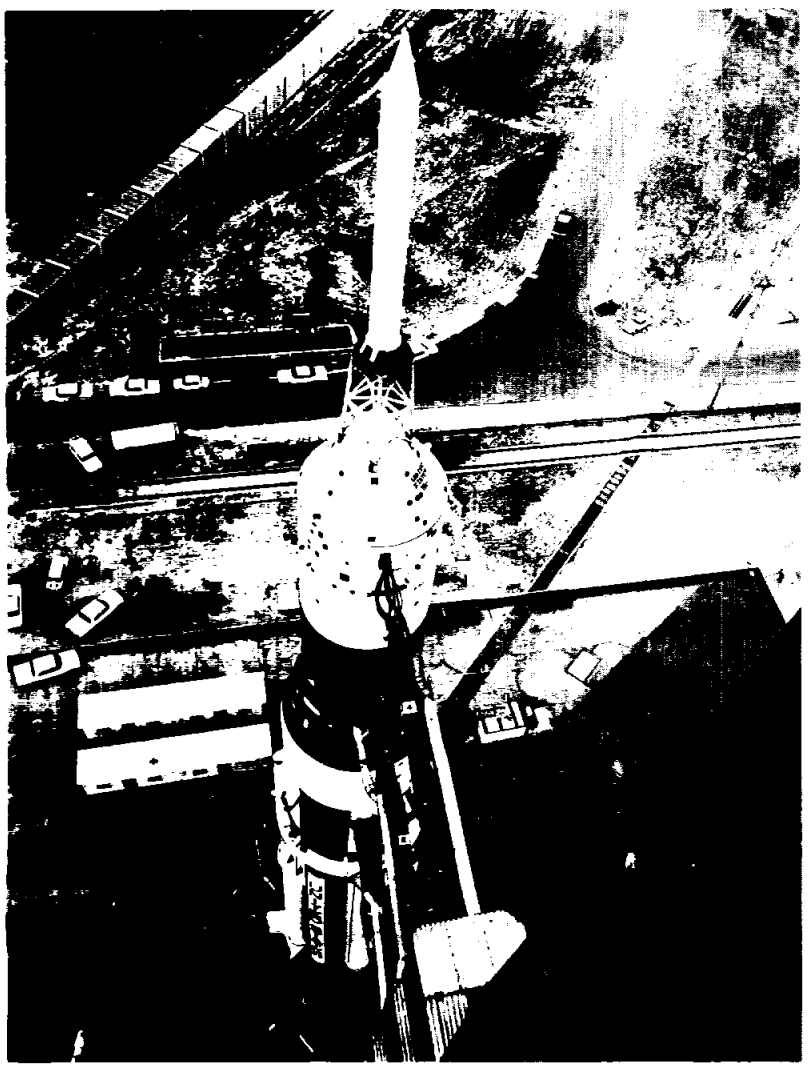
Space News ROUNDUP!

VOL. 3, NO. 16 MANNED SPACECRAFT CENTER, HOUSTON, TEXAS MAY 27, 1964



APOLLO/SATURN I – Towering 190 feet over launch complex 37, the Apollo/Saturn I vehicle (SA-6) undergoes tests prior to the scheduled lift-off. The flight will be the first of a series in the Apollo program before Americans are sent to the moon.

Cape Kennedy Saturn Launch To Orbit First Apollo Systems

Launching of the Apollo boilerplate 13 command and dummy service module and lunar excursion module fairing by the sixth Saturn I (SA-6) was scheduled for no earlier than tomorrow from Cape Kennedy, Fla.

A milestone will be set in the Apollo program when the giant Saturn launch vehicle lifts the first Apollo systems into an earth orbit which may last a week.

The flight will qualify the launch vehicle further and develop the technology necessary to build the more powerful Saturns needed for manned lunar landings and other space exploration.

Orbiting the Apollo systems will demonstrate the primary mode of the launch escape tower jettison, using the escape jettison motor; determine the launch and exit environmental parameters; and demonstrate the physical compatibility of the Saturn I launch vehicle and the Apollo spacecraft under preflight and flight conditions.

An active guidance system will be used on a Saturn for the first time to steer the second stage of the Saturn I and the attached Apollo spacecraft into an orbit ranging from 110 to 140 statute miles above the Earth. The SA-6 satellite, consisting of the second stage (S-IV), an instrument unit and the Apollo spacecraft will weigh 37,300 pounds.

The weight-in-orbit record is held by the fifth Saturn I (SA-5) launch which put 37,700 pounds in orbit January 29. This orbiting package consists of the S-IV stage, instrument unit and a sand-filled nose cone. An "open loop guidance", or autopilot system, was used in the SA-5 flight.

Included among the primary missions of the SA-6 flight are to test propulsion additionally, structure and flight control systems and to prove the technique for separating the second stage from the first stage.

Other missions include determining structural characteristics of the launch escape system, operational suitability of Atlantic Missile Range ground tracking stations, launch escape system jettison characteristics, and demonstrating the compatibility of spacecraft research and development instrumentation and communication systems with launch vehicle systems.

Five Saturn I's, each generating 1.3 million pounds thrust or more and weighing a million pounds have been successfully launched.

The first four (Block I) rockets had only the booster stage live. Beginning with the Block II Saturn SA-5 all Saturn I's have powered second stages and are capable of placing about 20,000 pounds of useful payload into Earth orbit.

SA-6 and later vehicles in the series carry early, unmanned models of the Apollo command and service modules. The last three Saturn I flights (SA-9, SA-8, SA-10) will carry meteoroid detection satellites.

SA-6 is 190 feet tall and will weigh about 1,130,000 pounds at liftoff. It consists of four elements: S-I stage, S-IV stage, instrument unit, and an Apollo spacecraft ("boilerplate" command module, dummy service module and insert/adapter, plus launch escape system).

The S-IV and the instrument unit are being flown for the second time. The S-I is undergoing its second flight test in this (Block II) configuration.

Dr. George E. Mueller, Associate Administrator for Manned Space Flight, at NASA Headquarters, is in charge of all NASA manned space effort, including the development of the Saturn vehicle and Apollo spacecraft.

The three centers sharing responsibility in the Apollo Moon program are the Marshall Space Flight Center, vehicle developer; Manned Spacecraft Center, spacecraft developer; and Kennedy Space Center, the launching organization.

Scott Carpenter To Have Part In Navy's Project Sea Lab I

The DOD and NASA announced recently that Astronaut Scott Carpenter will participate in Navy's Project Sea Lab I off the coast of Bermuda this summer.

Sea Lab I, a 40-foot undersea laboratory, is scheduled to be lowered to a depth of 192 feet on July 6 and remain submerged for the three-week period.

Carpenter, a Navy lieutenant commander who has been with NASA since April 1959, will join a 4-man Navy team of divers for the last week of the underwater experiment.

The Navy had indicated its desire to have technical assistance from NASA in the Sea Lab program. A personal interest in exploring man's capabilities in an underwater environment led Carpenter to volunteer his services for this assignment.

Capt. George F. Bond, MC, USN, who is in charge of all physiological and psychological aspects of the project, plans to utilize Carpenter's abilities as an observer in a hostile environment in the collection and evaluation of scientific data.

Dr. Bond pointed out that by participating in Project Sea Lab, Carpenter will become the first human to experience the two most hostile environments known to man.

$80-Million Lunar Orbiter Contract Signed With Boeing

The National Aeronautics and Space Administration has signed a contract with the Boeing Company, Seattle, Wash., to build Lunar Orbiter spacecraft.

Boeing was selected for negotiations on Dec. 20, 1963, from among five firms bidding for the project.

The contract signed May 8, is an incentive contract

(Continued on page 6)

Successful Parasail Testing Conducted With Gemini Model

Parasail landing tests using a one-third scale model of a Gemini spacecraft were successful last week at Fort Hood, Tex.

The spacecraft model was dropped from a helicopter at 10,000 feet. The parasail, a maneuverable radio-controlled parachute, brought the craft to the ground about one-half mile from the target.

Test director, James Burkett, said winds of 13 knots caused the one-half mile error. He said the parasail completed several planned maneuvers before landing.

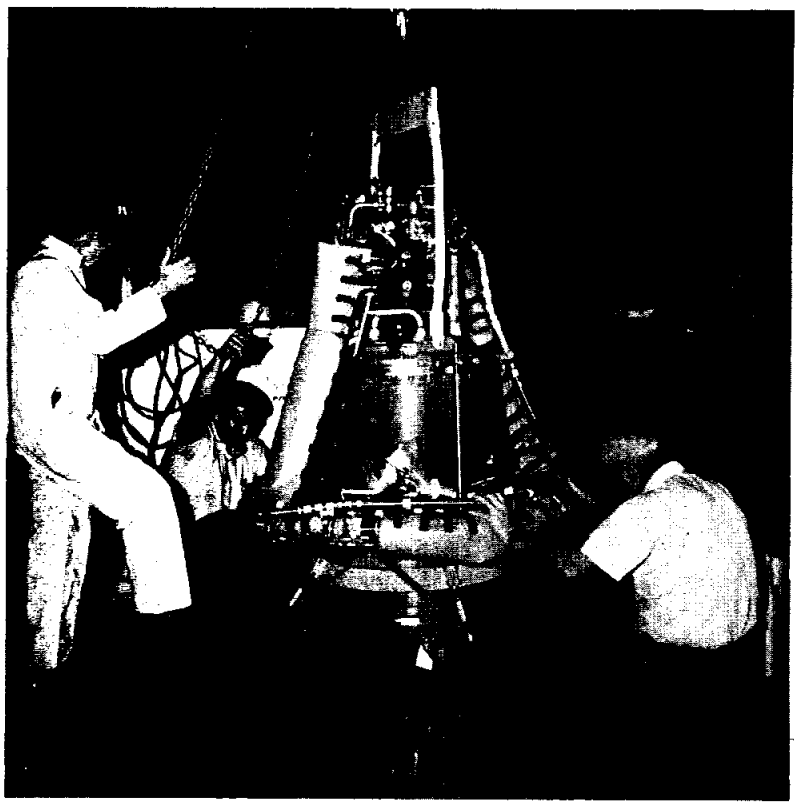
The parasail is being tested as a possible landing device for future Gemini flights. To date, all space flight landings have been made in the water and the parasail may be adapted for ground landings.

Weightless Tests At Wright-Patterson Checkout Life Aboard Gemini Spacecraft

A series of short weightless flights to see how well astronauts can eat, drink and move about in the two-man Gemini spacecraft were begun last week at Wright-Patterson AFB.

Astronauts Virgil Grissom and John Young along with four Air Force and McDonnell Aircraft test pilots are participating in the tests.

A full-size Gemini has been mounted inside a KC-135 jet aircraft. By flying the big cargo plane in an arching path, about 48 seconds of weightlessness can be achieved which is comparable to that of an orbiting spacecraft.



MOON MOTOR – This Project Apollo service module engine, first to arrive at NASA White Sands Operations test facilities near Las Cruces, is scheduled to undergo static testing in mid-summer. Produced by Aerojet-General Corp., for North American Aviation, prime contractor for the Apollo spacecraft, the service module engine is lowered to a dolly in preparation for checkout and mating to a propellant system already in place in the static test stand.

Lunar Research Vehicle Delivered; To Explore Moon Landing Problems

The first of two Lunar Landing Research Vehicles (LLRV) was delivered recently to the Edwards Flight Research Center by Bell Aerosystems, Buffalo, N. Y., to explore some of the problems involved in landing a man on the surface of the moon.

Conducting the flight program will be Flight Research Center personnel in support of Project Apollo.

