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RCA Picked For \$40 Million LEM Contract



APOLLO BOILERPLATE is lifted from the waters of Galveston Bay by the Retriever, MSC's converted LCU (landing craft, utility) which was delivered in June. The exercise was part of a demonstration for the press of the ship's operational capabilities. A Gemini boilerplate was also dropped overboard and recovered, both spacecraft on the first pass.

Firm To Build Communications, Radar, Test Systems, Components

Radio Corporation of America last week announced its selection as a major subcontractor for electronics subsystems and engineering support in the development of the lunar excursion module.

RCA will be responsible to Grumman Aircraft Engineering Corporation, prime contractor for the LEM, for five basic areas: communications, radar, in-flight test systems, systems engineering support, and ground check-out systems. In addition, RCA will fabricate some electronic components of the stabilization and control system.

Total value of the contract will be in excess of 40 million dollars.

The major portion of the RCA work will be performed at the company's Aerospace Communications and Controls Division in Burlington, Mass., about 10 miles from Boston. The plant recently underwent an expansion which brought its total area to more than 375,000 square feet.

RCA is the sixth major subcontractor selected by Grumman.

Substantial manufacturing

LSU Presents Doctorate To W. C. Williams

Louisiana State University presented MSC Deputy Director Walter C. Williams with an honorary doctor of engineering degree at commencement exercises last month in the John M. Parker Agricultural Center on the Baton Rouge campus.

Williams was cited for his active flight direction of the successful Mercury program, his contributions as a member of NATO's Advisory Group for Aeronautical Research and Development (AGARD), for contributions to the aeronautic and aerospace sciences through research and publications, and for services contributing to successful acceleration of the nation's space program.

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Carpenter To See Eclipse From Plane

Astronaut M. Scott Carpenter will go aloft with a team of scientists in a jet airplane to observe the eclipse of the sun over western Canada July 20, it was announced last week.

Boeing To Study Feasibility Of Base On Moon

NASA announced Monday that a \$196,000 contract had been awarded to Boeing Aircraft Company, Seattle for a four-month study on whether the U. S. should try to put a scientific base on the moon during the 1970's.

The establishment of the base is being studied as a follow-on to the successful completion of Project Apollo, scheduled to land a man on the moon by 1970.

Eleven firms submitted proposals for the contract.

NASA has been considering a lunar base system using a prefabricated expandable module technique. The launching of a base in modules or sections by Saturn V rockets would provide flexibility of establishing small two-men outposts or larger installations housing up to 18 men.

A DC-8 commercial jet, with the seats on one side replaced by telescopes, cameras and other astronomical equipment, will fly along the path where the totality of the eclipse of the sun by the moon will last the longest.

The 520 mph plane, chasing the moon's shadow as it races across the surface of the earth at about 1,700 mph, will be able to observe the eclipse for about 144 seconds, as opposed to 100 seconds if observed from the ground. In addition, the jet will be flying at about 42,000 feet and will thus be above any clouds and most of the obscuring effects of the atmosphere.

Carpenter's chief object during the eclipse will be to study the zodiacal light, a phenomenon which has been under observation

(Continued on Page 2)

Gilruth Speaks At Space Meet In Shawnee

Says Competition To Force Basic Science Advance

Dr. Robert R. Gilruth, Director of the Manned Spacecraft Center was the principal speaker at the Space Age Symposium held in Shawnee, Oklahoma on June 29 in conjunction with the city's homecoming celebration for Astronaut L. Gordon Cooper.

Before an audience of some 400 people in the Shawnee High School auditorium, Dr. Gilruth stated that higher education, the space program, and the country's place in world affairs are inexorably entwined.

Dr. Gilruth stated that the intrinsic value of a lunar landing could not be immediately evaluated but that it was of major importance to the country as a symbol of dominance in today's world of technical competition. He pointed out that such competition will force the utmost progress in the basic fields of

(Continued on Page 2)



MSC DIRECTOR Robert R. Gilruth told a space symposium at Shawnee High School (Oka.) auditorium June 29 that the nation's space effort, higher education and the country's place in world affairs "are ultimately intertwined." The symposium was part of the hometown celebration for Astronaut Cooper.

New York Firm To Build Rail System At Cape

A New York firm has proposed to build an 18-mile-rail system to serve NASA's Merritt Island Launch Area for \$2,386,250.42.

The Corps of Engineers said in Jacksonville the proposal by A.S. Wikstrom, Inc., Skaneateles, New York, was the lowest of three bids opened early this month.

Two spur tracks will be constructed under the terms of the contract. One will extend from the community of Wilson on Merritt Island past the Saturn V/Apollo Vertical Assembly Building into the MILA industrial area. The second spur track will go from Wilson eastward to the three launch pads of Complex 39, where the Saturn V is to be launched.

The rail system will deliver construction supplies to the MILA and later will provide rail delivery of operational and maintenance equipment in support of Saturn V launches.

The successful bidder on the railroad spur system will be required to complete the project within 180 calendar days after award of contract. The completion date is timed to coincide with delivery of large quantities of structural steel for the construction of the 524-foot tall Vertical Assembly Building, where Saturn V boosters will be erected and checked out.

A second contract, for \$752,155, has been awarded to J. Hilbert Sapp Inc. of Orlando to provide primary water facilities at MILA.

RCA Contract

(Continued from page 1)

turing within the systems for which RCA is responsible will be subcontracted by RCA. In particular, the usage of common Apollo and Gemini spacecraft parts will be implemented under the RCA make-or-buy plan, which is subject to the approval of Grumman and NASA.

A make-or-buy is a listing by a contractor of those items he proposes to make himself and those he proposes to subcontract. Other specialized equipment will be subcontracted in a similar manner.

The satellite Explorer XVI launched to gather information on meteoroids, was punctured 16 times during its first 29 days in flight.

Astronauts To Begin Practice Jumps At Pensacola This Fall

MSC's 16-man flight crew will begin making practice parachute jumps as part of their emergency water survival training for Project Gemini this fall at Pensacola Naval Air Station.

They will wear 20-pound Gemini pressure suits and survival gear, and jump

from helicopters with an unfolded parachute trailing.

The Gemini spacecraft's escape system involves ejection seats similar to those used on supersonic jet aircraft. It is to be used only as an emergency measure, since the astronauts would normally land in the spacecraft.

The "new" nine astronauts selected last fall will take part in a week of desert survival training at Stead AFB, Nevada during July. The original Mercury spacemen have had such training.

Frictionless Platform

(Continued from page 8)

Capable of duplicating only the first moments of the reaction to a force applied by the subject in free space, the simulator cannot overcome the one-gravity pull of the earth. For this reason, the device cannot truly duplicate weightlessness. The simulator, however, floats so freely on its cushion of air that the slightest movement of the subject will cause a reaction--usually in the opposite direction, and for all practical purposes, creates the working problems the astronaut encounters in an unrestricted, weightless environment.

The frictionless platform is scheduled for delivery to MSC late in 1963.

Gauging System

(Continued from page 8)

rather than collecting in the bottom of the tanks.

The nuclear measuring device utilizes radioactive rays produced by radioisotopes. The rays detect the diminishing fuel and as the fuel is used, the rate of use is signaled by computer to a display panel in the Apollo command module.

The propellants are contained in eight tanks and situated in the service module of the three-man spacecraft. Drastically reduced gravity will prevail during most of the 364-hour round trip to the moon.

Utilization of nuclear techniques in the amni-measuring, linear system will make possible extremely accurate measurements--without placing sensors in contact with the fuel.

