program climaxed November 9 with the successful maiden flight of Saturn V—largest U.S. rocket—carrying Apollo IV spacecraft to an orbital height of 11,234 miles and recovery in the Pacific. The success opened the way for six flights next year and five more in 1969, and

moved the program one significant step closer to realization of the goal of manned lunar landing before decade's end.

The Mariner V probe, sweeping within 2,554 miles of Venus on October 19 after flying 217 million miles in four months, radioed a large amount of data about the planet's atmosphere, the effects of solar wind, and the absence of carbon dioxide. It reported no layers of radiation like the Van Allen belts of Earth. Scientists will be occupied many months with the Venus data.

The successful Lunar Orbiter program photographed in detail the entire surface of the Moon and, for good measure, transmitted the first photos of Earth from lunar orbit. Its picture coverage gave scientists and engineers 100 times the detail of lunar surface data possible with



YOUNG CRATER—Lunar Orbiter V on August 14, 1967 made this crisp photo of the crater Tycho, believed by astronomers to be a young crater since ejecta from the crater is superimposed over older lunar features. The photo was made from an altitude of 135 miles, with the camera looking almost directly down into the 50-mile wide crater. The landing point for Surveyor VII, launched January 7, was near the crater Tycho.

Earth-bound telescopes. The five Lunar Orbiters together (including two launched in 1966) gave complete photo surveys of eight proposed Apollo manned landing sites.

Still more knowledge of the Moon came from Surveyors III, V and VI, landed successfully in 1967. The spacecraft radioed more than 45,000 photographs closeup—some after the intense cold of lunar night—and two were still operating as the year waned. The seventh and final Surveyor flight is on NASA's January, 1968 calendar.

Under the camera's eye, Surveyor's mechanical claw pounded and dug the Moon's soil, and a sensitive radiation instrument probed the lunar soil, to furnish precious information about the Moon's composition—apparently it's similar to common volcanic rock of Earth. Engineers on Earth made the first launch from the Moon when they fired Surveyor VI's small control rockets, lifting it about 14 feet and moving 8 feet away. The action of rocket exhaust on the lunar soil was of great interest to science.

The 45-hour flight of Biosatellite II, carrying wheat seedlings, pepper plants, frog eggs, amoeba and similar items, produced new knowledge of how life forms develop in space, and the combined effects of radiation and weightlessness. Some of the animal and biological experiments carried must go through three generations back on Earth before results are fully understood.

NASA's launching of three Intelsat commercial satellites and three of ESSA (weather bureau) insured continued weather and communications coverage from orbit—services of growing necessity to broad areas of the world.

Orbiting Solar Observatories launched March 8 and October 18 are teamed to survey the Sun's activity to learn how it affects radio blackout, Earth's weather and other phenomena. OSO-IV made the first "color" picture of the Sun—an ultraviolet chart of the surface temperatures. OSO-IV was the 3,000th object launched from Earth in the first decade of the space age.

OGO-IV, a polar-Orbiting Geophysical Observatory was put up July 28 to furnish long-sought information about the other half of the Sun-Earth relationship, the Earth's atmosphere. In combination with OGO-I and -II, it is returning a wealth of data while the Sun nears the peak of its 11-year cycle.

In NASA's scientific satellite series, the two Interplanetary Monitoring Platforms, Explorer XXXIV and XXXV, measured solar and galactic rays within and outside the Earth's magnetosphere. The first, launched May 24 into a wide ellipse from 154 miles apogee covers more than half of cislunar space, while Explorer XXXV, in orbit since July 19, has been in a 475-by-4,900 mile orbit.

The latter satellite has already returned lunar findings of scientific interest. It confirmed that the Moon has no significant mag-

netic field and no radiation belts. Its data proved, too, that there is no supersonic shockwave as planets have, but a sizeable "wake" or cavity exists in the solar wind behind the Moon.

The first continuous high-quality color pictures from "stationary" orbit were made by the third Applications Technology Satellite launched November 5. Along with ATS-I, launched last year, the U.S. has two versatile weather-voice-television satellites spanning the Pacific Ocean. In addition, the ATS is capable of movement on ground command to station over the Atlantic, along the equator.

The venerable X-15 research airplane, flying since 1959, set a new (unofficial) speed record of 4,534 mph on October 3 with its newly increased propellant tanks. Following a fatal crash on November 15, flights were suspended temporarily in the two remaining aircraft. NASA is reviewing flight operations procedures and the accident, that took the life of Air Force Maj. Michael J. Adams, is under formal investigation. The mishap was the first death in 191 flights of the rocket-powered airplane.

Looking deep into the future, NASA set research programs for design of wing structures for the hypersonic airplane, for sustained flight at Mach 8—5,300 mph. For the airplane of the more immediate future, studies were undertaken to reduce noise substantially in the jet engine and about the airplane generally as it affects the airport environment.