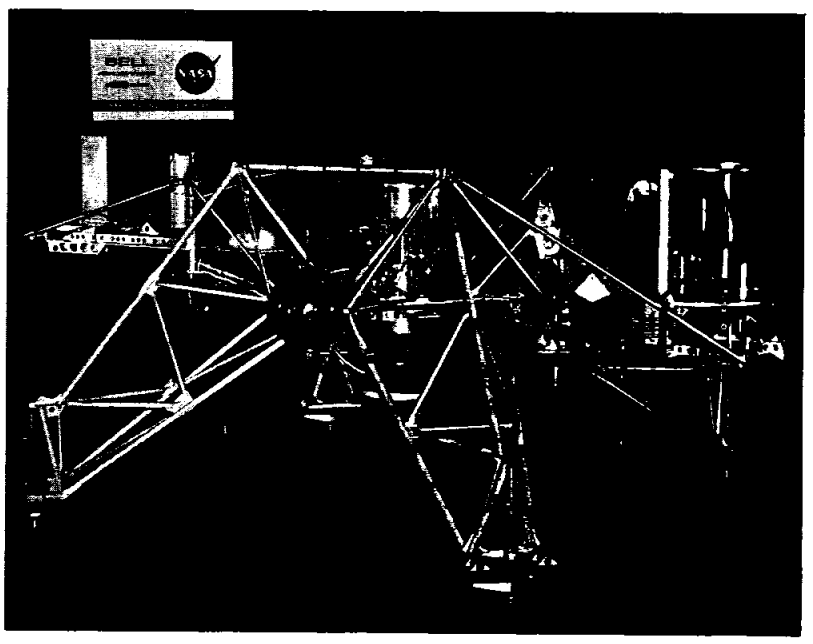
The LLRV is slightly more than 10 feet tall and four aluminum alloy truss legs with a spread of 13 feet support, a plexiglas-covered platform for pilot and controls.

Weight of the vehicle is about 3,600 pounds when loaded with fuel and instrumentation.

A turbofan engine and hydrogen peroxide rockets provide thrust enabling the vehicle to takeoff, hover and then gently descend to the earth in simulated lunar landings.

The LLRV will be used in an extensive research program having the three-fold purpose of exploring problems associated with lunar landings, providing information to aid in the design of the lunar excursion module, and training astronauts in the correct procedures of approach, hover and touchdown on the surface of the moon.

LLRV is a vertical takeoff and landing machine that is designed to fly up to altitudes of 4,000 feet. In addition to hover capability, it can fly horizontally.



LUNAR RESEARCH VEHICLE – The Lunar Landing Research Vehicle (LLRV) shown above was delivered recently to the Edwards Flight Research Center to explore lunar landing problems.

Test Demonstrates Apollo Fuel Cell Electrical Output

A Pratt & Whitney Aircraft fuel cell powerplant being developed for the Apollo program has produced electrical power well beyond the 14-day supply needed by astronauts on their coming moon mission, it was announced recently.

Conducted in Pratt & Whitney's Apollo facility, East Hartford, Conn., the endurance test, lasting more than 400 hours, was carried out in a simulated space environment.

The total electrical energy generated by the device exceeded the normal total energy demand foreseen for any one fuel cell powerplant used on the lunar mission.

This test also exceeded the time during which the fuel cells are designed to operate on a lunar mission. The Apollo spacecraft will utilize three such powerplants. They use hydrogen as fuel and oxygen as oxidizer.

In addition to electrical energy, the Apollo fuel cell, designated Powercel 3A by Pratt & Whitney, produces potable, or drinkable, water as a byproduct. This water will be used to supply crew needs and for cooling spacecraft components during the mission.

Fuel cells convert chemical energy directly into electricity without smoke, fumes or vibration. They were chosen for the Apollo mission because of great weight savings over conventional devices such as batteries. These savings result from the exceptionally high efficiency of the fuel cell.

In addition to the Apollo command and service module powerplant, Pratt & Whitney is developing another fuel cell system, Powercel 6A, for the Lunar Excursion Module.

Aerospace Medical Group Elects Dr. Berry To Council

Dr. Charles A. Berry, chief, Center Medical Programs Office here at the Manned Spacecraft Center was one of three men elected to three-year terms on the Executive Council of the Aerospace Medical Association (ASMA) at that group's annual meeting in Miami, Fla., May 10-15.

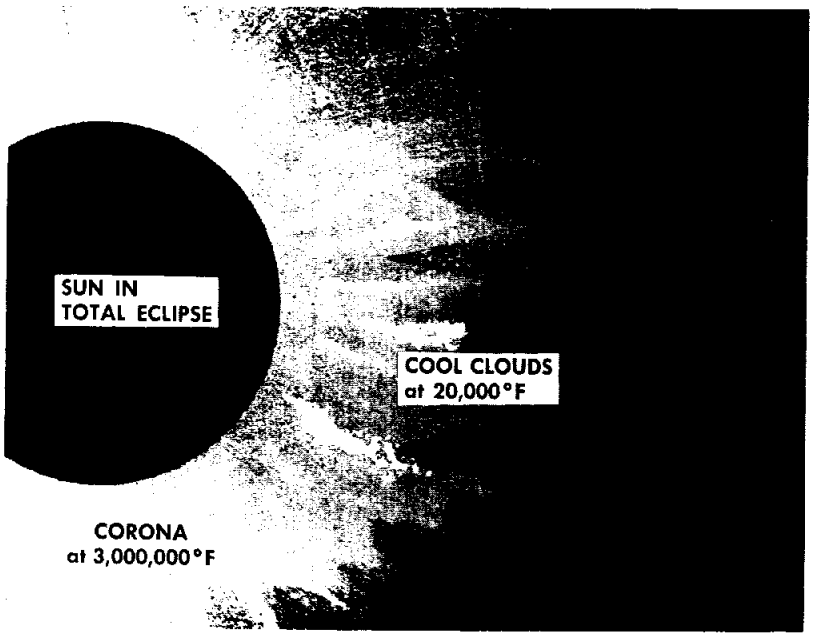
DR. BERRY

The ASMA is the largest medical organization devoted to the study of aerospace medical problems.

Berry was also chosen as president-elect of the Space Medicine Branch of ASMA at the meeting.

Members of the Center Medical Programs Office and the Crew Systems Division here at MSC were in Miami to make a three-hour closed circuit TV presentation on medical support in the Gemini spaceflight program.

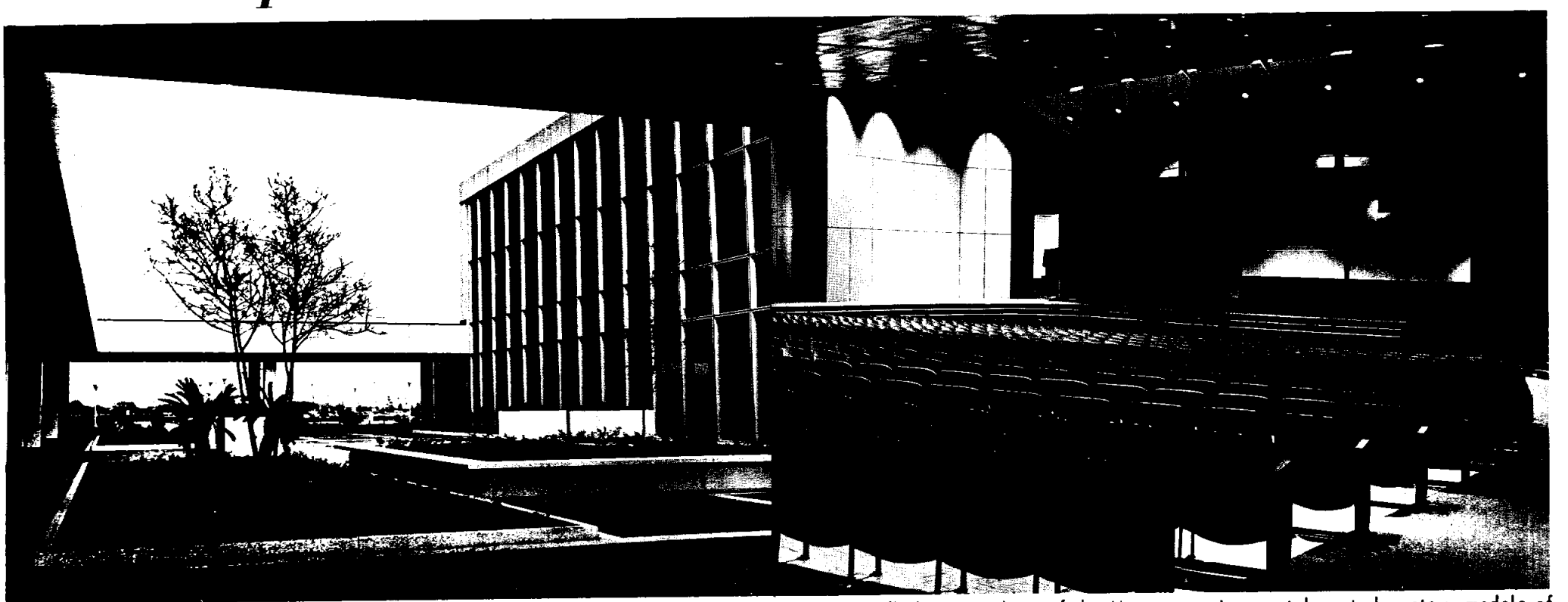
Dr. Berry was the anchor man in the closed circuit TV presentation which was transmitted from the Jackson Memorial Hospital in Miami to the Americana Hotel in Bal Harbour where the meeting was held.



COOL CLOUDS, believed to exist in the three-million-degree Fahrenheit corona of the sun, and extending out 400,000 miles from the sun's edge, are shown in this artist's conception. Evidence of the clouds, with a temperature of about 20,000 degrees F., was gathered in a Douglas Aircraft Company research program, which was part of the Douglas-National Geographic Society Solar Eclipse Expedition of July 20, 1963. Astronaut M. Scott Carpenter and Dr. Jocelyn Gill, NASA Hg., participated in the program. The cool region surprised astronomers, who had thought the temperature of the corona, the luminous gas surrounding the sun, was more nearly uniform.

SPACE INSTRUMENT USED IN EMBRYO RESEARCH – The Piezoelectric Transducer, designed by Vernon L. Rogallo, Measurements Research Branch, Ames Research Center, for micrometeoroid momentum measurement in outer space, has a more earthly possible application as well. The instrument was used successfully in a biological experiment to measure the heart beat of an egg embryo. Here, Rogallo holds a tiny bobwhite whose heart beat was measured throughout the embryonic stage. The measurement device is shown above the oscilloscope with a bobwhite egg in the plastic cup.

Center Open House Is Scheduled For June 6-7



AN OPEN HOUSE will be held at Manned Spacecraft Center's Clear Lake site Saturday and Sunday, June 6 and 7. Following those dates, similar activities are planned for each succeeding Sunday afternoon as long as the public participation continues. Vehicle parking and seating space in the auditorium (above right) for film showings will be on a first-come first-served basis. Security guards will insure that a maximum use of the parking facilities is accomplished. In addition to the film shown in the auditorium twice each hour, there will be inside exhibits in the lobby (glassed in portion of above left photo) of that building. They will include historical and hardware displays of Project Mercury, a one-fiftieth scale model of the Manned Spacecraft Center site, scale models of the Gemini and Apollo spacecraft, the pressure suit and survival gear used by Astronaut Scott Carpenter on his Aurora 7 flight, a mock-up of the Mercury environmental control system, models of several MSC buildings, cameras used on Mercury flights, exhibits on the Gemini and Apollo programs, and a one-twentieth scale model of the Saturn V launch vehicle. There will also be another exhibit area outside, located just west of the entrance to the site. The displays there will include a full scale mock-up of the Gemini spacecraft; a full scale Gemini boilerplate, used in research and development work; a full scale mock-up of the Apollo spacecraft command module; a full scale mock-up of the lunar excursion module (early version); a full scale scout rocket; a Mercury spacecraft, a Mercury boilerplate, a Mercury escape tower; and a Redstone launch vehicle, identical to those used in launching Astronauts Alan B. Shepard Jr. and Virgil "Gus" Grissom on their early space flights.