An airborne system consisting of a radioisotope source, detector, computer and a display panel will make up the propellant-measuring system.

Williams

(Continued from page 1)

At a news conference, Williams said every moment from liftoff until the men hurled into space are back on earth is an anxious one.

He said the most disturbing period in the Mercury program was May 24, 1962, when for almost 40 minutes the world, and Mercury control, lost contact with Astronaut Scott Carpenter.

Williams confessed a desire the joint the astronauts in flight. On the subject of whether the United States will beat the Russians to the moon, he said that was another story which defied an answer, "mainly because we don't know what they have done, what they plan to do or even what they want to do."

Williams is an engineering graduate of LSU and a native of New Orleans.

"Learn the fundamentals of engineering and learn them well," he advised future engineers as a formula for success.

Earlier, Dr. Kenneth S. Pitzer, president of Rice University in Houston, told LSU graduates, "If the pursuit of learning is not defended by the educated it is not likely to be defended at all." He added that "it is important that our community as a whole respect the discovery of new ideas... and respect the innovator."

In his address, Dr. Pitzer pointed out that some of the principal reasons for the space program "seem to have been overlooked," commenting that "we cannot afford to remain ignorant about a subject which is of such great potential importance. Anyone with imagination can see that space is important. We do not know ahead of time just what its importance will be any more than Columbus could predict the significance of his great voyage."

Lear Siegler, Inc. Gets Research Bid

NASA has selected Lear Siegler, Inc., Santa Monica, Calif., to conduct a research program designed to maintain future aero-space pilots and astronauts in their best physiological state while in flight.

Gilruth Speech

(Continued from page 1)

electronics, optics and radiation physics, materials and structures, computer technology, rocket engines and reaction control, navigation and guidance, medicine of stress and survival, and knowledge of space itself.

Following a review of the space program and space accomplishments of the past two years, Dr. Gilruth stated that the exploration of space requires the services of the most capable, most experienced and most dedicated people.

"Every manned spacecraft that leaves this earth must represent the best that dedicated, skillful, and inspired men can create. This... must always be our goal," he concluded.

Eclipse

(Continued from Page 1)

during the past several manned orbital space flights.

Aiding him will be Dr. Jocelyn R. Gill of Goddard Space Flight Center, an astronomer.

The zodiacal light is a pyramid-shaped glow in the night sky visible shortly after sunset or before sunrise, and believed to be caused by the reflection of the sun on dust particles around the earth.

From the ground, it is impossible to observe within about 30 degrees of the sun because of light scattering in the sky. In space, however, it might be possible to trace the faint glow of the dust particles to within a few degrees, or about nine million miles, from the sun.

This would support a theory that the dust particles extend out in a great lens-shaped cloud from the sun to the earth's orbit.

Astronaut L. Gordon Cooper took a series of photographs of the zodiacal light during his 22-orbit flight in May.

Scientists from the National Geographic Society, Douglas Aircraft Company, Inc., the Air Force and Navy and numerous universities and astronomical

Flight Research Center, Edwards, Calif., which will provide technical management of the program will conduct negotiations this month. The total cost of the design study program is expected to exceed one million dollars.

The proposed system, called a psychophysical information acquisition processing and control system (PIAPACS), will have the capability to sense and record the various physical functions of the pilot and his vehicle. NASA scientists, with the aid of computers, then expect to use this information to provide controls for maintaining the pilot and his environment in the best operational state.

First step in the 18 month program will be the development and construction of a unique sensor system mounted in the pilot's garment and headgear. This system, which will replace the present system of attaching sensors to the pilot by the use of tape and internal instruments, will permit acquisition of data on a continuous basis without discomfort or distraction to the pilot. This sensor system will be worn by NASA pilots on flights, both simulated and actual, in a variety of aircraft including the supersonic F-104 and the rocket-powered X-15. Data obtained from these flights will be recorded and processed for computer reduction. The data from the computer would be used to display immediate and continuously the physiological and physical condition of the pilot at all times in flight. It could also be used as a basis for predictions and, if necessary, to control or correct any abnormal trends or conditions.

The final portion of the program will result in the conceptual design of the ultimate operational system for use in advanced spacecraft.

Lear Siegler was selected from 11 other firms for the contract.

observatories will make the trip.

The eclipse will be visible only in a thin 65-mile wide band from the northern Japanese Island of Hokkaido, from Alaska, Canada and in Maine.

Space Industry Symposium Set July 30 At Rice University

The Second Space Industry Assistance Symposium will be held July 30 on the Rice University campus, co-sponsored by the Manned Spacecraft Center and the Houston Chamber of Commerce, in cooperation with Rice University.

Lockheed Gets Contract For Launch Escape Motor

Lockheed Propulsion Company has announced receipt of a definitive contract in excess of six million dollars for development and production of solid propellant rocket motors for the Project Apollo launch escape system.

Gemini Ejection Seat Undergoes Rocket Sled Test

The ejection seat escape system for Gemini has successfully undergone its first high speed rocket sled test.

Both of the two dummy astronauts used in the test were safely recovered after ejection at nearly 600 miles per hour from a boilerplate spacecraft traveling down the high speed test track at the Naval Ordnance Test Station, China Lake, Calif.

A series of tests are also being conducted to simulate ejection before launch. These consist of firing the ejection seats from a 150-foot tower, after which the dummy astronauts parachute to earth.

Unlike the escape system of the Mercury spacecraft, in which the entire spacecraft is rocketed away from the launch vehicle in case of malfunction, the Gemini escape system provides for seat ejection of the astronauts from the launching pad, in case of launch vehicle failure. The system will also provide for escape during a portion of powered flight and after re-entry. The rocket sled tests simulate an emergency ejection during the

The award was made by the Space and Information Systems Division of North American Aviation, principal contractor to NASA for the Apollo spacecraft.

The contract confirmed terms of work actually begun in February 1962 when North American selected Lockheed for the assignment. The job of the launch escape system is to fire in any emergency occurring during the launch phase of a lunar exploratory flight, pulling the spacecraft and its three astronauts to a safe position from which parachutes can lower the vehicle to earth.

Lockheed is developing the primary launch escape motor, a solid-fuel rocket approximately 15 feet long and two feet in diameter which develops almost instantly the thrust of an intermediate range ballistic missile.

A second Lockheed-built unit, called a pitch control motor, is mounted horizontally near the nose of the escape system, and fires briefly to direct the trajectory of the spacecraft as it is drawn rapidly away from the Saturn launch vehicle.

The Redlands, Calif. firm has repeatedly ground-tested both motors, with an unblemished record of successful firings, and has recently test-fired them together in a tie-down firing of the complete launch escape system.

boost phase of the flight.

The theme will be "How We Buy, What We Buy... Oriented Toward Business in the Houston Area."

MSC will display products and equipment, conduct classes with question-and-answer sessions on these items, and discuss possible requirements.

Participating agencies include: U. S. Small Business Administration, General Services Administration, Raytheon Co., General Electric, North American Aviation, Aerojet-General, Lockheed Aircraft, General Dynamics, Philco, McDonnell Aircraft, General Motors (AC Sparkplug), and Grumman Aircraft.

There will be a 12:30 p. m. barbecue luncheon served on the ramps of Rice Stadium. Reservations are required for the luncheon which costs \$2.50. Tickets must be obtained in advance from the Chamber of Commerce's Industry and Commerce Department, Box 53600, Houston 52, Texas.