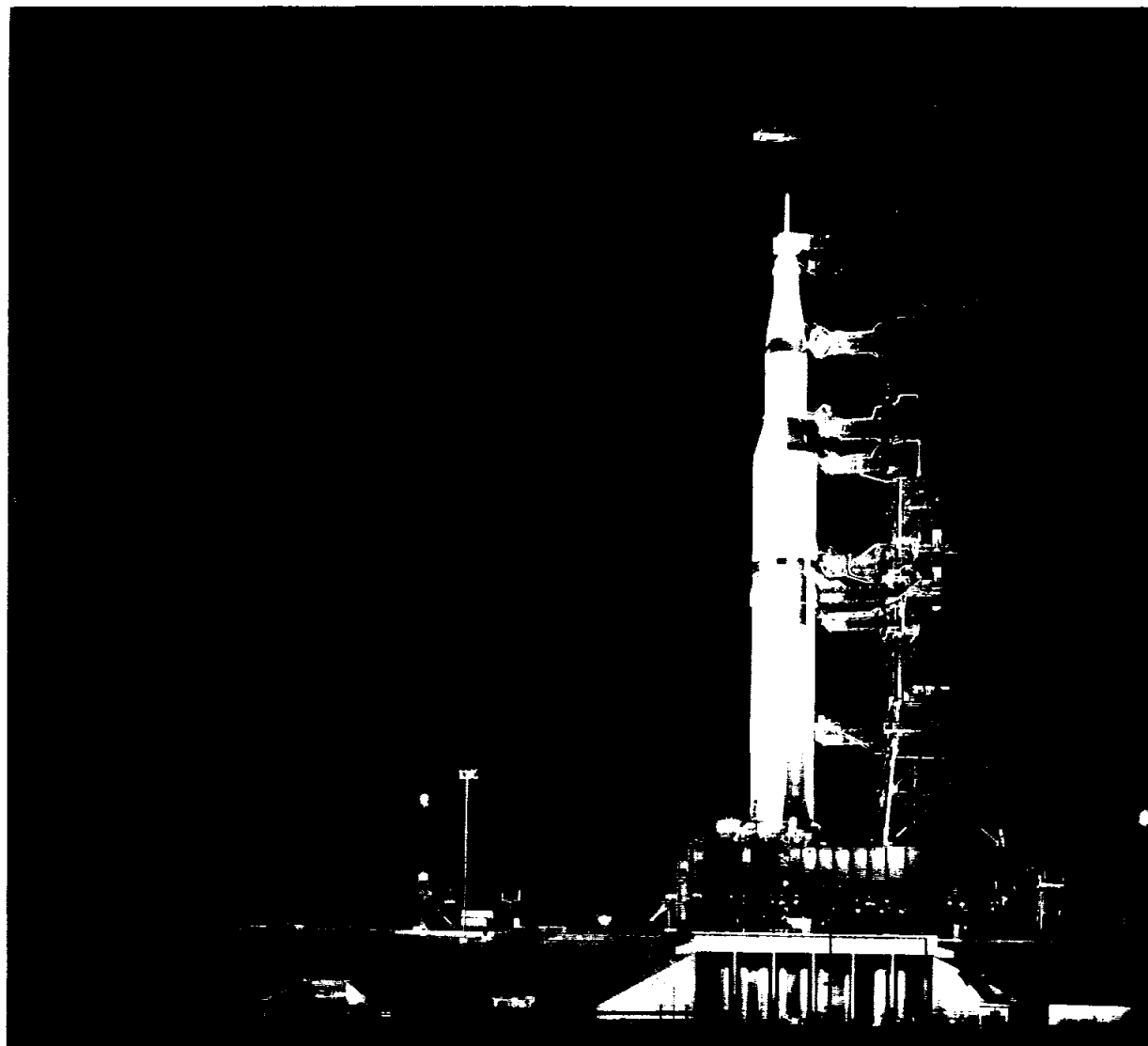
The Lifting Body flight research program received a setback with the crash-landing May 10 of the Northrop M-2. NASA Research Pilot Bruce A. Peterson was severely injured.

In June NASA conducted the third and final successful test firing of the large solid rocket motor. The test of the 260-inch diameter motor in Dade County, Fla., produced 5.7 million pounds of thrust.

Tracking, communications and data acquisition reached a greater volume than ever in 1967, with a large number of unmanned satellites and space probes, plus complete checkout of the new Apollo Manned Space Flight Network. At year's end NASA's Office of Tracking and Data Acquisition was simultaneously supporting 50 NASA flight programs, six cooperative international ones and 12 for the Department of Defense.

The Earth satellite network became capable of working 47 satellites at once, around the clock. For the Deep Space Network, the busiest tracking period occurred between May and November, when Mariner V, Lunar Orbiter V and Surveyors IV and V were launched. Meanwhile, DSN stations around the world were covering Mariner IV, Pioneers VI and VII and Lunar Orbiters II, III and IV, with work shifts operating 20-24 hours a day.

San Marco II, the first satellite placed in orbit from a platform at sea, highlighted the NASA international program. It was launched April 26 under a cooperative agreement be-



NEW GENERATION—Apollo IV achieved two major goals: the Apollo command module heatshield was qualified at entry speed in excess of lunar return velocity, and the untried Saturn V S-IC first stage and S-II second stage were successfully tested. The command and service module were boosted into an elliptical orbit with an apogee of 9769 nm. The command module landed in the Pacific some 18,500 yards off the aiming point.

tween the Italian Space Commission and NASA. A similar agreement with the United Kingdom orbited the third Ariel satellite on May 5. In addition 124 scientists from 26 countries participated in research at NASA centers and scientific sounding rockets were launched from six sites in cooperation

with Argentina, Brazil, West Germany, India, Japan and Norway.

Rounding out the year's schedule was a double feature—a probe in solar orbit and an Earth satellite launched December 13 on the same Delta rocket. The probe, Pioneer VIII, joined two others in the same series to keep

watch on solar storms and study the Earth's magnetosphere.

TTS-1, the Earth satellite, was a small but valuable instrument used to exercise the new Apollo Manned Space Tracking Network and to train personnel for the forthcoming Apollo flights. The TTS-1 satellite went into a 182 by 304 mile elliptical orbit.