Study Reveals Best Method For Preventing Life Support Air Leaks In Space Station

How do scientists and engineers plan to prevent life support air from leaking out of an orbiting space station into the near-vacuum of space 300 miles above the earth?

Keeping sufficient air inside their man-made worlds may be a survival question to the astronauts who will man America's future space stations.

Continual replenishment of space station oxygen would not be practicable. Transportation and weight problems involved in rocketing large quantities from earth to the space station are too great.

Answer is durable sealing of internal station structure and its openings during earthly fabrication plus patching in orbit if required.

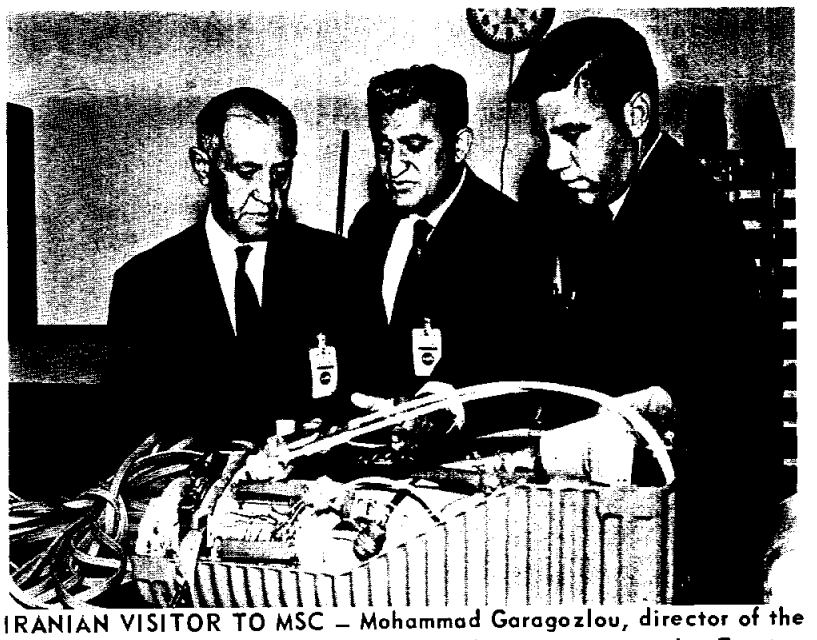
Most effective sealing techniques and materials were determined by Lockheed--California Company engineers in a study for the NASA's Manned Spacecraft Center.

Seals would have to withstand a temperature range from an Arctic winterish 100 degrees below zero to a sizzling 300 degrees Fahrenheit. They also will be required to resist the possible weakening effects of near-vacuum space conditions and radiation during the one- to five-year life of the station.

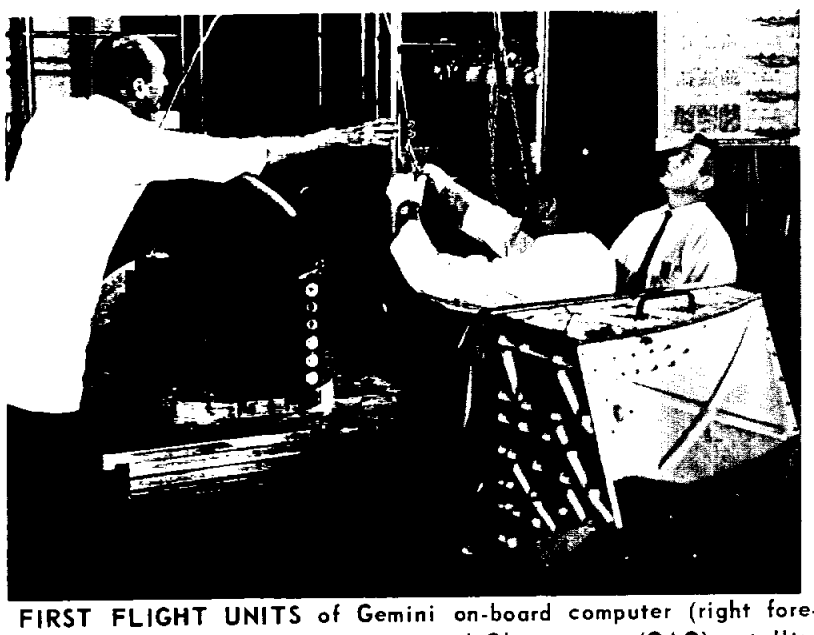
Meteoroid particles, while plentiful and swift (averaging 150,000 mph), are not expected to be a major problem for properly designed space stations.

Although a space station in low orbit will be peppered periodically by the minute (mostly less than sandgrain-size) micrometeoroids, it is anticipated that only an occasional puncture may be experienced. A detection system could set off alarms and alert the space men to patch the holes.

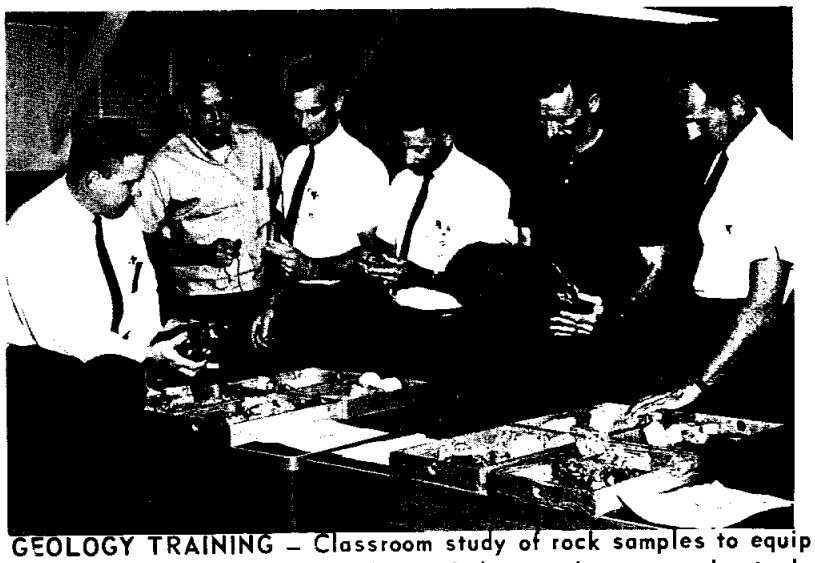
In making inside space station repairs, Lockheed-California engineers recommended a down-to-earth "tire patch" technique, using an adhesive-backed plastic film in combination with fabric and rubber. A sealing compound should be spread over for additional protection, they added. Self-sealants--chemicals, foam, elastics--could be used in inaccessible areas.



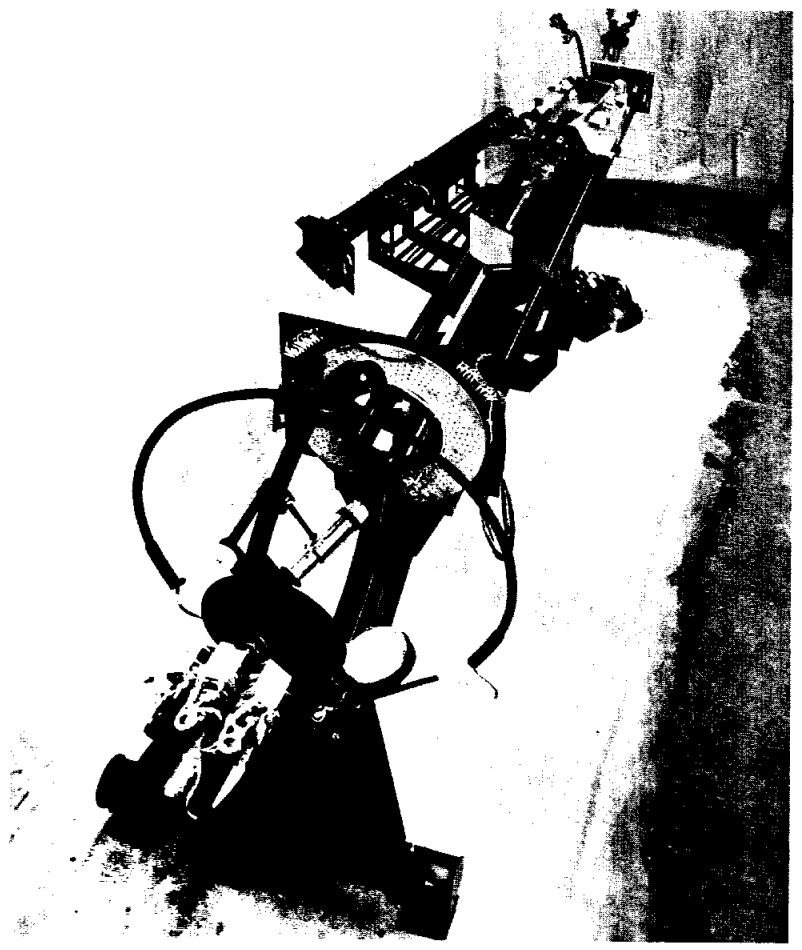
IRANIAN VISITOR TO MSC – Mohammad Garagozlou, director of the government owned factories of Iran and participant in the Foreign Leader Program of the U. S. Department of State, was a recent visitor here at MSC. He is shown at left with interpreter Halek Sahami, State Department, and Richard S. Johnston (right), chief, Crew Systems Division.



FIRST FLIGHT UNITS of Gemini on-board computer (right foreground) and the Orbiting Astronomical Observatory (OAO) satellite data processor (left) are shown undergoing final acceptance tests at IBM's Space Guidance Center, Owego, N. Y. Coincidentally, both units were accepted and shipped in the same week – the computer to McDonnell Aircraft Corporation and the data processor to Grumman Aircraft Engineering Corporation. The computer will be aboard Gemini during the upcoming suborbital test flight. Future Gemini units will aid two-man crews in navigating their vehicles.



GEOLOGY TRAINING – Classroom study of rock samples to equip the astronauts with geological knowledge so they can selectively obtain samples of the moon's surface is conducted by Uel S. Clanton (left), NASA Geologist. Examining rock samples are (l. ro r.) Astronauts Clifton C. Williams Jr., Eugene A. Cernan, William A. Anders, R. Walter Cunningham, and Theodore C. Freeman.



RENDEZVOUS DEVICE – Shown in an interim stage of development is a typical device built by Link which generates the necessary vehicle images for simulated rendezvous in space.

EDITOR'S NOTE: This is the twenty-eighth in a series of articles designed to acquaint MSC personnel with the Center's industrial family, the contractors who make MSC spacecraft, their launch vehicles and associated equipment. The material on these two pages was furnished by the Information Representative, Systems Division, General Precision, Inc., Link Group.

Spaceflight Simulation Equipm

For thirty years Link trainers have provided a means for teaching flying to a countless number of military and civilian pilots. In 1934 the Army Air Corps signed a contract with Edwin A. Link for the first flight trainer. This contract called for a prototype and nine production units. The trainers were produced in a small room set aside in his father's organ factory.

Today, the Link Group of General Precision, Inc. has grown from this humble beginning to over half a million square feet of floor space, with facilities in Binghamton and Pleasantville, N.Y. and Palo Alto, Calif. General Precision/Link has remained no less than first in its field throughout its history. The name is synonymous with flight training equipment.

In late 1962 Link was awarded its first and second major contracts for spaceflight simulation equipment. One contract was for the design, development and manufacture of a complete spaceflight simulation facility for the Air Force, and the other for digital simulation computation equipment and computer programs for the Gemini Mission Simulator, the first located at Cape Kennedy and the second to be located at Houston. The latter was provided under subcontract with the Electronic Equipment Division, McDonnell Aircraft Corporation which was responsible for development of the Gemini trainers.

Gemini flight crew mission training will be in these Gemini trainers, the main computer system of which is the Link Mark I digital computer.