The program begins at 8:00 a. m. with registration in Rice's Memorial Center lobby, Building 26. The keynote address will be delivered at 8:30 by Wesley Hjernevik, MSC's Assistant Director for Administration.

Classes include research and development procurement, construction facilities, support physics laboratory, legal clauses and general provisions, product and equipment reviews, and a panel discussion by the three major prime contractors.

The main speaker 11:00 a. m. in the Memorial Center will be Dave W. Lang, Jr., Chief of MSC's Procurement Division, who will present a "Study of MSC's Economic Impact."

Rocket Group Announces Opening Of Goddard Award

Dedicated to the leadership of American rocketry and astronautics, the National Rocket Club has announced the opening of the Robert H. Goddard Historical Essay Award competition for 1963. This annual nation-wide competition with a \$200 prize, is open to any U.S. Citizen.

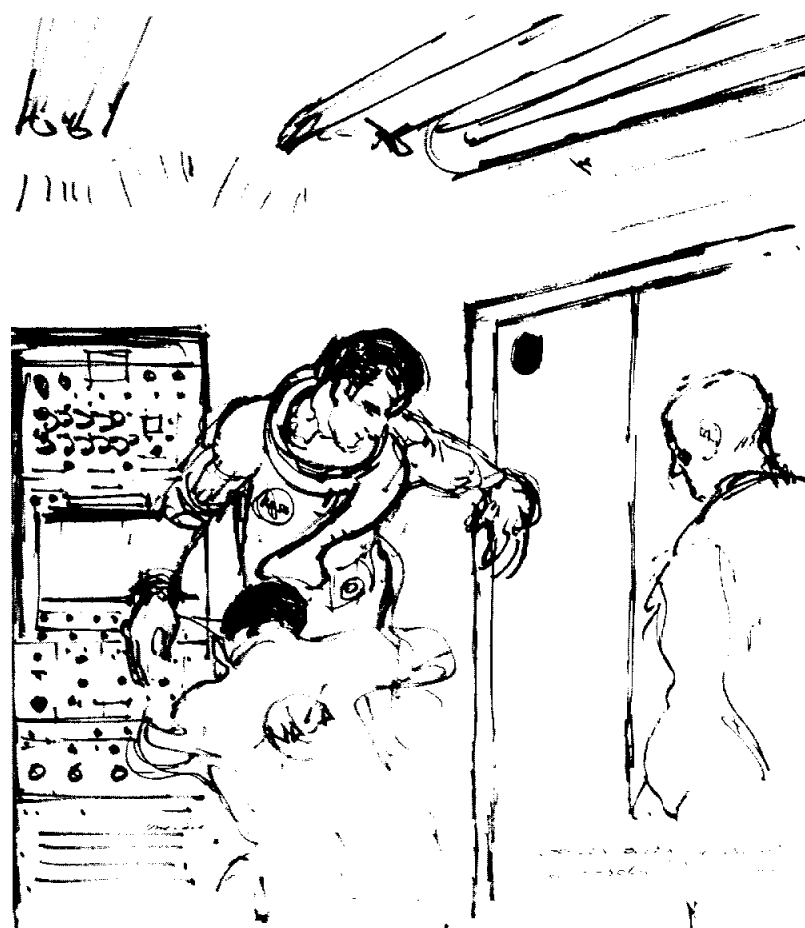
The contest is named in honor of the world rocket pioneer, Dr. Robert H. Goddard, whose scientific and technological contributions--although belatedly recognized in the United

States--opened the door to space.

Essays may treat with any significant aspects of the historical development of rocketry and astronautics, and will be judged on their originality and scholarship. They may bring new information to light or may cast a new and different light upon events or individuals influencing rocketry and astronautics in the United States. Entries should be submitted by November 1,

1963 to the Goddard Historical Essay Contest, c/o National Rocket Club, 1745 K Street, N. W., Washington 6, D. C. The winner, who will be announced at the Dr. Robert H. Goddard Memorial Dinner in March, 1964, will receive the Goddard Historical Essay Trophy and a \$200 prize.

The Robert H. Goddard Historical Essay Award is the only literary competition devoted to historical affairs in the field of rocketry.



ONE OF 60 sketches released from several hundred made by eight artists during MA-9 was this representation of Astronaut Gordon Cooper suiting up in Hangar S before the flight. It was drawn by Robert T. McCall of Chappaqua, N. Y. Other artists participating were Peter Hurd, San Patricio, N. M.; Mitchell Jamieson, University of Maryland; Robert Shore, New York City; George A. Weymouth and John W. McCoy, II of Chadd's Ford, Pa.; Paul Calle, Stamford Conn.; and Lamar Dodd, head of Art, Georgia University.

Artist's Program Yields Sketches Of MA-9 Launch

Some sixty sketches made during Astronaut Gordon Cooper's Mercury Atlas-9 mission have been received by the National Aeronautics and Space Administration under its Artists' Cooperation Program.

The working sketches--pen and ink, charcoal, and wash drawings--were made by seven nationally known artists at Cape Canaveral, Fla., and one in the prime recovery area in the Pacific.

MA-9 activity was the first event which the artists were invited to cover. Other NASA activities of historic interest will be recorded by artists.

The sketches are preliminary to the artists completing finished paintings of their impressions of MA-9 activity. The paintings and sketches will become Government property and will be exhibited on tour nationally before being placed for indefinite

display in Federal buildings.

Said NASA Administrator James E. Webb, "Important events can be interpreted by artists to give a unique insight into significant aspects of our history-making advance into space. An artistic record of this nation's program of space exploration will have great value for future generations and may make a significant contribution to the history of American art."

During the Cooper mission the artists often worked alongside news media representatives who covered the event.

Reproductions will be made available for tours to schools and other public institutions throughout the country. Other reproductions will be used by NASA to illustrate publications, documentary films, and other graphic presentations.

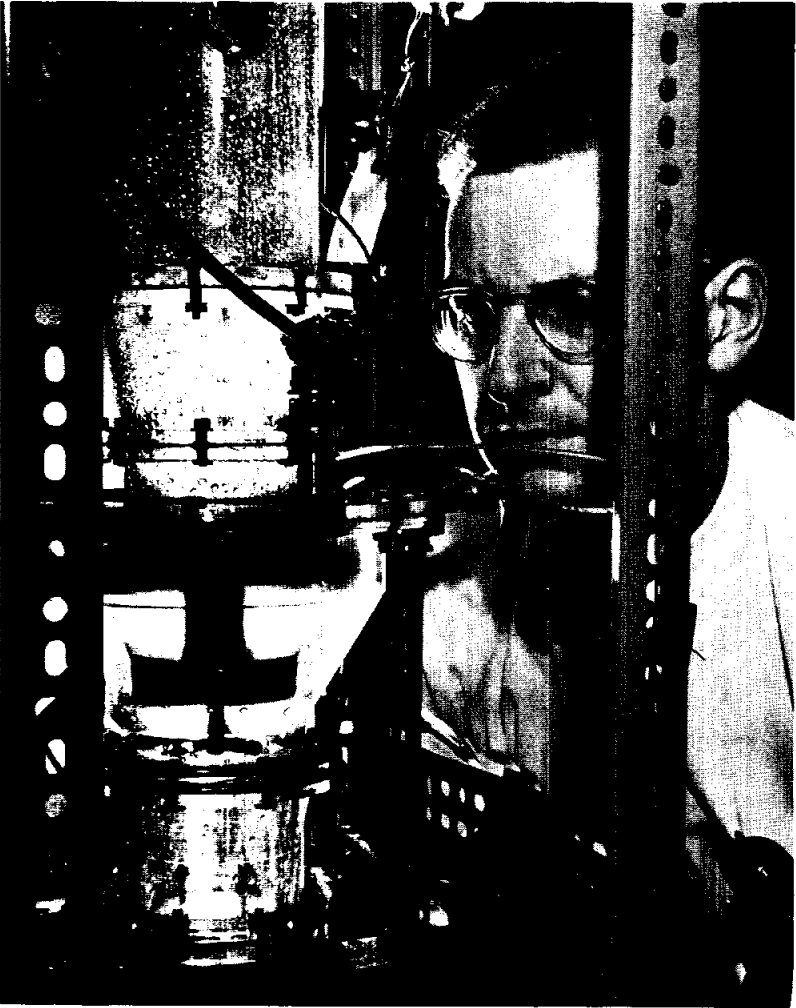
The Artists' Cooperation Program was instigated by NASA Administrator Webb in March, 1962, with the cooperation of Director David E. Finley of the Fine Arts Commission and Director John Walker of the National Gallery of Art. Principal advisor to NASA on the program is Dr. Lester Cooke, the National Gallery's Curator of Painting.