1967 Major NASA Launches

Date	Name	Launch Vehicle	Launch Site	Mission	Results	
					Vehicle	Mission
1/11	*Intelsat IIB	Delta	KSC	For Comsat	S	S
1/26	*ESSA IV	Delta	WTR	Operational Weather Sat.	S	S
2/4	Lunar Orbiter III	Atlas-Agena	KSC	Photograph Lunar Landing Sites	S	S
3/8	OSO III	Delta	KSC	Solar Observation	S	S
3/22	*Intelsat II (F-3)	Delta	KSC	For Comsat	S	S
4/5	ATS II	Atlas-Agena	KSC	Communications and Technology	F	F
4/17	Surveyor III	Atlas-Centaur	KSC	Lunar Photography and Surface Sampler	S	S
4/20	*ESSA V	Imp. T-A Delta	WTR	Operational Weather Sat.	S	S
4/26	San Marco	Scout	Mombasa platform	Study Air Density	S	S
5/4	Lunar Orbiter IV	Atlas-Agena	KSC	Lunar Photographs from Polar Orbit	S	S
5/5	Ariel III	Scout	WTR	Cooperative UK-US Satellite Launch	S	S
5/24	Explorer XXXIV	TAD	WTR	Particles and Fields	S	S
5/29	ESRO II	Scout	WTR	Study Solar, Cosmic Rays	F	S
6/14	Mariner Venus	Atlas-Agena	KSC	Flew within 2,500 miles of Venus on Oct. 19	S	S
7/14	Surveyor IV	Atlas-Centaur	KSC	Lunar Photography and Surface Sampler	S	F
7/19	Explorer XXXV	TAD	KSC	Particles and Fields	S	S
7/28	OGO IV	Thor-Agena D	WTR	Study Sun Effects on Earth	S	S
8/1	Lunar Orbiter V	Atlas-Agena	KSC	Photograph Lunar Landing Sites	S	S
9/7	Biosatellite II	TAT	KSC	Experiments on Space Effects on Cells, Tissues	S	S
9/8	Surveyor V	Atlas-Centaur	KSC	Photography and Chemical Analysis of Lunar Surface	S	S
9/27	*Intelsat II-D	Delta	KSC	For Comsat	S	S
10/18	OSO IV	Delta	KSC	Solar Observation	S	S
11/5	ATS III	Atlas-Agena	KSC	Communications and Technology	S	S
11/7	Surveyor VI	Atlas-Centaur	KSC	Photography and Chemical Analysis of Lunar Surface	S	S
11/9	Apollo 4	Saturn V	KSC	First Flight Test of Saturn V launch vehicle	S	S
11/10	*ESSA VI	Delta	WTR	Operational Weather Sat.	S	S
	Pioneer VIII			Interplanetary Solar		
12/13	TTS-1	Delta	KSC	Observation Apollo Tracking Check	S	S

*Not NASA Mission (Environmental Science Services Admin., US Dept. of Commerce)
 **Not NASA Mission (Communications Satellite Corporation)

KSC—Kennedy Space Center, Fla.
 WTR—Western Test Range, Calif.
 S—Success
 F—Failure

NASA, Italy Cooperate In San Marco Launch

Italy and the United States will cooperate in a third joint space project with the launching of a scientific satellite into an equatorial orbit from a unique ocean platform off the coast of Kenya, Africa. The satellite will carry out upper atmosphere experiments during 1969-70.

The new project, named San Marco C, follows the successful launching of San Marco II on April 26, 1967, from the same San Marco equatorial range. The Italian National Space Commission (CRS) was responsible for development of the range as well as for the design and construction of the satellite. The launching vehicle was a Scout rocket provided by NASA.

The launch site is the only one capable of boosting Scout payloads into equatorial orbit. An equatorial orbit is advantageous for measuring a variety of atmospheric characteristics. Specifically, an equatorial orbit can provide useful data on the density, composition, temperature, and structural behavior of the atmosphere above 120 miles as affected by solar and geomagnetic activity and the twice-daily variations of the atmosphere.

The main experiment on San Marco C will be carried out by means of the so-called "balance

instrumentation." This drag balance, conceived by Prof. Luigi Broglio, Chairman of the CRS, was developed by the Aerospace Research Laboratory of the University of Rome and successfully used in San Marco I and II.

San Marco I was successfully launched from NASA's Wallops Station, Va., on December 15, 1964 by an Italian crew using a NASA Scout vehicle.

The drag balance experiment on San Marco C will measure continuously the atmospheric density and molecular temperature during a period near the maximum of solar activity. San Marco C experiments will provide a useful means to compare and correlate the principal techniques in use today for investigating the upper atmosphere.

San Marco C will permit comparison and correlation of the direct measurement of density and molecular temperature with the direct detection of atmospheric particles and their atomic weight or composition and independent measurement of atmospheric temperature.

In addition to the Italian drag balance experiment, the scientific payload will include two mass spectrometer experiments prepared by NASA's Goddard Space Flight Center in cooperation with the University of Michigan.

A memorandum of understanding between CRS and NASA affirms the interest of the two agencies in continuing their cooperation in satellite measurements of atmospheric characteristics and provides for a division of responsibilities with respect to San Marco C. Italy undertakes to design, fabricate and test the satellite including the balance instrumentation, provide the range facilities, conduct the launching, acquire data from the experiments, and join with NASA in analyzing the final results. CRS is the Italian agency designated to carry on these operations.

NASA agrees to provide the mass spectrometer experiments, the Scout launching vehicle, training of Italian personnel as necessary, tracking and data acquisition services, and analysis of the spectrometer data.

Each agency will bear the cost of discharging its respective responsibilities. Results of the experiments will be made available to the world scientific community.

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

Credit Union Straight Talk

By Paul M. Sturtevant

As reported in the January 5, issue of *Roundup*, the MSC Federal Credit Union declared a dividend of 5%. On your federal income tax return, credit union dividends must be reported regardless of the amount received. Many members believe that credit union dividends are classified in the same manner as dividends received from corporate stocks. This is not so. Report all dividends on your return, even if the amount was less than \$10.

If the credit union paid you \$10 or more in 1967, your form 1099 is now being mailed to you. The copy is only for information

and should not be attached to your income tax return.

If you itemize deductions, all interest paid on loans may be deducted. Should you have questions about reporting dividends or taking deductions, consult the local office of the internal revenue service.

Waken Dormant Accounts

There are quite a few of you who have dormant accounts in the credit union. This doesn't help you . . . in fact it hurts you! A credit union operates differently than any other financial institution—not for profit, not for charity, but for service. Its primary purpose is to help members practice thrift through regular savings and the wise

use of credit. Our goal during the year is to bring all share accounts up to a minimum of a \$25 balance. Statistics have shown that the cost of maintaining an account even without life savings insurance premium cost is about \$5 per year. So, as you can see, it is necessary for us to activate dormant accounts. Please try your best to bring your balance up to at least a \$25 minimum. Don't forget the suggestion to try to save a part or all of the recent pay raise . . . *pay yourself first!*

Still shopping for a new car? Check with us before you commit yourself to higher interest rates and other costs . . . we can help you. *Straight talk* is our motto . . . we mean it.