In the Gemini trainer computer complex, the Mark I provides real-time solutions to the equations describing orbit mechanics, aerodynamic forces and moments, and trajectories during simulated launch, orbit, and descent. In addition, the Link computer handles the computations associated with the attitude control system, orbital navigation, and all other functions pertaining to the flight of the spacecraft. Orbit mechanics and attitude control of the target vehicle for the rendezvous maneuver is also computed.

To accommodate the varied dynamic requirements of the Gemini simulation problem, the mission computations are divided into two phases which are stored on the general program section of the Mark I drum.

The first phase consists of the simulation of launch to sustainer engine cutoff (insertion into orbit). The second phase is composed of the remainder of the mission which is orbit to re-entry and letdown, plus the duplication of the attitude control and maneuvering electronics (ACME) that controls the rotational motion of the spacecraft, much as an autopilot stabilizes an aircraft.

Switching between the two programs takes place automatically, whenever sustainer engine cutoff is reached or switching is activated by the instructor.

A feature of the Mark I for Gemini is the automatic data pre-selection portion of the computer drum which serves as a storehouse of initial conditions (mission phase starting points). There are thirty-two sets of initial conditions meaning that the instructor can begin the training problem at any one of thirty-two points in the mission.

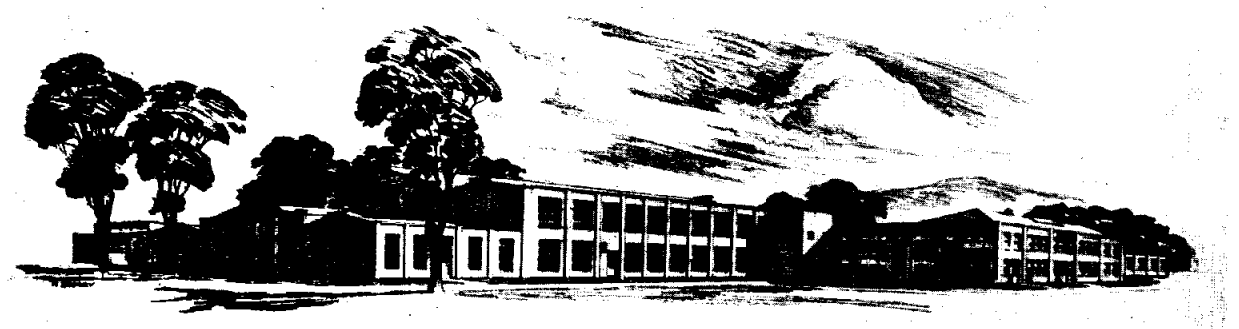
Upon selecting a particular set of initial conditions, all words of that set are automatically loaded into preassigned core memory locations for computational use. This is done by merely pushing an "enabling" button that appropriately affects the time-varying equations. When the "operate" button is pressed, the problem commences from the point selected.

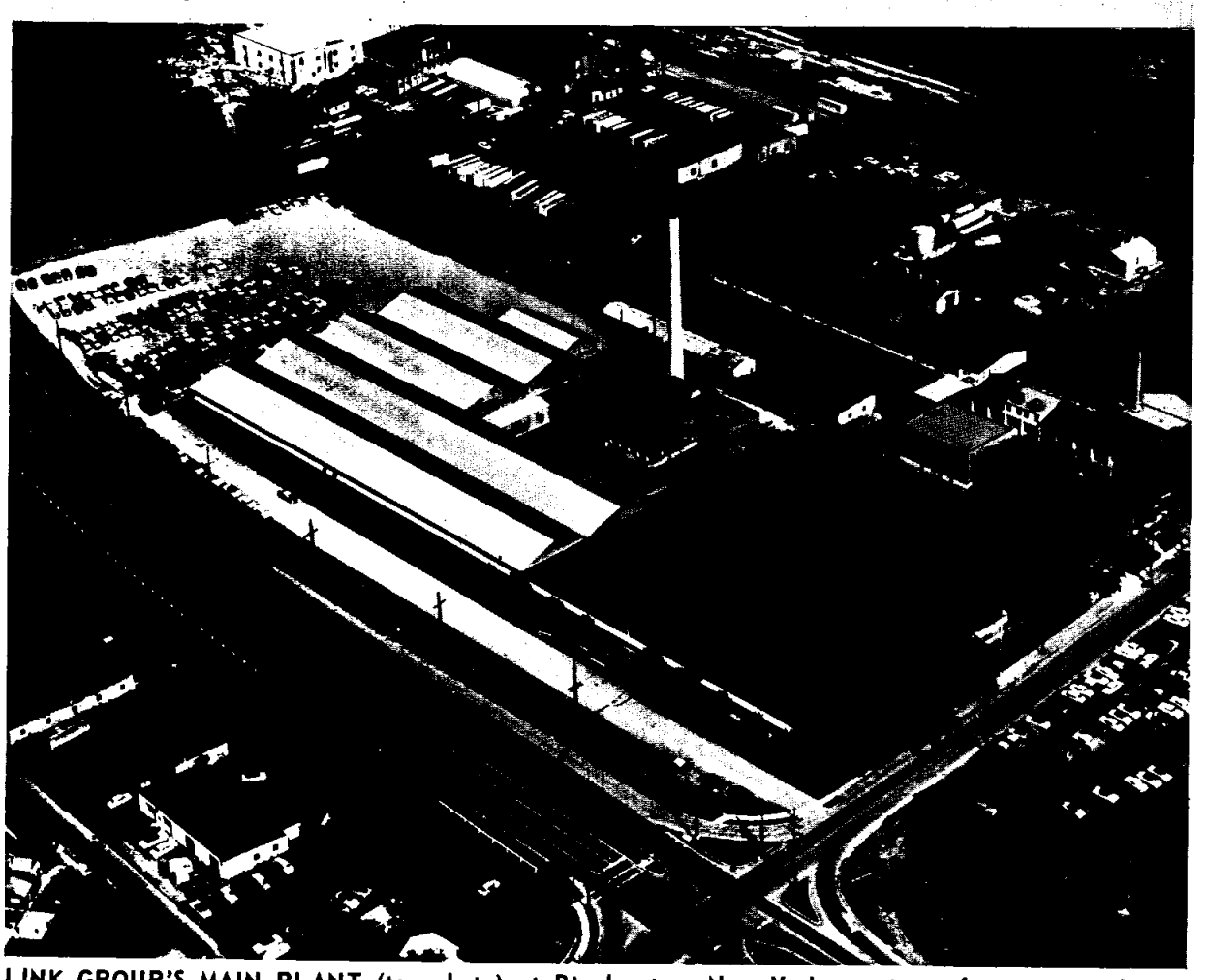
If the instructor wishes to jump ahead to a new phase during the operation, he can push a "problem freeze" button, select the new starting point desired, push the "enabling" button, and resume the exercise by pushing the "operate" button. This allows astronauts to concentrate upon troublesome portions of the mission.

Early in 1963, Link was awarded a contract from the Space and Information Systems Division of North American Aviation to direct the design and development of mission simulation facilities for NASA's project Apollo.

The largest and most complex ever planned, these facilities will provide realistic, continuous simulation of the Apollo space vehicle throughout all of its mission phases well ahead of the actual mission for placing U.S. astronauts on the Moon. Further, all onboard vehicle subsystems will be simulated in a manner to permit training under whatever normal or abnormal conditions may be encountered.

Integral features of the





LINK GROUP'S MAIN PLANT (top photo) at Binghamton, New York consists of approximately one quarter of a million square feet of floor space devoted to manufacturing, general administration offices, and an advanced development laboratory. Plant No. 2 in Binghamton (lower photo) contains approximately 150,000 square feet of floor space devoted to the production of simulators and trainers, and to subcontract assembly and fabrication.

LLOYD L. KELLY president of the Link Group, General Precision, Inc.

JAMES M. McGOWAN vice president program management of the Link Group, General Precision, Inc.

MSC Toastmasters Meet Elect First Club Officers

The recently organized Toastmaster club here at MSC met May 20 in the Executive Dining Room of the Cafeteria and elected officers to lead the club during the coming year.

Elected were William Der Bing, president; Philip Hamburger, educational vice president; Donald Gregory, administrative vice president; Marv Matthews, secretary; Jim Grimwood, treasurer; and Lloyd Yorker, sergeant-at-arms.

The presiding officer for the evening was Toastmaster Philip Hamburger. Area Governor J. W. Albritton delivered a talk on the organization and functions of Toastmasters along with the duties of each officer elected.

Toastmaster meetings are held the first and third Wednesdays each month from 5 to 6 p.m. in the Executive Dining Room of the Cafeteria.

Party Bridge Club Meets For Play Also Elects Officers

The MSC Party Bridge Club held its regular meeting May 12 at the Ellington AFB Officer's Open Mess and also elected officers to lead the group.

Stig Ekeroot was elected president and Carolyn Detmore was elected secretary-treasurer.

Winners for the evening were: first place, Bill Beeson, and second place, Paige Burbank.

All MSC employees and their guests interested in a sociable game of contract bridge are invited to contact Ekeroot at Ext. 35425 or Detmore at WA 8-2811, Ext. 3235.

Scuba Diver Class Graduates Tonight

Graduation exercises tor the first class of the MSC/EAA SCUBA class will be held at 7 p.m. tonight in Bldg. 323 at Ellington AFB.

Dick Holt, instructor, will present successful candidates with certificate cards.

An organizational meeting will also be held to establish a club charter and officers will be elected. Also on the agenda is the showing of an underwater color movie and making plans for a group diving outing.

Experienced divers, students and interested parties are invited to attend.

Spotlight On Secretaries...

LILLIAN ENRIQUEZ (upper left), secretary to C. L. Taylor, project officer, command and service modules, Apollo Spacecraft Program Office, Joined MSC and the Apollo office in September 1962. Prior to her present secretarial duties, she was in the Systems Integration Division of Apollo. Lillian was born in San Antonio, Tex., and was graduated from the San Antonio Vocational and Technical High School in that city. Prior to employment with MSC, she was a secretary at Lackland Air Force Base, San Antonio. Lillian includes bowling, dancing and reading among her recreational interests. She resides in Houston.

VELNA M. TROXLAR (upper right) is secretary to A. D. Mardel, chief, Reliability and Quality Assurance Division, Apollo Spacecraft Program Office. She joined MSC in February 1963 as a secretary in the Flight Projects Division and assumed her present position this past January. Born in Alamance, N. C., she is a graduate of Clear Creek High School and attended the University of Houston and Metropolitan Business College in Galveston. Prior secretarial jobs were with the American Oil Company in Texas City and the USAF at Ellington. Her husband Roy is employed by the American Oil Company and they reside in Texas City. The couple has two sons Roy and Gene, living in New Mexico and a daughter Barbara, attending the University of Houston. Velna was recently elected president of the Business and Professional Women's Club of Texas City for the 1964-65 term. She includes gardening, reading and club work as her main interests.

how to be a spy

in six easy lessons

3

Check wastepaper baskets for pay dirt.
Scribbled notes and frazzled carbons are just as good as "smooth copy."

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SAFEGUARD CLASSIFIED MATERIAL!

PERSONNEL NOTES:

(EDITORS NOTE: The messages in this column are being presented by the MSC Personnel Office).

Women In Federal Service

The President's Commission on the Status of Women has just recently completed its work and submitted its report to the President. The Commission was charged with assessing the current status of women in this country and with making recommendations, as needed, for constructive action to advance the full partnership of men and women.

One area of concern of the Commission was the existence of attitudes, customs, or practices which unjustly affect the employment status of qualified women who choose to work outside the home or are forced by family or other personal circumstances to do so.

In announcing the establishment of the Commission in December 1961, President Kennedy said:

"Women are entitled to equality of opportunity for employment in Government and in industry.....

"I believe that Federal employment practices should be a showcase of the feasibility and value of combining genuine equality of opportunity on the basis of merit with efficient service to the public.