The Artists' Cooperation Program is directed by the Office of Educational Programs and Services, NASA Headquarters.

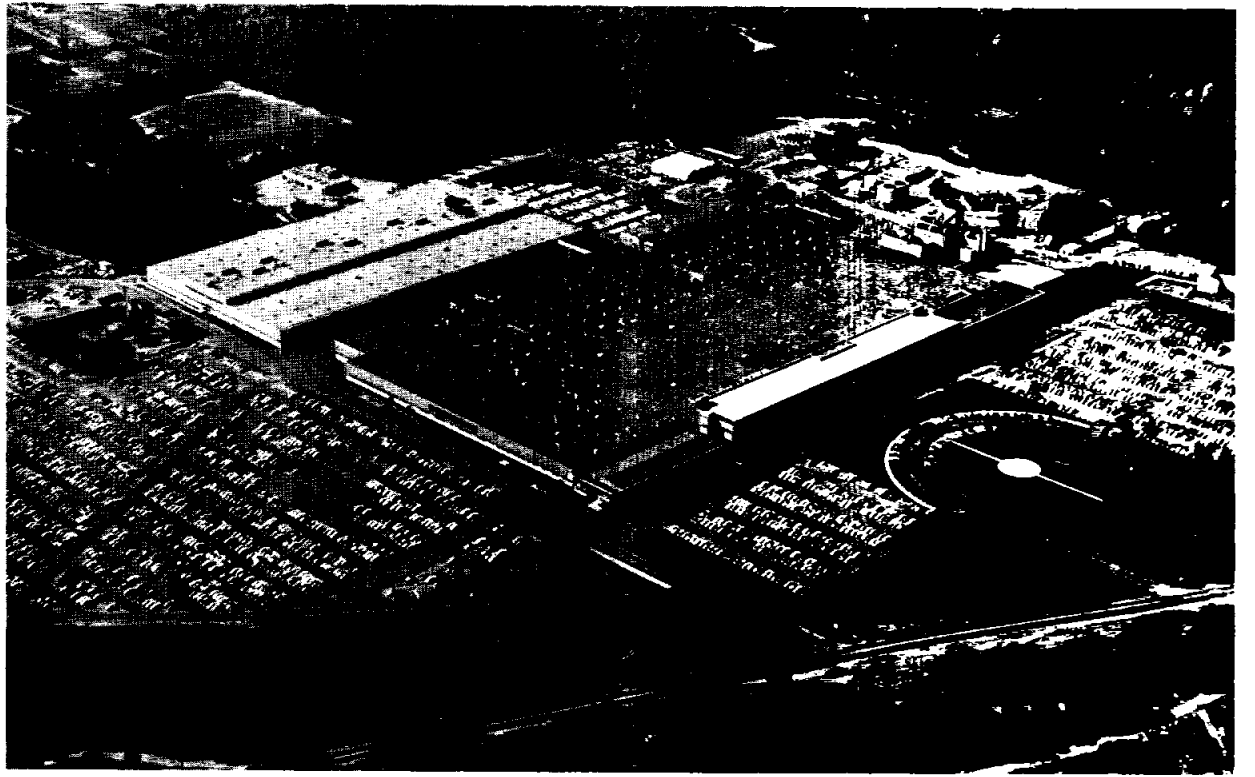
Callery Chemical Year Long Study On Moon Water

Callery Chemical Co., of Callery, Pa. has received a \$74,707 contract to find ways to get water from rocks on the moon.

The year-long study will include extraction of water, oxygen and hydrogen by heat or chemical action and the recombination of the gases to produce power.



TO REMOVE CONDENSED MOISTURE in the air flow of a closed-loop spacecraft environmental control system Hamilton Standard is developing a water separator. Centrifugal force of spinning drum extracts droplets of water from the air stream in this experimental test. Dry air is then ready for re-circulation.



HAMILTON STANDARD'S PLANT in Windsor Locks, Conn. is the home of the Space & Life Systems department. Located mid-way between Hartford and Springfield, Mass., the two buildings have 1,500,000 square feet of space. The United Aircraft division also maintains a third plant in Broad Brook nine miles away.

Hamilton Standard Is Busi

Nestled in the Connecticut River Valley, midway between the capitol city of Hartford and Springfield, Massachusetts, sits the Hamilton Standard division of United Aircraft Corp., pioneer in the aircraft industry and currently developers of the Project Apollo space suit assemblies and the environmental control for the lunar excursion module.

Engineers and scientists working on these projects are part of a team of more than 8,000 men and women who make up the Hamilton Standard division. Housed in a modern 1,500,000 square foot facility at Windsor Locks and a smaller 250,000 square foot plant at nearby Broad Brook, these employees form the most diversified division of United Aircraft. Under the direction of William E. Diefenderfer, division president, the organization produces propellers, jet fuel controls, air inlet controls, jet engine starters, ground support equipment, electronics, electron beam machines, and aircraft environmental controls.

It was from the latter product group that the space life support activity evolved. Hamilton Standard entered the aircraft environmental control field in the late 1940's with refrigeration units for the North American F-86D. Within the next decade, more than 25 different models of modern jet aircraft were using the division's equipment including some of the world's fastest and highest flying, like the F-104, F-105 and B-58.

From producing systems such as this for aircraft which skirt the

fringes of space, it was a logical step into the area of environmental controls for spacecraft. Beginning in 1959, Hamilton Standard embarked on an in-house program of space life support equipment. One of the first closed environmental control chambers in New England was constructed and prophetically dubbed the "Moon Room." Early development efforts were directed toward a contaminant removal system to remove waste gases in human breath from a manned space vehicle. These systems, which have operated on test continuously for more than 30 days, are today incorporated in the systems designs of several long duration space stations.

Other development efforts resulted in a small device for manned spacecraft which could remove condensed moisture from the cabin during gravity-free flights. These water separators reclaim the water which can then be used for drinking or other purposes during a space flight.

Work on these and other space systems continued as a company-sponsored effort and, in October of last year, the Manned Spacecraft Center selected Hamilton Standard as prime contractor for the integrated space suit and portable life support for Project Apollo. The division manages and integrates the suit program and also designs and manufactures the life support back packs; International Latex, as principal subcontractor, is developing and fabricating the suits.

The combined space suit and portable life support system, prototypes of which are being delivered this summer, will supply oxygen and pressurization,

and will control temperature, humidity and air contaminants in the suit. It will protect the astronaut against the moon's harsh temperature extremes from 250 degrees above below, and solar radiation that could blind or burn him.