Back in the November 24, *Roundup* I wrote an article about "the good guys will make it easy for you to buy with a charge account for Christmas" . . . A good many of you came to see the credit union and *saved* money.

For those of you who missed the article and met all "the good guys", have you checked the interest rates on your "charges." I'll bet that in most cases we can help you by loaning you money to pay off the Christmas spree! Come see us.

Last year we had to repossess an automobile (much to our chagrin). We don't want it to happen ever again. We'll help you with anything within reason, but there is one thing we cannot do . . . make payments for you.

Each individual has a responsibility to insure that his credit status is the very best he can possibly have. Payments must be made as agreed and every effort must be made to keep your payments timely.

Annual Meeting Coming Up

The annual meeting and election of directors and credit committee members for 1968 will be held on January 24.

All members are earnestly urged to attend this important meeting. The nominating committee will have a slate of proposed directors and committee members for your selection and of course nominations from the floor will be accepted.

The meeting will be held in cafeteria #2 (Bldg. 11) at 5:30 pm. Light refreshments will be served and a door prize of five shares in the credit union will be given to the lucky member attending.

Please call Ext. 2066 and indicate if you plan to attend.



Put your money where your heart is —
IN AMERICA

**U. S. SAVINGS BONDS,
NEW FREEDOM SHARES**

Ceremony Recognizes Employee Achievement

A two-year accumulation of individual and group achievement awards January 12 was recognized at the MSC Honor Awards Ceremony in the auditorium. The ceremony was attended by some 400 MSC employees.

In presenting the 30 Year Service Awards, MSC Director Dr. Robert R. Gilruth commented, "These 30 Year Awards occasion a bit of nostalgia and reminiscence as we look back over the progress and change taking place over the past 30 years.

"We were in a transition from fabric-and-wire aircraft to all-metal aircraft. The DC-3 was the front-line airliner of that time. We made rapid progress in aerospace during World War II and afterward, when we encountered the sonic barrier problem. The guided missile came in during the late 40s.

"In 1947," continued Gilruth, "the X-1 made the first supersonic flight; the 50s brought jet bombers; the late 50s saw the development of the intercontinental ballistic missile and the jet airliner, and the 60s saw the first manned space flights.

"These 30 years have indeed been a period of great accomplishment and change."

Receiving 30 Year Service Awards at the ceremony were Roy A. Alford, Alvin H. Morewitz, John E. Roberts, Jr., James E. Waton, Paul S. Armstrong, James S. Busby, Charles S. Coston, Joseph G. Griffith and Eugene J. Strass. Recipients of 20 and 25 Year Service Awards were recognized in a group.

MSC Certificates of Commendation were presented to Cadwell C. Johnson, assistant chief ASTD, for the division's work in systems design; to Joseph N. Kotanchik, chief SMD, for superior technical management abilities in Apollo flammability testing; and to Martin L. Raines, manager MSC White Sands Test Facility, for outstanding leadership in launch and static fire activities.

The MSC Group Achievement Award went to the Lunar Receiving Laboratory Program Office "for their outstanding success in the overall management of the design and construction of the Lunar Receiving Laboratory." The award was accepted by Joseph V. Piland.

The Thermochemical Test Branch P&PD received the Accident Prevention Award in recognition of "their exemplary safety record without having a lost-time accident to any employee for a period of one calendar year."

Invention Awards went to the following: William C. Huber and Edwin Samfield for an inflatable tether; Kenneth D. Cashion for a control system for the solar telescope dome at the Solar Particle Alert Network (SPAN) facility; Allan W. Joslyn and Vernon H. Gray for a boiler for generating high-quality vapor.

In closing the awards ceremony Gilruth said, "Apollo IV represents a great amount of effort on the part of MSC and of other centers. Whether you work at a desk, in the vacuum chambers or labs, you are just as vital to the program.

"In a few days we are coming up to bat again with the extremely complex LM-1 mission which plays a vital part in the lunar mission. The next two years will see a high concentration of flight tests and increasingly longer missions.

"We have a great team in this center as well as across the program," continued Gilruth, "and I'm sure each of us will do his part to meet our goals."

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/RENT—REAL ESTATE

Wooded lot on Dickinson Creek in Dickinson, 60 ft. by 247 ft., \$2300. Dwayne Weary, 877-2206.

Nassau Bay contemporary home, all brick, 2400 sq. ft., 4 bedrooms, 2½ baths, 2 car garage, extensive built-ins, fireplace, on wooded lot. \$39,500. Harvey S. Hertz, HU 8-4226.

100 ft. by 100 ft. wooded lot, S. Carlisle St., Bayside Terrace, LaPorte (two blocks from bay), \$3500 cash. Wilma Wells, GR 1-1512.

Two Riverland Estate lots outside Scottsboro, Alabama. Eston Meade, HU 7-0870 after 5.

Clear Lake City, for sale by owner: 3-2-2, built-ins, 4 walk-in closets, central air and heat, recreation center membership. \$21,950 and assume monthly payments of \$162. Dennis Doherty, HU 8-0182.

For Rent: 4-2-2 in El Lago. Available in March on one-year lease. Central air/heat. Built-in kitchen. Carpets. W. B. Lenoir, 877-1843.

3-2-2 brick in Bayou Chantilly, Dickinson, large family room w/cathedral ceiling and fireplace, formal living room, large master bedroom, laundry, electric kitchen, landscaped, large lot, patio w/gas grill, fenced, carpets and drapes, garden house. Available immediately. Asking \$23,000, 10% down. Harold E. Atwater, 534-5684 for appointment.

For rent. Waterfront property, furnished 2 B. R. home, lrg. den with fireplace. New 250 ft. private pier on Clear Lake with two covered boat stalls with sun deck. One stall with electric boat lift. Very large fenced-in lawn. Large patio and barbecue. Bill Munro, 877-2219 after 8 p.m.