"It is my firm intent that the Federal career service be maintained in every respect without discrimination and with equal opportunity for employment and advancement."

The President specifically charged the Commission with examining, among other things, the employment situation in the Federal services.

At the same time he requested the Chairman of the Civil Service Commission, also a member of the Commission on the status of women, to begin working with the various departments and agencies in eliminating existing personnel practices which might be discriminatory with respect to one sex or the other.

In line with its overall mandate, the President's Commission established a number of subordinate committees, one of which was the committee on Federal employment policies and practices.

This committee was concerned with constructive employment opportunities for women in the competitive service, the excepted service, the foreign service, and the armed forces.

It was this committee which initiated action resulting in the abolition last year of the long-standing appointment and promotion policy which had permitted, over the years, any Federal appointing official full discretion to limit his consideration to men or to women, without regard to duties to be performed.

A number of steps are being taken within NASA to expand the opportunities for employment and advancement of women.

Daisy Fields, Personnel Division at NASA Headquarters, has been designated to coordinate the Status of Women Program in NASA.

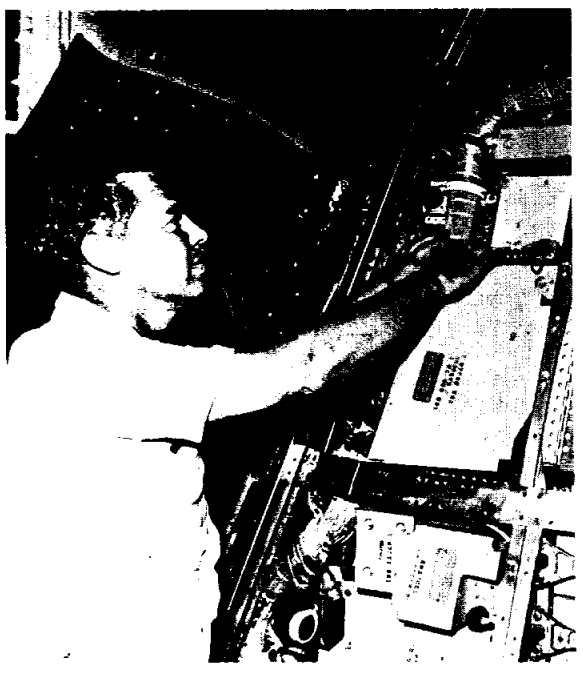
Kathryn C. Walker, MSC Personnel Division, is the coordinator for the Manned Spacecraft Center.

LEAGUE CHAMPIONS – The NASA 5 – P. M. Monday bowling league ended May 11 with the Hot Shots as league champions. They are (front row l. to r.) Douglas Hendrickson, Hazen Walker and Billy Calhoun, (back row l. to r.) Charles L. Wagner, Edward S. Johnson, and Charles Eckert.

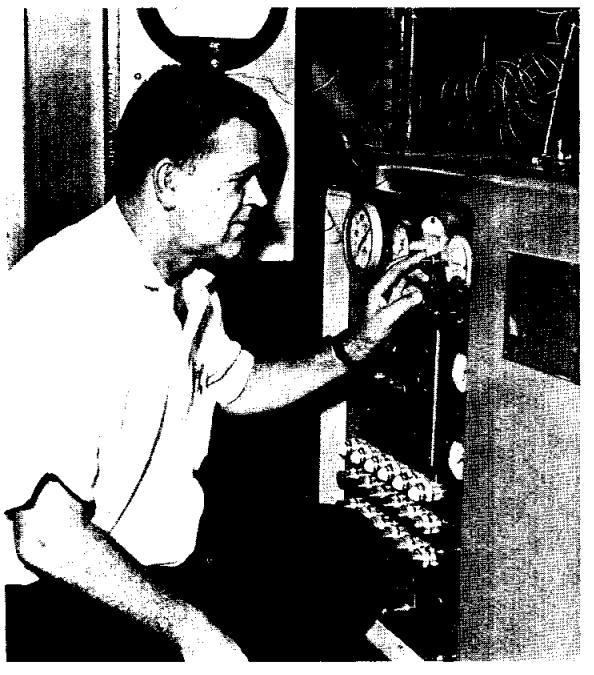
MSC at work...

JOSEPHINE JOW, programer, Information System Branch, Computation and Analysis Division, operates an IBM 1403 printer in the design section.

GRACE MALICOTE, assistant librarian, Library Service Branch, of the Technical Information Division, files cards on new acquisitions in the card catalogue cabinet.



JERRY H. FLEMING, experimental machinist, Field Test Branch of the Technical Services Division, checks the watertight connections on a Gemini spacecraft test vehicle.



JOSEPH J. McGUIRE, mechanical technician, Environmental Facilities Branch of the Structures and Mechanics Division, adjusts the helium refrigeration on Chamber E in Hanger 135 at EAFB.

MSC BOWLING ROUNDUP

MSC MIXED LEAGUE
Standings as of May 19.

Team	Won	Lost
Alley Oops	98½	41½
Eight Balls	89	51
Five Flushers	84½	55½
Snap Shots	77½	62½
Virginians	77	63
Space Mates	74	66
Little Splits	73½	66½
Pricers	73½	66½
Celestials	73	67
Hardley Ables	64½	75½
Aborts	59	77
Core Dumps	57	83
Gabs	51	89

High Game Women: C. Barnes 213, 207, M. Lewis 211.
High Game Men: A. Farkas 246, B. Harris 240, J. Pavlosky 236.
High Series Women: C. Barnes 554, 545, 545.
High Series Men: P. Petersen 640, A. Chop 632, 606.
High Team Game: Alley Oops 984, 938, 930.
High Team Series: Alley Oops 2658, 2636, 2597.

NASA 5 PM MONDAY
Final standings for season ending May 11.

Team	Won	Lost
Hot Shots	79	49
Computers	69	59
Alley Gators	68	60
P&C Division	66	62
Suppliers	57	71
Accounting	45	83

High Game: H. Walker 242, J. McIver 227, G. Carter 217.
High Series: A. Lee 592, H. Walker 589, G. Carter 578.
High Team Game: Alley Gators 920, Hot Shots 920, Suppliers 870.
High Team Series: P&C Division 2519, Suppliers 2484, Computers 2442.

MSC COUPLES LEAGUE
Standings as of May 19.

Team	Won	Lost
Ridgerunners	46½	21½
Lame Ducks	42½	25½
Spare-O's	35	33
Four Aces	34	34
Hackers	33½	34½
Schplitz	31	37
Shucks	31	37
Bowlernauts	30½	37½
Goofballs	28	40
Piddlers	28	40

High Game Women: C. Clyatt 215, V. Lantz 200.
High Game Men: H. Maples 245, G. Sanders 223.
High Series Women: C. Clyatt 515, J. Sands 513.
High Series Men: H. Brasseaux 564, H. Maples 560.

MSC MEN'S LEAGUE
Standings as of May 14.

Team	Won	Lost
Lunar Lights	47	21
Turkeys	39	29
Whirlwinds	38	30
Fizzlers	36	32
Tecnics	36	32
Spastics	34	34
Pseudonauts	34	34
Overshoots	30	38
Asteroids	25	43
Cosmonuts	21	47

High Game: J. Garino 266, B. Harris 263.
High Series: J. Keggins 650, J. Strickland 621.
High Team Game: Tecnics 965, Turkeys 940.
High Team Series: Tecnics 2566, Spastics 2488.

MSC Duplicate Bridge Group Now Giving Master's Points

Nine tables of MSC Duplicate Bridge players met at the Ellington NCO club May 19 with Fractional Master's Points being awarded to the winners.

Now affiliated with the American Contract Bridge League, the club awards Fractional Master's Points (FMP) at each session. Master Point nights will be held as they become feasible.

Winners on May 5 were: N-S, A. E. Kilpatrick, and Richard Tuntland; E-W, Mr. and Mrs. John Herrmann. Each received .12 FMP for being winners in a six table Mitchell movement.

The Duplicate Bridge Club meets on the first and third Tuesdays of each month at 7:15 p.m. in the EAFB NCO Club. Interested parties contact Jim Raney, Ext. 35468 or Evelyn Huvar, Ext. 32541.

Search Is On For Talented Musicians

Anyone interested in becoming a part of a dance band, combo, or other musical group, can utilize their talents as a musician by calling Clint Taylor at HU 3-2841.

Langley Studies Sun Controlled Space Satellites

Satellites controlled by the Sun may become one of the newest things under the Sun.

The possibility of controlling satellites through solar pressure is being studied by NASA's Langley Research Center.

Scientists are investigating special coating materials of varying sensitivity to solar pressure. These would be used in conjunction with a magnetic coil--activated by solar pressure inside the satellite.

...ent Supplied By Link

facility design will be the incorporation of a highly flexible computer complex as well as a unique visual display system.

The Apollo simulator will duplicate the following to a high degree of accuracy: pre-launch conditions, first-and-second-stage boost and separation, parking and earth orbits, insertion into translunar trajectory, initial and midcourse coast, circumlunar pass, pre-retro coast and retro-to-circular lunar orbit, circular lunar orbit, separation with lunar excursion module (LEM), insertion to transearth trajectory, initial and midcourse coast, and re-entry and landing.

Effects of booster separation and space lighting, enabling the astronauts to see the Moon and Earth in proper relation to the spacecraft during all mission phases will be provided. Food, water, and waste systems will also be included and operational in the simulators. Heat will be introduced into the astronauts space suits to simulate re-entry temperatures.

A complete out-of-the-window visual display will be provided at each of the five viewing windows continuously throughout a simulated mission. All of the viewable objects in space will be displayed in proper perspective by means of a unique system that contains as much as eight tons of glass in the form of lenses and large curved mirrors.

Astronauts will train in the rendezvous and docking maneuvers that are required between the command module and the lunar excursion module. The visual cues of these maneuvers are provided at the two docking windows through high resolution closed-circuit TV.

The display system is designed such that astronauts will see a realistic view from any angle. This is achieved through the use of a wide-angle viewing system and a large exit "pupil" located at each window.

An instructor-operator station (IOS) is equipped to control the simulator and to monitor the astronauts performance via several closed-circuit TV monitors. IOS also informs the instructor of the status of virtually every indicator, control, and instrument in the command module.