The space suit will give the astronaut a high degree of mobility. He will be able to walk, climb ladders and bend over with a minimum of effort while the suit is pressurized.

In the helmet will be an airlock feeding device to permit the astronaut to drink water and eat specially prepared foods while the suit is pressurized. The helmet's face plate will have provisions for protecting the eyes from intense solar glare. It will also be fogged and defrosted for good visibility in cold temperatures.

The complete assembly will contain a separate emergency oxygen supply. a two-way radio will provide communication with the Apollo spacecraft and the lunar excursion module. It is part of a telemetry unit that will also relay to the vehicle the astronaut's physiological functions as well as the suit's pressure, oxygen and temperature conditions.

The life support pack, carried on the back, will contain the oxygen supply necessary to pressurize and ventilate the astronaut's pressure suit, and the mechanical systems required to cool the ventilating gases, remove contaminants, and insure adequate gaseous flow. The astronaut will be able to carry tools, a light, and containers to hold the specimens he collects on the lunar surface.

The space suit and life



IN THE LABORATORY, a Hamilton Standard scientist conducts an experiment of a process for reclaiming drinkable water as part of a waste management effort. Research such as this is aimed at the development of equipment for environmental control systems aboard long duration spacecraft. Work on this and other space systems continued as a company-sponsored effort has resulted in selection of Hamilton Standard by MSC as prime contractor for an integrated space suit and portable life support equipment for Project Apollo.



CARDIAC MONITOR being developed by Hamilton Standard for NASA picks up functional changes of the heart and telemeters information to data collection equipment. Affixed to this test subject is prototype unit of monitor that will be one-quarter the size of a postage stamp, containing an amplifier, a transmitter and its own power supply.



William E. Diefenderfer
Division President, Hamilton Standard

ly Engaged In Space Work

support system is designed to permit an astronaut to put it on or take it off in five minutes, unassisted.

In still another area of engineering at Hamilton Standard, studies are under way to adapt electron beam welding to in-space fabrication. The high energy Hamilton-Zeiss electron beam machine will be investigated as a means of fabricating, modifying, and repairing spacecraft in outer space. All indications are that the machine holds great promise as a space welding tool: it produces hermetic joints, the welding takes place in a vacuum, it has already welded most of the space age metals, and there is no appreciable reactive force from the stream of electrons. Under present contracts, Hamilton Standard will produce a prototype machine which will be capable of one-man operation in a space environment.

The success of electron beam welding in space could, of course, affect future planning of many space programs, including the manned space station.

Studies for these long-duration stations are currently being conducted at Hamilton Standard and, in recent weeks, MSC awarded the company a contract to investigate the environmental control and life support requirements for one which would orbit for from one to five years. This would be a 24-man

station, orbiting 200 to 300 miles above the earth.

In establishing design approaches for this space station, the Space and Life Systems department will consider two concepts: an artificial gravity, three-module rotating space station; and a zero gravity, one module, non-rotating station.

Studies such as this one, the hardware being developed for the space suit assembly and the LEM, the bioastronautic work, indeed, all of the futuristic programs under way at Hamilton Standard, are indicative of the underlying dynamic drive of a company which, for more than 40 years, has spearheaded advance development in aerospace.

Bioinstrumentation, too, is being pursued and a cardiac monitor about one-quarter the size of a postage stamp has been designed and developed. Affixed to the skin, the monitor consists of a sensor, an amplifier, a transmitter, and its own power supply. These tiny monitors are capable of detecting immediately functional changes in the heart and telemetering this information to remotely located data receiving and interpretation equipment.

Competence in the basic sciences and practical hardware, engineering and manufacturing, are combined in the Space and Life Systems department. But this approach is not unique to this department alone. It is the foundation upon

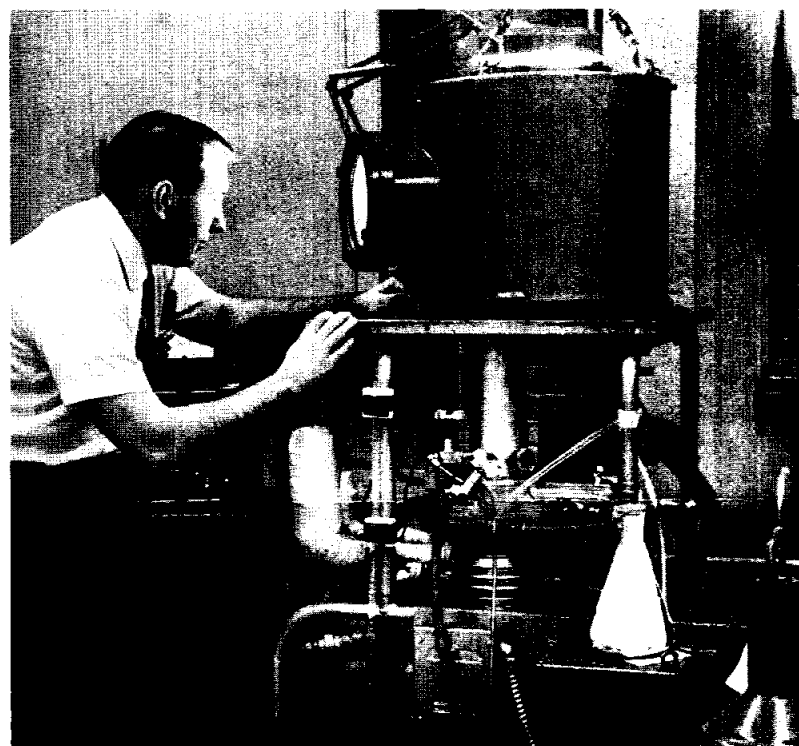
which Hamilton Standard operates and one which has enabled other departments of the division to make significant contributions to today's missile and space systems.

The Ground Support Equipment department, for example, is contributing to MSC's Gemini program by producing trailers which will fuel up the capsule's two flight control systems with liquid fuel and oxidizer. It will also supply skid-mounted units to automatically control the temperature of the propellants which will fuel the modified Titan II missile that will launch the Gemini.

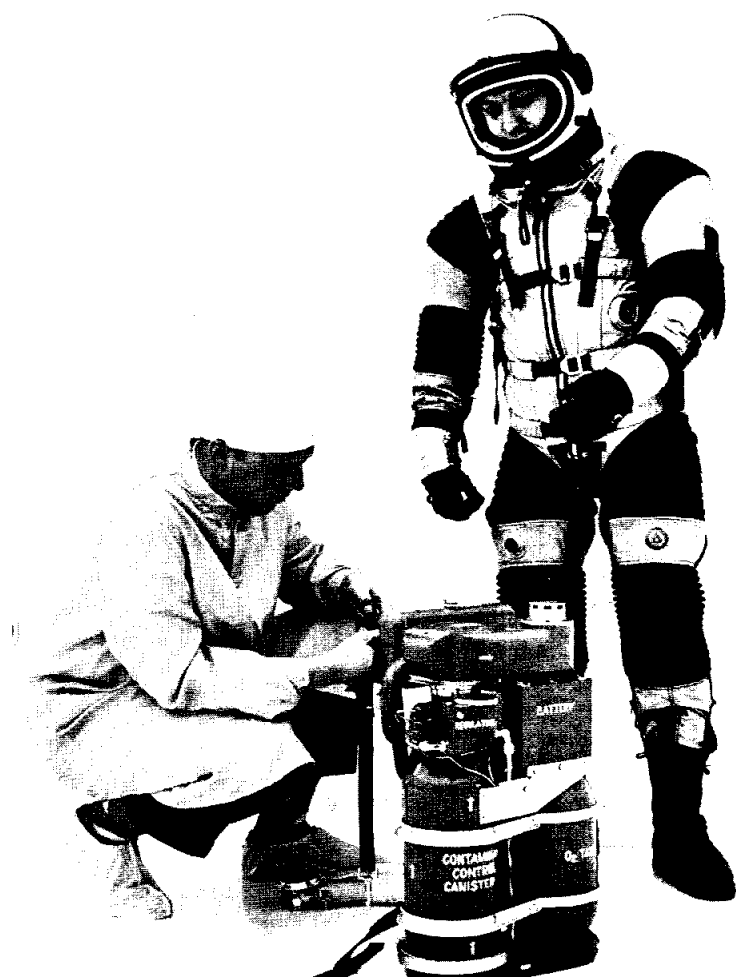
Another of Hamilton Standard's integrated departments—Electronics—is also contributing to the success of NASA programs by providing satellite power conversion equipment. One of the department's power converters will be used to operate the ion electron detector on NASA's Orbiting Geophysical Laboratory (OGO); another type has been selected to operate scientific equipment on board the Orbiting Solar Observatory (OSO).