3-2-2 brick in Fairmont Park, central air/heat, build-in kitchen, carpets, fenced yard. Monthly payments \$129. 5¼ VA, low equity. R. L. Baumgartner, GR 1-4765.

FOR SALE—AUTOS

67 Ford F-100 pickup, long wheel base, custom cab, other extras, used only for transportation. John Doyle, 944-9483.

64 T-Bird coupe, light blue, paint excellent, interior excellent, all power and air. Make offer. R. E. Pryor, GR 4-2350.

63 Chevrolet, 6 cyl. 4 dr. sedan, a/c, pwr. glide transmission, excellent cond., original owner, 67,000 miles. \$800. Z. D. Kirkland, 932-4101.

64 Plymouth Sport Fury, 2-dr. hardtop, excellent condition, new tires. Air conditioned, 383 cu. in. engine, 4 bbl. carb. Torqueflite transmission, bucket seats, console. R. Beumer, 488-1270, ext. 291.

65 Mustang, 2-plus-2 fastback, 289 hp, auto. trans., air cond. GTO package, pwr. brakes and steering, rally pack, low mileage, one owner. \$1495 or will trade for larger car of equal value. Don Heywood, Dickinson, 534-3979.

62 Comet, 4-door sedan. Stick shift, 67,000 miles. Radio, heater, air-conditioner. In excellent condition—see to appreciate. \$490 Blue Book retail price. MSC Credit Union will loan up to \$245. Paul Haney, 946-6327.

64 Rambler American, 440 hardtop, automatic transmission, air conditioning, good tires. \$800. S. E. Jacobsen, HU 7-0823.

55 Chevy Belair, 2 dr. sedan, V-8 and automatic transmission reconditioned April

1967. Needs paint (primed and ready to be painted), \$175. Chuck E. Howard, MI 9-3993 after 6.

62 Volkswagen, clean, good tires, runs good. B. J. McGee, HU 8-3188 after 6.

61 Buick Special 4-dr. sedan, good transportation car, 2 new tires, new paint, pwr. steering, auto transmission, 18-20 mpg on reg. gas. V-8. J. M. Sisk, 944-7214 after 6:30.

63 Chevrolet Impala Super Sports Convertible V-8, automatic transmission, power steering, factory air and heat, radio, \$995. Shirley Roberts, 486-3903.

64 VW sedan, black w/red interior, sun-roof, whitewalls, radio, tinted front window, clean, 28,600 miles. \$975. Harold Atwater, 534-5684.

61 Comet, recently put into first-class condition. Has air, radio, tape player, new eng. paint, brakes, tires, etc. \$525. Unusually good car. Floyd Eaton, HU 2-7047.

62 Chevrolet station wagon, 6 cyl., std. transmission, radio, heater, air cond., one owner, excellent cond., 55,000 miles. R. K. Wolf, 932-2064.

59 Triumph TR3, very good condition, extra clean, radio, heater, new tires, new black paint, telescoping steering wheel, tonneau cover, boot, convertible top, no rust. \$550. Will pay all transfer fees. D. C. Pallard, 2530 Violet, Pasadena, HU 7-0024.

FOR SALE—MISCELLANEOUS

Interested in Viviane Woodward cosmetics? Flossie D. Leggett, 591-4591 after hours.

61 Chevrolet Engine disassembled and ready for rebuilding, power pack heads and four-barrel, intake and exhaust manifolds. \$65. N. Corbett, ext. 5961 (no home phone).

1960 Glaspar Citation, six individual seats, 75 hp Evinrude, tilt trailer, top and stern cover, extras, excellent condition, \$1250. N. Corbett, Ext 5961 (no home phone).

Will give Miniature Schnauzer dog to responsible individual or family. Dog is female, 5 years old, spayed. J. Hess, 877-2405 or 944-0966 after 5.

Utility trailer: Direction lights, heavy duty tires, overload springs, ball hitch, \$38. Pesman, HU 2-7692.

Minneapolis-Honeywell electronic filter unit: Heavy duty with remote control panel, \$275. Pesman, HU 2-7692.

Brown Miniature Poodle, 9 wk old male, AKC, wormed, shots, puppy cut and collar. Smith, OV 2-5204 after 5.

Corona Portable Typewriter, \$18. Guitars, almost new, \$15. Glenn L. McDuffie, HU 8-2776.

4 new Cinturato Pirelli radial tires size 165-SR-14 (replaces 5:60 x 14 and others). New fan belt and radiator hose for 1965 MGB. Tonneau cover plus bar for 1965 MGB used part of one summer. Robert W. Becker, 944-5118.

Zenith Stereo Combination-portable entertainment center, AM/FM/FM Stereo radio, phonograph, all in simulated walnut cabinet, Three years old and in very good condition. Robert Willmann, 591-2357 after 4:45.

12 cu. ft. refrigerator, good condition, \$25. W. G. Glover, 877-3384 after 4:30.

22 ft. Revelcraft Fisherman. 100 hp Volvo outdrive, plywood conventional "V" bottom, lapstrake sides. 2 bunks, compass, bilge pump, canvas top, side curtains, deck cover, dual batteries, spotlight. Boat in top condition. Excellent buy at \$1,300. H. Dotts, 591-3519.

1964 Viking Gold Seal Mobile Home, 10x55, dbl. expando, 2 bdr. with porches and awnings, storage shed plus other extras. Joe Vilgos, 643-2062.

Pair of 40-inch brass candlestick holders made in Thailand including candles, \$35. One brass Korean barbecue pot, \$15. Joe Vilgos, 643-2062.

English Painters, AKC reg. Tap show and field stock, liver and white. \$75 and up or trade for something of equal value. Rita Heywood, Dickinson 534-3979.

Chev. 283 or 327 V8 marine Chris Craft manifolds, never used. \$35. Don Heywood, Dickinson 534-3979.