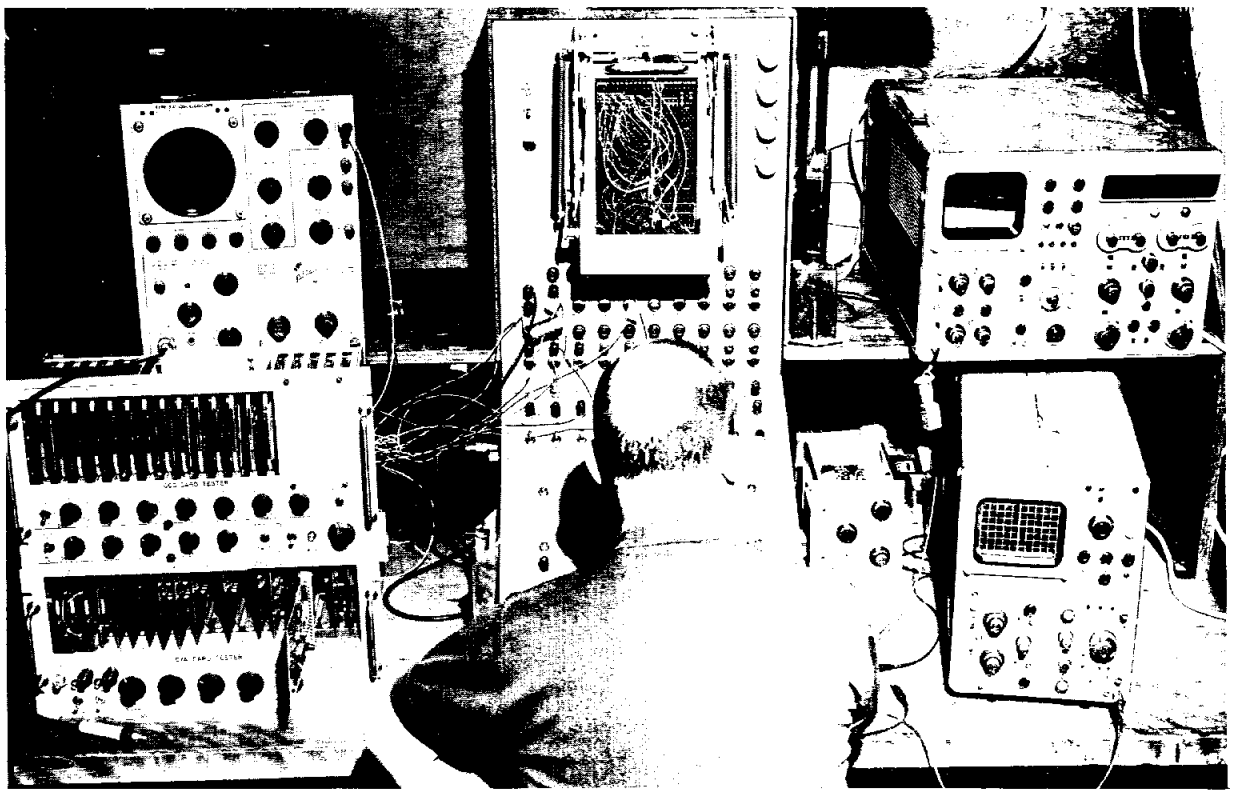
There is a direct hook-up between each simulator and the Mission Control Center (MCC). Thus, the astronauts will not only be engaged in the physical simulation of the two week round trip to the Moon, but will also be in contact with the real-world network of monitoring stations including communications with Australia, Iceland, and other actual stations.

Other General Precision, Inc. companies in addition to Link are engaged in various NASA projects. They are the Librascope Group, Glendale, Calif. and the Aerospace Group in Little Falls, N. J.

Among the products manufactured for NASA programs are computers for the Centaur guidance system, and the gyros which played a key part in "steering" the Mariner II spacecraft into a corrected course in its flight to Venus.

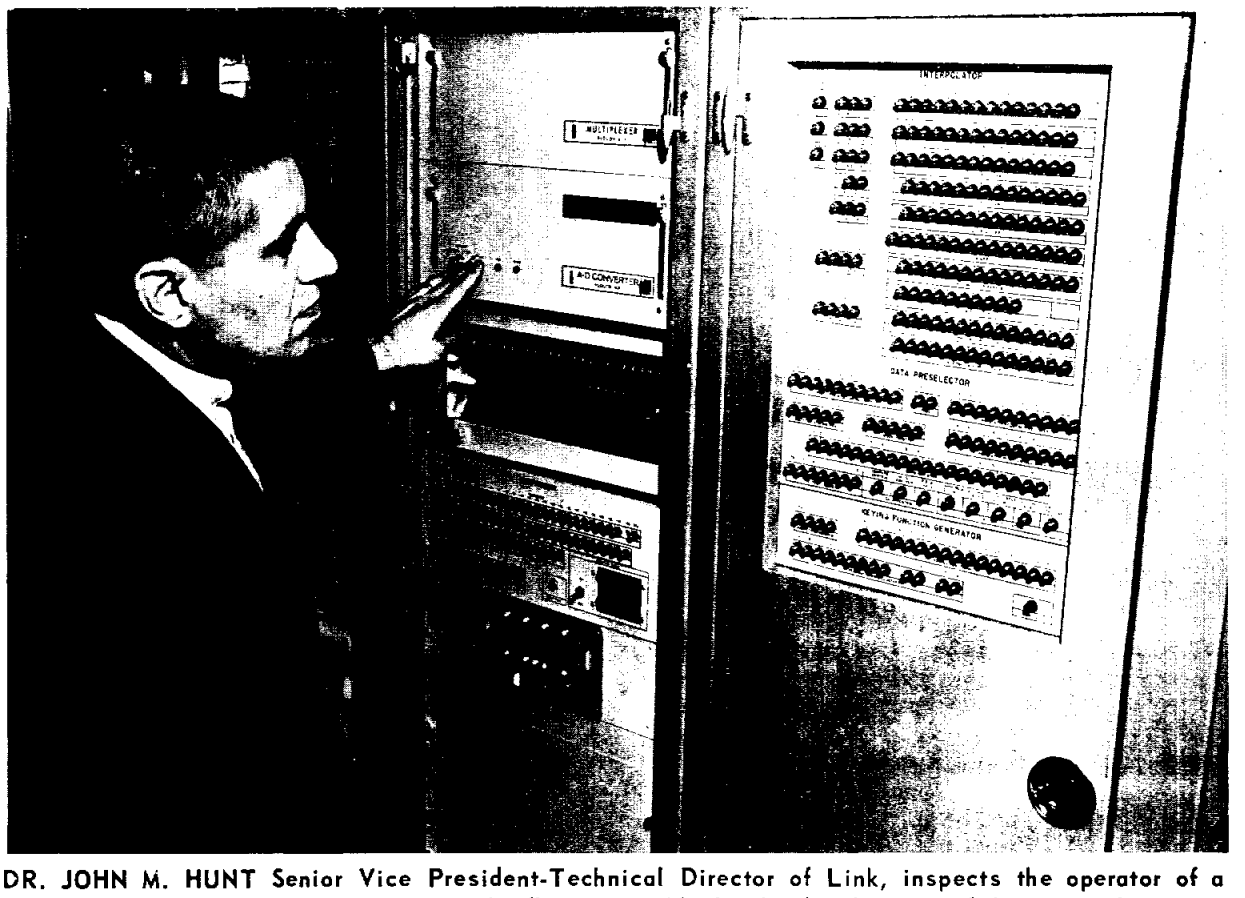
In addition, the GPL division of General Precision Aerospace Group recently received a contract for 73 precision television camera systems for use in NASA's Integrated Mission Control Center.

APOLLO FLIGHT SIMULATOR – This artist's rendering shows the instructor-operator station (IOS) which is equipped to control the simulator and to monitor flight crew performance via several closed-circuit TV monitors. Virtually every indicator, control and instrument in the Apollo command module are displayed at the IOS.



CIRCUIT CHECKOUT – A complete digital assembly checkout facility for testing in-process and completed assemblies. This set-up, of the latest equipment available, is designed for checking all printed circuit card modules that are common to digital computers including digital-to-analog converters.

ALL DIGITAL system solid-state components that are manufactured at Link are wired using the connector to connector impact insertion method for increased reliability.



DR. JOHN M. HUNT Senior Vice President-Technical Director of Link, inspects the operator of a Mark I Digital Computer. Dr. Hunt was chiefly responsible for the development of this special-purpose computer for aerospace digital simulation computation.

The SPACE NEWS ROUNDUP, an official publication of the Manned Spacecraft Center, National Aeronautics and Space Administration, Houston, Texas, is published for MSC personnel by the Public Affairs Office.

Director . . . . . Robert R. Gilruth
Public Affairs Officer . . . . . Paul Haney
Chief, News Bureau . . . . . Ben Gillespie
Editor . . . . . Milton E. Reim

On The Lighter Side

Dr. Dryden Says, 'U. S. Can Well Afford Space Program'

The United States can well afford the development of its space exploration capability, the trip to the Moon and the price of the high adventures to follow, Dr. Hugh L. Dryden, Deputy Administrator of the National Aeronautics and Space Administration, said recently in Detroit.

In an address to the Economic Club of Detroit, Dr. Dryden pointed out that the total NASA space program costs the nation about 50 cents a week per capita. This, he notes is less than Americans spend on cigarettes and alcohol.

Dr. Dryden said that the Apollo manned lunar landing program "represents a unifying goal, an incentive, and a spur to achievement. In a sense the trip to the Moon makes an ideal goal, since it is difficult enough to require us to build a new and vital technology but not so difficult that it cannot be accomplished."

Dr. Dryden emphasized that the Apollo program is an "orderly" one and not a "crash" program as sometimes charged. He said the program is "a well planned effort at nearly the optimum rate, i.e., that which produces the minimum overall cost to reach the stated objective. If adequately financed and no unknown insuperable problems arise, we expect to reach our objective of lunar landing and return within this decade."

"The Moon is the first way station on a journey soaring outward into infinity," Dr. Dryden said. "This nation's ability to lead the world in space endeavors depends chiefly on our solving the problems inherent in the first lunar landing as quickly as possible, and on getting ourselves ready for the next steps--both peaceful and defensive--which the world's leading spacefaring nation must take."

Dr. Dryden noted that the first venture into space, Sputnik I by the Soviet Union, "could have been ours--we had the ability to do it but not the foresight or the determination to do it.

"In the years since, this country has done much to atone for that mistake, and most people today realize we cannot remain a leader of the Free World Nations unless we pursue the exploration of space with all the resources required. This is not merely a question of national prestige--our national security is inevitably involved."

WELCOME ABOARD

Fifty-five new employees joined the Manned Spacecraft Center during the period April 26 through May 11, 1964. Of these, 13 were assigned to Cape Kennedy, Fla., five to White Sands Missile Range, N.-M., one to St. Louis, Mo., and the remaining 36 here in Houston.

MSC-FLORIDA OPERATIONS (Cape Kennedy, Fla.): Phillip E. Hooper, Julia R. Stevens, William R. Slattery, Henry H. Rogers Jr., Horace L. Lamberth, David V. Kerns Jr., Mary J. Hooper, Leon T. Fain Jr., Edward F. Miller, Betty P. McKibben, David R. Moore, Stanley M. Blackmer, and Larry E. Thompson.

APOLLO SPACECRAFT PROGRAM OFFICE: Laura L. Lord, Sheila Fleming, M. Kae Yates, and Inez B. Reynolds.

WHITE SANDS MISSILE RANGE (New Mexico): Judith A. Williams, Emma T. Acosta, and Willis G. Brown.

FACILITIES DIVISION: Meryl L. Wilde.

FLIGHT CONTROL DIVISION: Philip C. Shaffer, and Harry E. Wiener Jr.

PROPULSION AND ENERGY SYSTEMS DIVISION: Rebecca Sue Griffin (WSMR), Kenneth B. Gilbreath (WSMR), R. L. Clay, Lester J. Wynn, and William D. Taliaferro.

GEMINI PROGRAM OFFIVE: David H. Cordiner, and William F. Meek.

PROGRAM ANALYSIS AND RESOURCES MANAGEMENT DIVISION: Frank P. Parker, and Gary K. Goll.

PHOTOGRAPHIC DIVISION: Franklin Mayo, and James R. L. Dean.

CREW SYSTEMS DIVISION: Howard N. Hunter, and Robert P. Heaney.

FLIGHT CREW SUPPORT DIVISION: Herbert R. Greider.

CENTER MEDICAL OFFICE: J. Vernon Bailey.

GUIDANCE AND CONTROL DIVISION: Laquetta J. Webber, and Francis R. Lindsay.

OFFICE SERVICES DIVISION: Betty L. Reedy, and Mary L. Johnson.

PERSONNEL DIVISION: Bobbie S. Bates.

STRUCTURES AND MECHANICS DIVISION: Alfred Talas, and John T. Milton.

MISSION PLANNING AND ANALYSIS DIVISION: Jerry C. Bostick.

LOGISTICS DIVISION: Joanna Y. Yacura.

TECHNICAL SERVICES DIVISION: Ray Ramirez, Jerry D. Purcell, Billy C. Dye, and Clyde B. Trevey Jr.

OFFICE OF ADMINISTRATIVE SERVICES: Mildred D. Cascaden.

PROCUREMENT AND CONTRACTS DIVISION: Otis Blackmon Jr.

ENGINEERING DIVISION: Gerald C. Shows.

TECHNICAL INFORMATION DIVISION: Rosalie A. Laxton.