Not long after being selected as space suit supplier, Hamilton Standard took another large stride into space. In January of this year, it was selected by Grumman Aircraft Engineering Corporation to negotiate a contract for the lunar excursion module's environmental control.

Thus, the Project Apollo astronauts will live on Hamilton Standard life support from the time they enter the lunar excursion vehicle, during their descent to the moon's surface, for their one to seven day lunar exploration, and while returning to the command module.



ZERO-GRAVITY WATER BOILER being developed for environmental control systems on spacecraft undergoes tests in a vacuum chamber. Boiler is a heat exchanger device designed to remove heat from space vehicles by evaporation.



ENGINEER WEARING unpressurized suit prepares to put on mockup of a life support back pack to evaluate comfort and mobility. Experimental suit and back pack are being used in Hamilton Standard's development of integrated space suit assembly and portable life support systems for Apollo astronauts.

Editor's Note: This is the eighth in a series of articles designed to acquaint MSC personnel with the Center's industrial family, the contractors and subcontractors who make MSC spacecraft, their launch vehicles and associated equipment. The material on these two pages was furnished by the Public Relations Department, Hamilton Standard Division, United Aircraft Corp.

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.

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On The Lighter Side



If you some day face a futuristic firing squad equipped with Infrared aiming equipment—and they ask your last wish—take a cigaret. It'll be dashingly devil-may-care; and it'll save your life.

Experts at Aerojet - General Corporation's Avionics Division in Azusa, California, point out that the Infrared (IR) equipment's incredible instinct for heat radiation would aim at the cigaret with pinpoint accuracy.

In fact, they point out, where a carnival sharpshooter would draw applause by knocking a cigaret from his pretty partner's mouth at 10 paces—he'd really bring down the house if he had IR equipment.

With IR he could hit the burning tip from several hundred yards—and do it blindfolded or in the dark.

And this would be only a parlor trick demonstration of the fantastic capabilities of the science of Infrared. Already Aerojet Infrared "eyes" are in orbit, ready to immediately detect the heat of a missile firing.

And far beyond electronic Annie Oakley capabilities and surveillance satellite missions, Infrared technology is burgeoning into a multitude of applications for industry, medicine, food processing and a broad range of other civilian applications.

It is a usable device on anything that has a temperature above absolute zero (-273 degrees centigrade). Even ice gives off heat radiation easily detected by IR.

So if you ever do face that IR equipped firing squad, take the cigaret and light up nonchalantly. Only be sure and stand sideways!

—Cartoon by Pete Bentovoja, Los Angeles Examiner.
Copy by Don Bailer.
Reprinted courtesy of Aerojet-General.

SPACE ALMANAC

A CHRONOLOGY OF
EVENTS IN SPACE
EXPLORATION AND
RESEARCH.

Five years ago

July 29, 1958—National Aeronautics and Space Act of 1958 created NASA.

Four years ago

July 20, 1959 — NASA awards contract for construction of world-wide network of tracking stations for Project Mercury.

Three years ago

July 29, 1960—NASA announces plans for Project Apollo manned lunar landing program.

Two years ago

July 12, 1961 — NASA launches third successful weather satellite -- TIROS III.

One year ago

July 10, 1962--World's first active repeater communications satellite—Telstar — launched by NASA for American Telephone & Telegraph Company from Cape Canaveral.

EDITORIAL EXCERPTS

WASHINGTON, D. C. — Whenever a nation musters its resources to achieve scientific and technical goals there is a dividend to the industrial community and the consumers.

The national effort to develop the atomic bomb in World War II and the programs to perfect radar and other electronic systems gave rise to new industries that have benefitted the civilian economies at home and abroad.

It follows that similar "spin-off" benefits will result from the United States' program to achieve pre-eminence in space.

Recognizing this, the National Aeronautics and Space Administration has undertaken a program to insure that these space-age dividends are transferred to industry and consumers in the least possible time.

NASA's Office of Technology Utilization is searching for innovations uncovered through space research that hold promise for use by industry. After identifying the innovations, NASA catalogs and documents them and makes them available for the benefit of "all mankind."

This obligation to disseminate and promote the science and technology resulting from its research and development programs

MSC PERSONALITY

Joe N. Kotanchik Is Asst Chief Of SEDD

From the coal-mining country of Pennsylvania comes the Assistant Chief of MSC's Systems Evaluation and Development Division, Joseph N. Kotanchik, who will complete twenty-five years of continuous NACA-NASA service in October.

Born November 17, 1908 in Ranshaw, Pa., Kotanchik grew up and finished high school in that town and worked in the construction industry for eight years before entering Lehigh University in 1934.

Two years later, he transferred to Massachusetts' Institute of Technology in order to get a degree in aeronautical engineering. He graduated in 1938.

Kotanchik's first engineering job was with Curtis Airplane Company in Buffalo, N. Y., as a stress analyst in airplane structures. But he stayed with Curtis only four months before joining NACA at Langley AFB, Va. in October of 1938, thus beginning a long government career.

He began in structures research work and in his words, "more or less stayed there." He was successively head of the Special Project Section, head of the Special Project Branch, and Assistant Chief of the Structures Research Division.

In his 23 years at Langley, Kotanchik planned and supervised the construction of the Structures Research Laboratory and the High Temperature Materials Laboratory. He specialized in the strength of aircraft structural elements, particularly compression panels, and in high temperature work, notably the development of radiant heating and electric arc-powered facilities and tests of materials for protection of spacecraft during re-entry.

Kotanchik conducted tests on World War II airplanes for their ability to undergo ditching on water, including the B-24 and B-26, and participated in one "live" ditching in the James River at Newport News.

is written into the Act which established NASA in 1958.

NASA, while it is conducting the search for innovations with its own personnel, also has asked several non-profit institutes, a commercial research organization and a university to search.

To date, the list of space research spin-offs include items that help in the production of steel rods, new techniques in welding, and advances in electronics, to mention a few.



Joseph N. Kotanchik

Kotanchik transferred to Space Task Group (now MSC) on Christmas Day, 1961, and was special assistant to Assistant Director for Engineering and Development Maxime A. Faget, pending the establishment of the Systems Evaluation and Development Division. With the setting up of that division he was named Assistant Chief.