Girls 24-inch bicycle, Sears, fair condition, \$10. A. Smith, HU 8-3238.

22 in. Motorola TV, table model, good condition, picture tube less than two years old, \$25. Ted Sampsel, GR 1-0172.

Hoover floor buffer, home model, 8 years old, like new, \$10. Jan Haney, 946-6327.

Utility trailer, enclosed, w/spare wheel and tire. Best offer. Dick Regenburgh, 944-2433.

China cabinet, antique. Curved glass front and sides. Mahogany finish on oak. 36 inches wide, 56 inches high topped by 9 inch high curved mirror in scroll frame. 4 scroll-type legs. Excellent condition. \$125. Leona Germany, MI 3-4456 after 6.

Mossberg 12-ga. pump mod. choke, recoil pad like new. \$60 with shells. Walter Manning, MI 3-8007.

2-cycle Kenmore washer, \$20. Thompson, 946-7768.

Microscope, professional quality, 900X, 3 objectives, 3 oculars; definitely not a toy. Complete stereo system, Dyna, FM, records, speakers, earphones, and all hook-up wire. Excellent condition. Goodrick, NA 2-8341.

Portable heater, thermostat, instant heat, \$6.50. Complete 10 gallon aquarium outfit and wrought iron stand, \$17. Solid oak bookcase headboard, footboard and frame for single bed, \$25. Youth bed, rails and mattress, \$25. All articles in good condition. Richard E. Stanton, 932-2982.

Dolphin Sr. sailboat and trailer, 2 yrs old, excellent condition, \$400; picnic basket with plates, glasses and silver, \$5; large Coleman ice chest. \$12.50; 2 redwood patio chairs, \$5 ea; Cub Scout uniform (all but shirt), \$3. James S. Cooper, 944-2680.

Most powerful Eureka canister vacuum cleaner with all attachments including Vibrate power head, 2 years old, excellent condition, \$25. C. H. Eldred, GR 1-4332.

Record player, 1957 RCA Victor Upbeat hi-fi mono. Excellent condition. \$35. P. M. Ligrani, 877-4405 after 5.

Fly retractable gear with the Aero Club Inc. for MSC and contractors. K-Bonanza, IFR, 195 mph, \$16/hr. wet; Cessna 172 \$9/hr. and 15 \$7/hr.; instructor \$5/hr. Bob Ward, 877-3187.

Sears 23-in. Silvertone console TV, \$125, Garrard Lab 80 MK II automatic turntable with deluxe elliptical cartridge machine, both record and playback units, \$450. All equipment in excellent condition. F. J. Vansco, 644-7777.

Baby crib (painted white) \$10; Wooden play pen, \$5; stroller sleeper combination (like new) \$12; car seat \$3; high chair \$4. R. Wilson, HU 8-4139.

WANTED

Will pay liberally for ride to and from MSC (or from MSC only) to Cullen and Charleston Streets in Houston, (U of H area). Can come in on any shift 7:30, 8:00, or 8:30, however, must leave between 5:00 and 5:30. Baley Davis, Ext. 2441, or RI 7-0387.

Car pool arrangements between Baytown and MSC. Jim Ward, Ext. 4791.

Would like to form or join carpool from vicinity of Foleys (Alameda-Genoa) to Bldg. 2. Hrs. 8:30 to 5. B. J. Miller, 944-0042.

Wanted to buy: TV, Hi-Fi outfit or components, air conditioner, dryer, and a sailboat. If not working, will still be considered. 946-7193, Houston.

Male roommate to share two bedroom apartment at the Cotswold Village on the Gulf Freeway. Sam Cerniglia, 944-0198 after 5.

Wanted to buy: two (2) tickets together for the UH-UCLA basketball game to be played at the Astrodome on January 20, 1968. Prefer seats in one of the lower levels. Wayne Laszlo, 591-4502 after 5:30.

Male or couple to share private home in quiet residential section. L. Palmer, 877-1269 after 6.

Wanted roommate to share large house with two bachelors. Three car garage and swimming pool in Glenbrook Valley. R. Sachen, MI 3-8038.

Share rides or car-pool to work, Bldg. 2 from Baytown, Graywood area. Al Cornelius, 422-2206.

MSC Electronics Engineer (male-23) now booking for dates with single females about 23 who also believe in random access instead of computerized pre-selection. If interested, call F. J. Vansco, 644-7777 any hour.

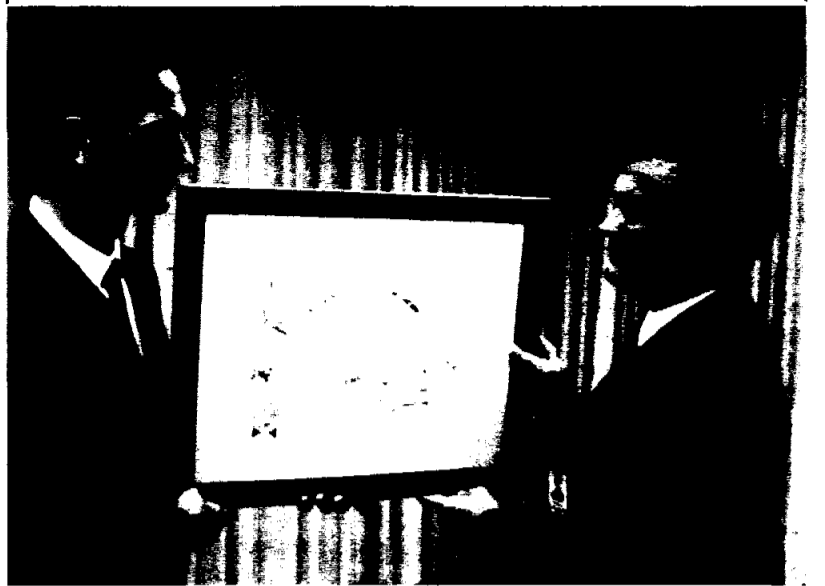
Female roommate with apartment, near 8300 Gulf Freeway, Labrecque, 645-7596 after 4:30.