Lunar Orbiter

(Continued from page 1)

with a basic value of about $80 million.

The Orbiter program, which includes five spacecraft, will take close range photographs of the lunar surface for scientific study and to help select landing sites for the manned lunar landing program.

Lunar Orbiter will weigh about 800 pounds, will be three-axis stabilized, and will be launched from Cape Kennedy, Fla., beginning in 1966 by Atlas-Agena.

MSC PERSONALITY

Scott H. Simpkinson Manages Gemini's Testing Program

Serving as chief editor of the "Gemini Program Mission Report", is one of the most recent accomplishments of Scott H. Simpkinson, Test Operations Manager of the Gemini Program Office.

Simpkinson edited the 220 page report that coordinated all pre-launch, launch and post launch information from the GT-1 flight on April 8 at Cape Kennedy.

On future Gemini flights he will continue as editor of the mission reports.

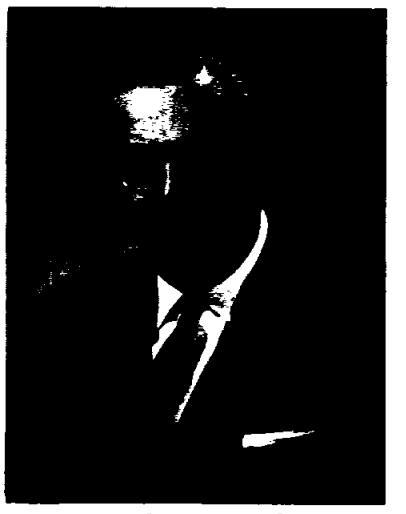
As Test Operations Manager, Simpkinson is responsible for test planning and the evaluation of results of tests performed in support of the Gemini program and for the procedures, equipment, and hardware associated with the testing.

In this capacity, he establishes and coordinates test programs, stipulating the test conditions and the type and amount of measurements to be made.

The tests include: evaluation tests; spacecraft and launch vehicle checkout tests, both at the manufacturing sites and launch sites; qualification and reliability testing; and ground and flight tests, excluding only developmental testing which is the responsibility of the organization principally concerned with the system or systems involved.

Simpkinson joined NASA (then NACA) in 1943 at the Lewis Research Center and the Manned Spacecraft Center (then the Space Task Group) in 1958 as chief of the Launch Operations Branch at Cape Kennedy.

Born in Piqua, Ohio, he attended high school in that city and in 1943 received a degree in mechanical engineering from the University of Cincinnati.



In 1959 he served as test conductor on Big Joe and on MA-I in 1960. He also served as test conductor on MR-I during the checkout.

During this period he formulated many of the operational procedures, and was responsible for the attention to detail that contributed much to the success of the Mercury program.

In November 1960 he went to St. Louis as systems consultant for the Engineering Division chief of Mercury.

From June 1961 to March 1962 he represented MSC as a special assistant to the director at the General Dynamics/Astronautics plant in San Diego and was present for the Mercury-Atlas launch vehicle composite test data reviews and factory roll-out inspections.

He became technical advisor to the Gemino Project manager in April 1962 and was named to his present position in November 1963.

Simpkinson is author or co-author of half a dozen technical NASA papers relating to his research fields since joining NASA.

He is a member of the American Institute of Aeronautics and Astronautics, a senior member of the Instrument Society of America, and the American Society of Mechanical Engineers.

Simpkinson is married to the former Arleen Ann Baxa of Cleveland, Ohio and the couple has one daughter, Carol Anna, age 12.

His hobbies include playing the trumpet (he has played in dance bands over the past 20 years) and he enjoys golf, when and if he can find the time.

Manned Apollo Vacuum Chamber Tests Check Environmental Control System

A giant metal vacuum chamber and an Apollo spacecraft test crew compartment are being readied in Downey, Calif., for manned tests of equipment that will provide a shirtsleeve environment for NASA's moon-bound astronauts.

The program is the start of an extensive manned environmental control system test series at North American Aviation's Space and Information Systems Division for NASA's Manned Spacecraft Center.

The test series, in which three men will spend up to 14 days operating the environmental control and life support equipment, is scheduled to begin in July and run through mid-1965.

The dome-shaped vessel, which functions like a laboratory bell jar, has been designed to test the crew compartment in a vacuum--an airless space environment.

The vacuum will be produced by enclosing the three-man Apollo test crew compartment within the 15-ton stainless steel dome 18 feet in diameter and 17 feet high. The air will be withdrawn from the space between the giant bell jar and crew compartment.

The Apollo environmental control system is being developed and fabricated by the Garrett Corporation's AiResearch Manufacturing Division, Los Angeles, under subcontract to North American's Space Division.

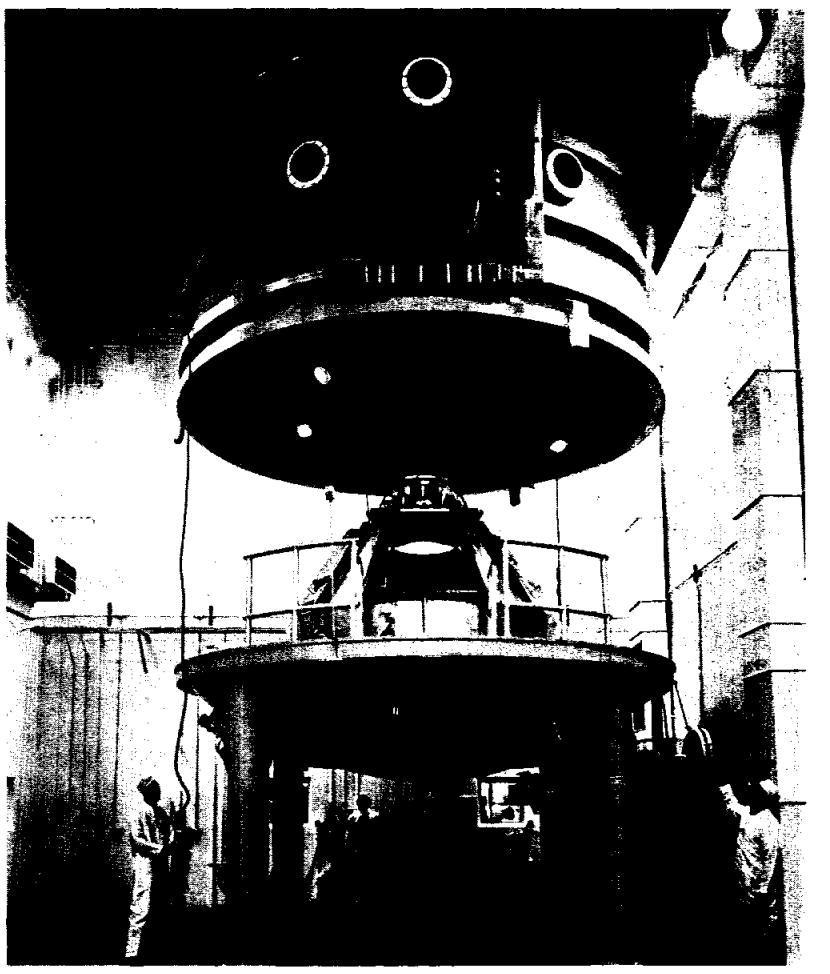
The system must provide the three Apollo crew members with a controlled environment during their 14-day round trip mission to the moon, and provide temperature control for other subsystems in the command module.

It will remove odors in the capsule and carbon dioxide exhaled by the astronauts by filtering the recirculated 100 per cent oxygen through lithium hydroxide and activated charcoal.

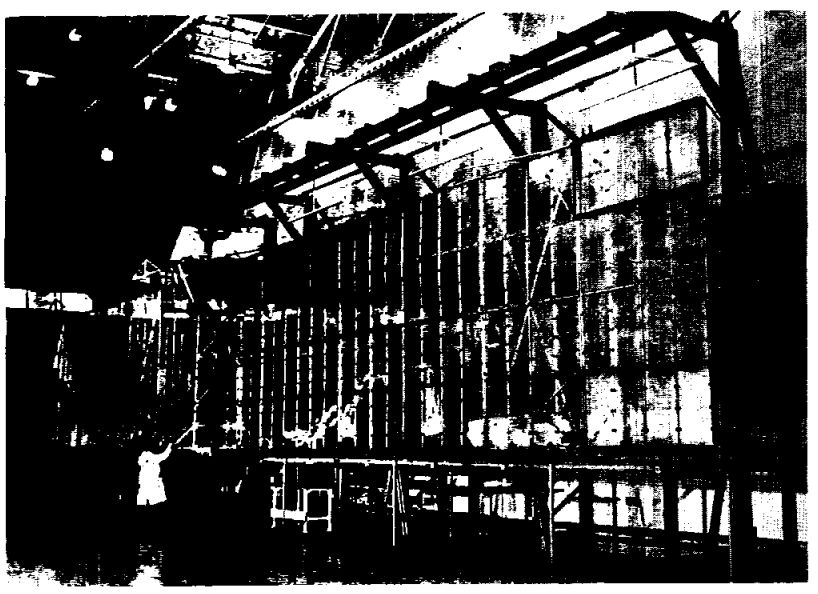
Moisture in the command module's atmosphere will be removed by separators and stored by the water management subsystem. A 75-degree average temperature is planned.

En route to the moon, space radiators on the service module will remove heat generated by the command module's operating equipment, the sun, and the crew.

The average cabin pressure will be equivalent to an earth altitude of 23,000 feet (approximately 1/3 the pressure the body senses at sea level). Relative humidity of the command module's atmosphere will be between 40 and 70 per cent during normal operation.



SPACE JAR READIED – Scientists prepare metal vacuum cell and and Apollo crew compartment for manned tests of the environmental control system that will produce a habitable environment for astronauts. Tests are conducted at North American's Space Division, Downey, Calif., for NASA's Manned Spacecraft Center. Huge 15-ton dome encloses aluminum spacecraft creating space-like vaccum.



SATURN SATELLITE – This is a dynamic test model of a meteoroid detection satellite being developed for the NASA-Marshall Space Flight Center, Huntsville, by Fairchild Stratos, Hagerstown, Md., for launch on Saturn I vehicles (SA-8, SA-9 and SA-10). The panels will unfold in space to form a wing measuring 15 by 96 feet. Electronic detectors will detect the size and frequency of meteoroids, gaining information to be used in the design of spacecraft which will be exposed to the space environment for long periods. The satellite will weigh less than 4,000 pounds.

Extremely Accurate 'Clock' Development To Help Control Gemini-Apollo Missions

An electronic clock so fast and accurate it splits a single second into 100,000 parts is the stop watch for the computer programs being developed for man's first flight to the moon.

The unusual timepiece was developed by the IBM Federal Systems Division as part of a $36-million contract to provide the NASA Manned Spacecraft Center here with a computing complex on the ground to support the Gemini and Apollo missions in space.

The electronic timekeeper, called a time standard unit, provides extremely accurate time in intervals as small as 10 microseconds. This will enable IBM and NASA programmers to write computer programs --precisely scheduled sets of instructions--so that computers can keep track of the intricate mission timetables.

Linked directly to computers, the time standard unit can be queried by the computer whenever the operating program requires time coordination. By its use in the dry runs needed to develop and check out the computer programs, the time standard unit adds a measure of realism by producing time signals for simulated events, such as booster liftoff or the mating of two spacecraft in orbital rendezvous.

With the time standard unit and special timing techniques, program analysts can create an artificial time within the computers--faster or slower than actual time. By compressing "time," programs can be run quickly to check their total performance. By expanding the "time," special studies can be made of programs characteristics in detail.

One of the most important current jobs for the time standard unit is supplying a time reference and a split-thousandths-of-a-second stop watch for the four powerful IBM 7094 computers presently installed in the IBM-developed Real Time Computer Complex of the Manned Spacecraft Center. This speeds the preparation of processing techniques and programs for mission control data in the moon-landing program.