SEDD is in charge of the major test facilities at the Center, including the Space Environment Simulation chambers, the flight acceleration facility, the thermochemical test area, and the structures, vibration and acoustics laboratories. The division also provides engineering and developmental support to the project offices in such areas as structures, mechanical systems, electrical power systems, reaction control systems, etc.

Kotanchik is married to the former Mary Habura of Shamokin, Pa. The couple has two sons, Jim, a rising senior at MIT, and a National Merit Scholarship finalist; and Joe, Jr., a rising senior at Clear Creek this past year.

Kotanchik says his greatest avocation is teaching. He taught University of Virginia Extension Division courses in 12 different subjects in mathematics and engineering for about 15 years in Newport News.

He also likes woodworking—to the extent that he and the family built their own home in Virginia.



THE COOPER FAMILY arrived 15 minutes early at the municipal airport at Shawnee, surprising a crowd of 500 gathered to greet them before they proceeded to Tecumseh for a breakfast press conference. Cooper flew the family's private plane to Shawnee for the first of many celebrations.



ASTRONAUT COOPER, his wife and daughters Cam and Jan start a crowded days of ceremonies and parades with a tour through Tecumseh, seven miles from Shawnee, and now the home of the astronaut's mother. At the close of the parade Cooper cut ribbons opening the newly-named Gordon Cooper Expressway linking Tecumseh and Shawnee with Oklahoma City.



SEATED ON THE BACK of an open convertible at the beginning of the Shawnee parade, Astronaut L. Gordon Cooper and his wife, Trudy, seem caught in a mob scene. Local businesses shut down for the day.



THE 'FAITH 7' SCHOOL for mentally retarded children was dedicated in honor of Astronaut Cooper during his visit to Shawnee, where he took part in groundbreaking ceremonies. The school's cornerstone and a color photo of the astronaut were displayed at the site. In the background is a float.

Cooper's Oklahoma Home Turns Out The Red Carpet

Astronaut L. Gordon Cooper and his family received a rousing welcome from the "hometown folks" in Shawnee and Tecumseh, Oklahoma, June 29 when he returned for the first time since his 22-orbit flight in May.

The astronaut and his family surprised some 500 Oklahomans at the Shawnee Airport when he landed his light plane there 15 minutes before he was expected. He was greeted by Bill Weaver, president of the Shawnee Chamber of Commerce, who handed orchids to Mrs. Cooper and her two daughters, Cam and Jan. Mayor Charles Pittman had brought the astronaut's mother, Mrs. Hattie Cooper, seven miles from home in Tecumseh to greet her son.

"When you were here last summer you stole our hearts, and we want you to keep our hearts," the mayor said, handing Cooper the traditional oversized key to the city.

After the airport welcoming, Pittman drove the

Cooper family to Tecumseh for a breakfast press conference in Tecumseh City Hall, the first event in a long schedule that included two parades, a ribbon cutting ceremony that officially dedicated the Gordon Cooper Expressway, and a luncheon.

Cooper also took part in a ground-breaking ceremony for the Faith 7 School for Mentally Retarded Children, a family picnic, a homecoming program and an ice cream social.

During a space symposium before 400 persons in the Shawnee High School Auditorium, MSC Director Robert R. Gilruth said the nation's space effort, higher education and the country's place in world affairs "are inexorably intertwined." (See story, page 1)

After the press conference, Cooper took part in a 30-minute parade before the town's 2,500 people which was led by Oklahoma's Lt. Governor Leo Winters, on horseback, and cut red, white and blue

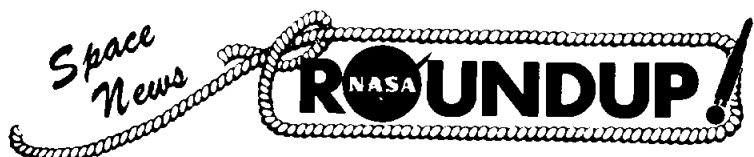
ribbons crossing two lanes of U. S. Highway 270 that links Tecumseh and Shawnee with Oklahoma City. The strip will now be known as Gordon Cooper Expressway. State Highway 18, between Tecumseh and Shawnee, has been named Gordon Cooper Drive in honor of the astronaut.

From the ribbon-cutting ceremony the family proceeded to a larger parade in Shawnee, where he was born in 1927. Shawnee businesses shut down for hour-and-a-half parade through the downtown district. The town was decorated as most residents said it never had been before, with flags and bunting and signs welcoming the astronaut. Vendors were doing a good business in balloons, flags, Cooper badges and pennants.

The town's single daily newspaper, the News Star, put out a special edition and an Oklahoma City television station televised the parade live. The crowd was estimated at 40,000.



COOPER GETS a gift, a pair of handmade moccasins, from Indian princess Muriel Patterson at ceremonies at Thorpe Field during his visit to Shawnee.



SECOND FRONT PAGE

Frictionless 'Platform' Simulates Space Motion

A frictionless platform to simulate five degrees of freedom, or the forces exerted by an astronaut working in free space, is being developed for the Manned Spacecraft Center in Houston.

Built by the Martin Company, Baltimore, Md., under contract to MSC for \$22,386, the frictionless platform will be used by MSC's Crew Systems Division to test and evaluate space suits, stabilization devices, tethering lines, and space maintenance tools.

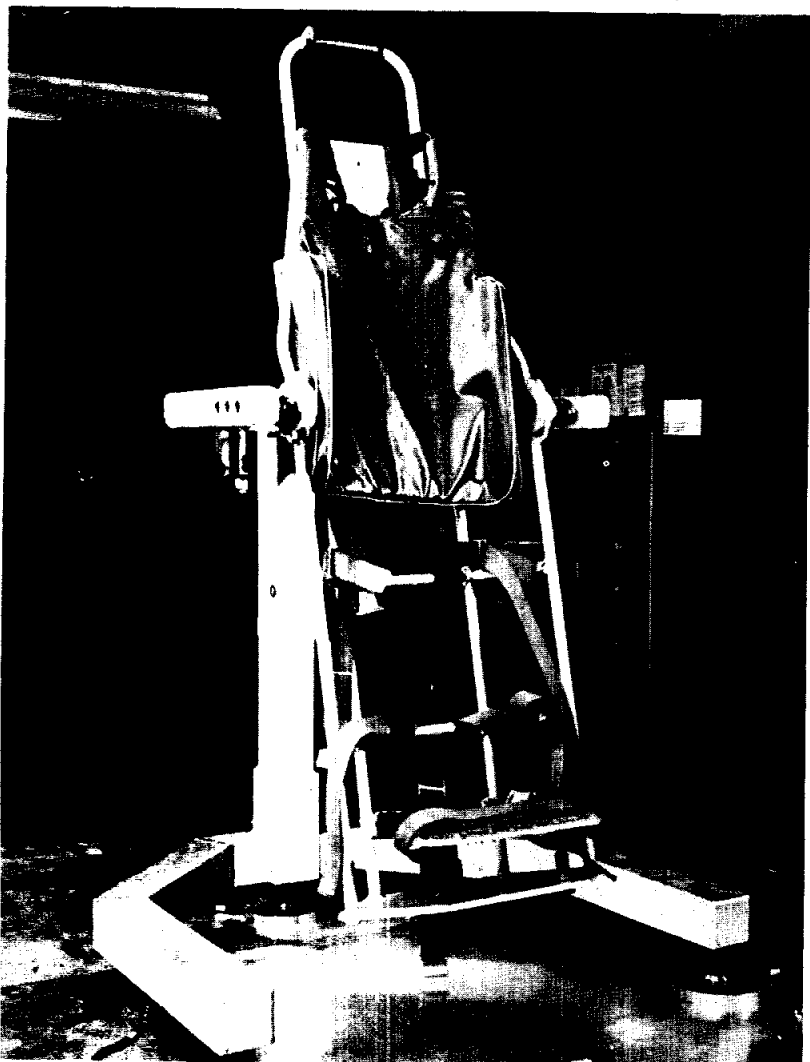
In space, a force applied in one direction is realized with an equal force in the opposite direction. For example, an astronaut about to tighten a bolt in a weightless environment may find himself being torqued instead. This "reaction" in five different directions is simulated by the Martin frictionless platform.