Would like to buy a child's swing set, Richard E. Stanton, 932-2982.

LOST/FOUND

Found: One puppy in El Lago Section 4 during Christmas holiday. If owner will describe, six-year old will reluctantly return. Jack Eggleston, 877-2863.

Charter Handover



NEW RIFLE CLUB—Bill Douglas of Administrative Services Division and chairman of the Pasadena Junior Rifle Club accepts the club's National Rifle Association charter from Jim Donnell of Flight Safety Office. Donnell is training counselor for the NRA. Douglas, an NRA instructor, began classes Wednesday in hunter and home firearm safety for boys and girls between seven and 15 years. For additional course information, call the Pasadena Jaycees at GR 3-8818.

Final NASCOM Link Installed at Ascension

The two-millionth mile of space communications circuits has been laid in a two-foot-deep trench across Donkey Plain in the Volcanic rubble of The Devil's Ashpit.

This mile of coaxial cable unites two antennas on Ascension Island in the South Atlantic Ocean where NASA is completing one of its links in the chain of manned space flight tracking, telemetry and voice communications facilities.

than freeway rush-hour, flows across that mile of coaxial cable to the satellite communications antenna where it is directed skyward to the communications satellite. There it is relayed west across the Atlantic to the AT&T ground station at Andover, Maine, then by land line to Network Communications Control Center at NASA's Goddard Space Flight Center, Greenbelt, Md., and on to Mission Control at Houston.

The towering, cup-shaped antenna reflectors dwarf everything near them and make the mile of desolate lava ash and rock seem short enough to shout across.

But the messages across this mile will be flowing at microsecond speed, with thousands of telemetry data bits of flight information in addition to the voices of flight controllers at Mission Control Center—Houston, and of Apollo crewmen.

The antennas are a 30-foot-diameter paraboloidal reflector for contact with Apollo spacecraft and a 42-foot diameter dish to link with the communications satellite, Intelsat II, hovering at 23,300 miles over the Atlantic.

All this communications traffic, thousands of times faster

The flow of telemetry and voice goes to all 14 of NASA's Apollo land stations in the Manned Space Flight Network circling the Earth and to the five Apollo tracking and communications ships which support insertion into Earth orbit, injection of the spacecraft into flight toward the Moon, and reentry into Earth's atmosphere and splash-down. The ships are stationed in Atlantic, Pacific and Indian Ocean areas where no land sites are possible.

Integrated in the NASA communications circuits are STADAN facilities for scientific satellites and the Deep Space facilities to support probes to the Moon and the planets.

All these circuits comprise the two million miles of NASA Communications, known as NASCOM, of which the Ascension Island cable is the final link.

Quarter Century



Jerald D. Bulls
25 Year Service Award
MSC-White Sands

ESSA Scientist Speaks At MSC Solar Seminar

"Forecasting Solar Disturbances" will be the topic of this afternoon's MSC Solar Physics Seminar at 3 pm in the Bldg 31 Conference Room (Room 193). The speaker will be Dr. Constance Sawyer of the Environmental Sciences Services Administration (ESSA) Research Laboratories.

Volleyball League Starts Play Feb. 26

February 16 is the deadline for entering teams in the volleyball league which begins play on February 26. To enter a team, send team name, team manager's name, extension and office code to Ray Southers or Jeff Vyner, both at Ext 3241.

Schedules and ground rules will be mailed to each team manager by February 23. All games will be played at Ellington AFB. The number of games per night per week per team will depend upon the number of teams in the league.

BUSY GROUP

Apollo V Flight Control Team To Put LM-1 Through Paces

By Milton Reim

After the Apollo launch vehicle and its Lunar Module payload lifts off Launch Complex 37B at Cape Kennedy, Command Control of the flight will be centered in the Mission Control Center-Houston.

In the hours prior to liftoff of the Apollo V vehicle, the role of MCC-H is more one of monitoring the pre-launch activity and preparation for command takeover of the mission.

Real-time in-flight analysis of trajectory and vehicle systems will be augmented by the various tracking sites along the path of the flight.

The prime team of flight controllers will come on duty in MCC-H at about three hours before liftoff and man their console positions through accomplishment of the primary objectives of the mission or about seven hours into the flight. At this time number two team of flight controllers will take over command of the vehicle and exercise the LM-1 vehicle in various contingency configurations and monitor vehicle systems until depletion of consumables. The latter phase will also be about seven hours in duration.

Mission Director for the Apollo V mission is William C. Schneider from the Office of Manned Space Flight, NASA Headquarters. He will be responsible for the overall conduct of the mission.

Christopher C. Kraft Jr., Director of Flight Operations at the Manned Spacecraft Center will man the Flight Operations Director console in MCC-H during major phases of the mission in his capacity as head of flight operations at MSC.

Department of Defense support of the mission will be headed by Air Force Maj. Gen. Vincent G. Huston, DOD Manager, Manned Space Flight Support Operations, Andrews AFB, Washington, D.C. DOD support includes launch site services and tracking facilities.

Flight directors for the Apollo V mission will be Eugene F. Kranz and John D. Hodge. They will head the two shifts that will be necessary for the countdown and flight portions of the mission. The flight director's responsibilities

include implementation of mission objectives and making changes on an as-necessary basis that could affect the flight plan and/or mission rules. Glynn S. Lunney will be back-up flight director for this mission.

Assistant flight directors for Apollo V will be Perry L. Ealick and Charles R. Lewis. During the mission they will assist the flight director in the detailed control of the mission and will assume full responsibility during the absence of the flight director from the control room.

Operations and Procedures Officers for the mission will be H. Russell Goodwin and Lawrence L. D. Armstrong. They will be responsible to the flight director for detailed implementation of the MCC/GOSS (ground operational support system); implementation of remote site flight controller scheduling and operations, flight controller communications network discipline and monitoring all mission control teletype traffic.