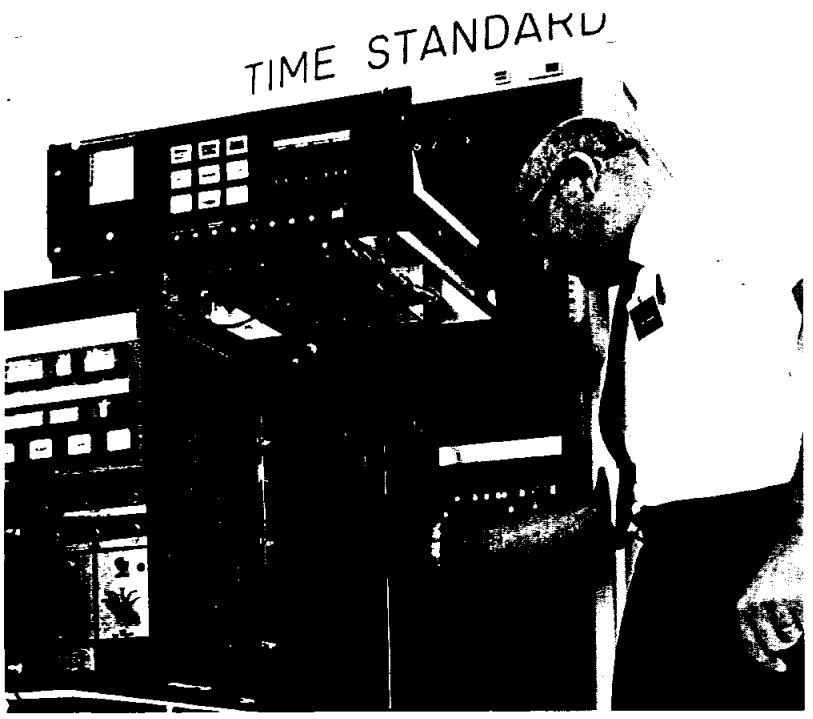
The unit, moreover, plays an important part in a unique computer programming concept IBM is developing to make maximum use of computer power in the moon project.

By a self-monitoring technique, the computers go down a check list in computer memory, performing--in spare millionths-of-a-second--the computing "odd jobs" that must be carried on continuously within the overall computing mission. The program monitor within the computer determines how many microseconds the computer has available to work on an interim computation in this check list before it must go to higher-priority jobs. The time standard unit electronically sounds the alarm when the time is up.

Design and development of the time standard unit is but one of the many special requirements within the $36,000,000 IBM job "to build and staff the most complex real-time computing center the world has yet known," according to James E. Hamlin, the IBM project manager.

Real-time computing for the moon shot program means: (1) acceptance of information from spacecraft and tracking stations around the world; (2) processing and digesting immense quantities of this data; (3) sending the resulting information for display to ground control personnel in time for them to meaningfully affect the progress of the mission. The maximum time required for this entire information handling process within the computer complex will be one-half second.

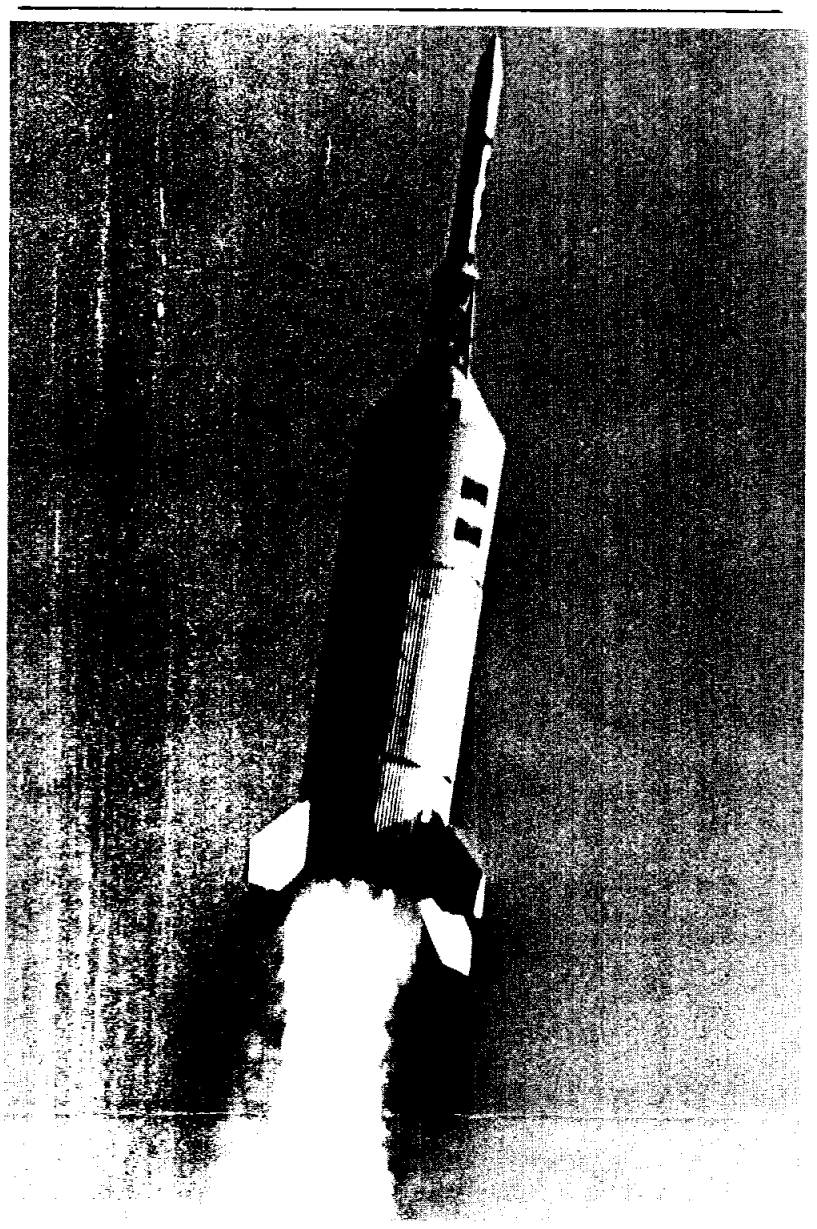
The computers supporting the moon missions must handle 10 times more data and produce 100 times more output than was the case in the Project Mercury flights.



ELECTRONIC "CLOCK" developed by IBM can split a second into 100,000 parts. "Clock" will be used to help control Gemini and Apollo missions here at the Manned Spacecraft Center.

Space News NASA ROUNDUP!

SECOND FRONT PAGE



A ROARING SUCCESS – The Little Joe II rocket with an Apollo boilerplate spacecraft is shown instants after it roared off the launch pad at White Sands Missile Range. The purpose of the flight, to test the launch escape system, was declared to be a complete success.

Apollo-Little Joe II Launch At WSMR Described As Most Spectacular Ever

In what was described as the most spectacular launch ever conducted at the White Sands Missile Range in New Mexico, a Little Joe II rocket lofted the Apollo (boilerplate) spacecraft and launch escape system off to a successful flight on May 13.

The purpose of the flight was to test the launch escape system of the Apollo, and Robert O. Piland, deputy manager of the Apollo Spacecraft Program Office, described the test as a "complete success" at the press conference following the flight.

Launch time, scheduled for 6 a.m. was computed at exactly 5:50 and 59.717 seconds MST.

The visual spectacle of the flight--the launch, the triggered explosion filling the air with burning debris and metal, the escape tower pulling the spacecraft to safety, parachute deployment and descent--temporarily overshadowed the scientific data accumulated by the test.

The Little Joe II launch vehicle left the pad in an orange-red sea of fire, trailed by a silver smoke trail.

At the instant of abort, one of the rocket engines broke from the launch vehicle and dropped separately, burning a brilliant shining white as it fell.

The sky was filled with glittering pieces of metal that resembled confetti, and these along with pieces of burning debris drifted lazily earthward.

Some anxious moments were entertained by spectators immediately after the spectacular destruct of the Little Joe II.

The escape tower was jettisoned at 40.1 seconds after launch. The command module then began a free fall and at 50.1 seconds the drogue chute opened, then 119 seconds after launch the main parachutes were deployed from the spacecraft.

At this point the spacecraft was rotating and the risers from one of the chutes tangled on a brace atop the command module. This caused the chute to collapse and swirl, with the shroud lines snapping as a result of the pressure and releasing the chute.

However, the other two chutes lowered the command module to a safe landing at a 30 feet per second rate of descent.

Future flights will have two drogue chutes instead of one, giving more stability to the spacecraft.

Owen Morris, operations director, said at the post launch news conference that the third parachute was redundant. He said only two parachutes were required and that one chute could lower the command module to earth without serious injury to astronauts inside, providing there were no extreme ground conditions.

The shot, originally scheduled for a Tuesday morning, was postponed until Wednesday because of excessive wind and dust.

George Page, test director, from MSC-Florida Operations, said the countdown progressed smoothly. At one time Page said, the crew was more than an hour ahead of the count and had to slow down in order to let the clock catch up.

This test was the first of five to determine the effectiveness of the escape system up to its maximum designed altitude of 100,000 feet.

A high altitude shot--possibly to 36,000 feet--at supersonic speeds is scheduled for the latter part of this year.

AFTER SAFE LANDING of the Apollo command module a visual check is made of the spacecraft. Looking on (center foreground) are Astronauts James A. Lovell Jr., and Charles Conrad Jr. They were stationed in a forward area during the Apollo launch escape test at the White Sands Missile Range.

S-Band Streamlined Communication System Being Negotiated For Apollo Lunar Spacecraft

The National Aeronautics and Space Administration is negotiating for a streamlined communications system to be used on the Apollo lunar spacecraft.

NASA announced recently that Collins Radio Co. of Dallas and Philco Corp., Palo Alto, Calif., have been selected for competitive negotiations for prime contractor to provide the Apollo Network S-Band Systems.

The estimated $5-million contract calls for a basic purchase of two complete tracking and data acquisition systems with 30-foot diameter antennas and three electronic subsystems.

The single radio frequency and antenna system will be used in the Apollo missions to perform the same functions which required individual facilities on the Project Mercury flights.

Among the functions the single band will handle are tracking, telemetry, updata and television and voice communications.

In the system to be procured, the separate radio frequencies of these functions are combined into one coded carrier frequency and transmitted by a single antenna. The carrier is received by one antenna system and decoded into its individual signals.

These techniques for manned space flight are similar to those developed for deep space telecommunications in the exploratory Project Mariner, with appropriate voice and data channels added to support Apollo requirements.

Chewing Of Gum For Oral Hygiene May Be Used By Astronauts In Space

Scientists here at the NASA Manned Spacecraft Center are investigating the use of chewing gum for astronauts who, because they must spend long periods in a gravity-free environment, cannot use tooth paste or mouth wash.

"Chewing gum won't prevent cavities," admitted Dr. Elliott S. Harris of MSC's environmental physiology branch, "but it will help stimulate dental tissues and freshen the astronaut's mouth during long-duration space flights."

"Besides," he added, "we don't expect serious tooth decay to develop during flights of two weeks or less."

The Systems Division of Whirlpool Corporation, St. Joseph, Michigan, recommended a sugarless gum be chewed periodically during space flight, and that an interdental stimulator--a rubber prong--be used to remove food particles.

About the sticky problem of disposing of chewing gum in spacecraft?

The astronauts can swallow it.

WELCOME TO WHITE SANDS for Paul Purser, special assistant to the director of MSC, was accorded by White Sands Missile Range Commanding General J. Frederick Thorlin and New Mexico Governor Jack M. Campbell, center. Purser, featured speaker along with Gov. Campbell for Law Day ceremonies at the missile range, was hosted at White Sands by Wes Messing, left, manager of MSC White Sands Operations, and Jack Proctor, right, manager of North American Aviation activities at the range.