Booster Systems Engineers for the Apollo V flight will be William L. Brady and William H. Hooper. They will be responsible to the flight director for monitoring the Saturn launch vehicle propulsion system, propellant containers and pressurization systems. They will also monitor and evaluate the status of the Saturn IB digital computer system, navigation and guidance system, attitude control system and sequential system. Charles W. Casey will be back-up booster systems engineer.

Guidance and Control Officers for the mission will be Jackson B. Craven and Robert L. Carlton. They will be responsible to the flight director for monitoring spacecraft guidance and propulsion systems.

The Electrical, Environmental and Communications Systems Engineers for Apollo V will be Donald R. Puddy, and W. Merlin Merritt. They will be responsible for monitoring the operation of the electrical power system, the environmental control system, communications system and instrumentation, and sequential systems.

Flight Dynamics Officers for Apollo V will be H. David Reed, Jerry C. Bostick, Maurice G. Kennedy, and William M. Stoval. They will be responsible to the flight director for monitoring the powered flight phase of the mission, orbital events, and trajectories from the standpoint of mission success.

Guidance Officers for the flight will be J. Gary Renick, Charley B. Parker, Kenneth W. Russell and William E. Fenner. They will be responsible to the flight director for monitoring guidance, sequential and propulsion systems.

Retro Controllers for Apollo V will be James E. I'Anson, John S. Lewellyn, and Bobby T. Spencer. They will be responsible to the flight director for monitoring the LM program

reader assembly and for selecting sequences to accomplish alternate mission planning.

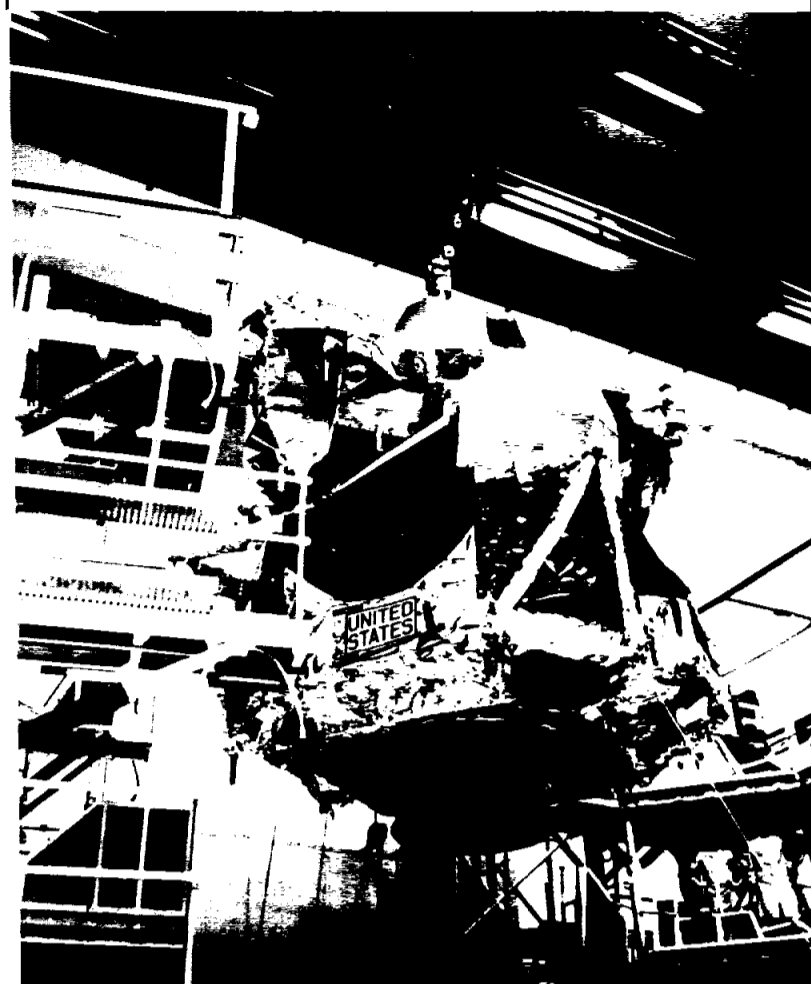
Network Controllers for the mission will be George D. Ojalehto, Clifton W. Phillips, Thomas Guy and Douglas R. Wilson. They will be responsible to the flight director for capability of the network instrumentation required to support the flight.

The Public Affairs team for commentary on Apollo V is Terry White and Don J. Green. They will be responsible for relaying to the news media all vital information on the mission.

Three remote sites will be manned by flight controllers from MSC for this mission. These sites will be Carnarvon, Australia, the tracking ship *Coastal Sentry* (CSQ) off the west coast of Australia, and the tracking ship *Rose Knot* (RKV) off the coast of Baja California.

Manning the Carnarvon site will be Gary B. Scott, capcom; Harold A. Loden, and Hershel R. Perkins, LM systems; and James F. Park, booster systems engineer.

Legless Payload



FIRST FLIGHT—Lunar Module 1, payload for the upcoming Apollo V mission, hangs from the overhead crane in the highbay area of the Kennedy Space Center Manned Spacecraft Operations Building. Minus its landing legs below the "knuckles", LM-1 has since been mated to uprated Saturn I launch vehicle 204. LM-1 will zap about in earth orbit responding to ground commands in a checkout of its ascent and descent engine systems.

Spanish Club Has Talk on Mexico

Christian H. Clarke, special representative of Braniff International, will be the featured speaker at the MSC Spanish Club meeting Monday at 5:15 pm in Room 108 Bldg 13. Clarke will discuss points of interest in Mexico and will show films of the country.

The program will be of particular interest because of the nearness of Mexico to the MSC area and the upcoming summer Olympics in Mexico City.

Todos son bienvenidos.

HUMAN ERRORS?
WE'VE ALL GOT TO DO OUR BEST
TO ELIMINATE THEM.

IT'S GOT TO BE GOOD

IF IT'S APOLLO.
MUCH IS RIDING ON SUCCESS
LIKE YOUR FUTURE
AND MINE.

Walter Cunningham
NASA Astronaut



THE SYMBOL OF EXCELLENCE

MANNED FLIGHT AWARENESS