The simulator, weighing about 175 pounds, is lifted from the floor on a cushion of compressed air. This pressurized air forced through three legs suspends the simulator 0.005 of an inch from the floor. Twenty-one pounds

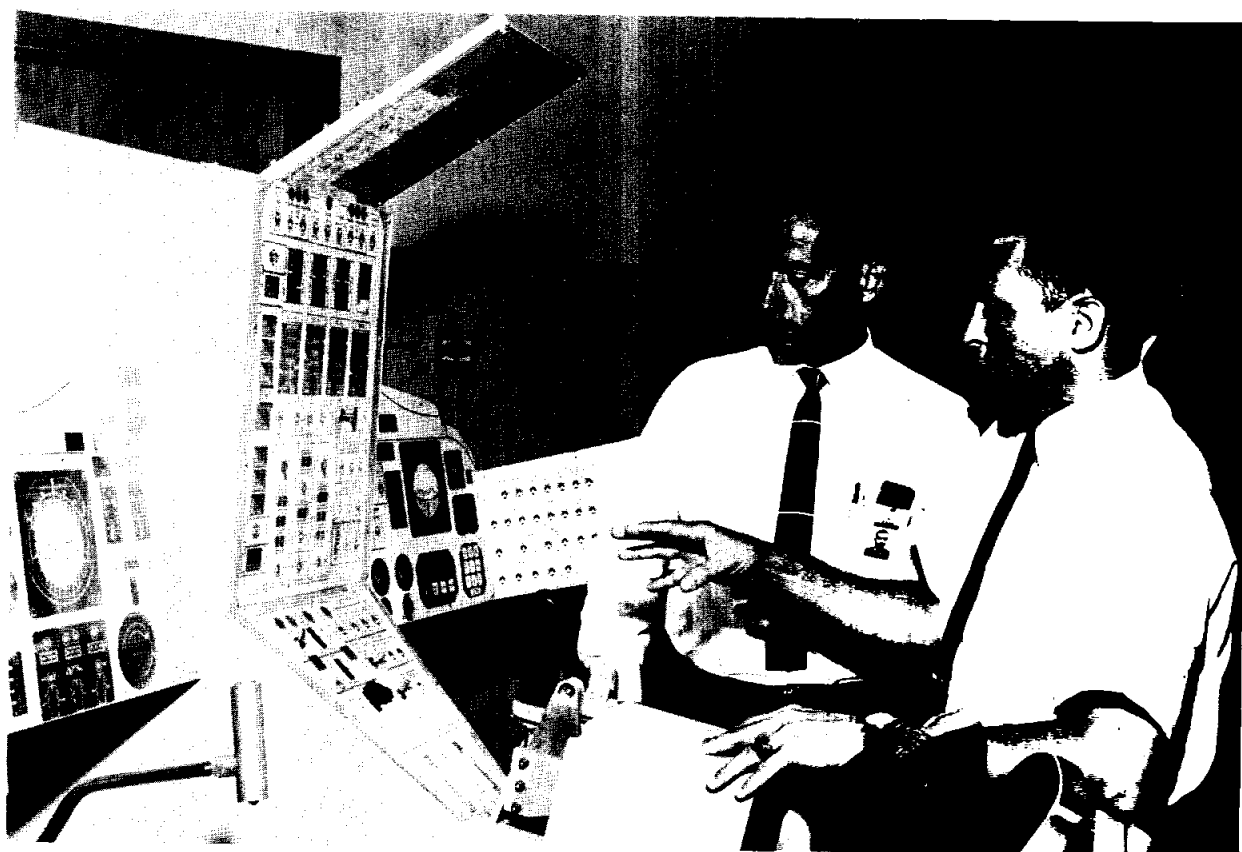
of pressure per square inch (psi) is required to lift the simulator and an additional 300 pounds, or the equivalent weight of a subject wearing a space suit with a portable environmental control system (ECS) back-pack. An increase in pressure automatically increases the capability. As much as 500 pounds has been lifted by the simulator.

The simulator duplicates five degrees of freedom—pitch, yaw, and roll, and two on the horizontal plane (forward-backward, side-to-side). It can rotate and roll a full 360 degrees. A sixth degree, on the vertical plane (up and down), may be added later by MSC through auxiliary equipment. One method could be through a space maintenance practice console which would react on the vertical plane from an applied force by the subject.

(Continued on page 2)



FRictionless PLATFORM with five degrees of freedom—pitch, roll, yaw, horizontal forward-backward and side-to-side motions—will be used by Crew Systems Division to test space suits, stabilization devices, tethering lines and space maintenance tools. This Martin Company prototype shows general configuration of the simulator. MSC's version will allow subject to be fully clothed in pressurized space suit with portable environmental control system back-pack. It is scheduled for delivery to MSC late this year.



FINE POINTS of spacecraft flying seem to be the subject of discussion by Astronauts Elliott See (right) and John Young over one of the new Gemini systems trainers, recently arrived at MSC. The cockpit layout console above, equipped with a control stick, will be used to actuate classroom-sized animated diagrams shown in background of major systems in the Gemini spacecraft. Signal flow patterns through a system of lights will illustrate the way each system works.

Big, Animated System Trainer Teaches Spacecraft Operation

Animated lights to illustrate operational flow patterns on classroom-size systems diagrams are teaching astronauts and engineers of the Manned Spacecraft Center the inner-workings of the Gemini spacecraft.

California Firm Developing Fuel Gauging System

A propellant gauging system that relies on nuclear-measuring techniques is being developed for the attitude control propulsion system of NASA's Apollo spacecraft.

The nucleonic fuel-gauging system, which must operate in a zero-gravity (weightless) environment, is being developed by Giannini Controls Corp., Duarte, Calif., for North American Aviation's Space and Information Systems Division, Downey, Calif., principal contractor on the Apollo spacecraft.

The system will measure fuel supply for the 16 reaction control engines situated on the sides of the Apollo service module.

Primary use of the engines, powered by a hydrazine blend as fuel and tetroxide as oxidizer, is to make adjustments in spacecraft attitude during lunar orbit and upon return from the moon.

The estimated \$1.5 million contract calls for a nucleonic approach for measuring propellants because the system must operate in a zero-gravity environment during portions of the three-man spacecraft's round trip to the moon.

Conventional gauging systems will not operate

The Gemini systems trainers, now located at MSC's training site at Ellington AFB, pictorially show how each system works. Schematically, they lay out on a flat, upright board each major spacecraft system. Upon initiation of a system, the schematic board lights up to display an operational flow pattern through lights traveling from component to component throughout the system. Opening a switch, for example, can simulate a malfunction in that component, and the signal flow, in choosing an alternate route, illustrates to the "student" the automatic switchover which actuates itself, or the manual switchover which he, as pilot, must initiate.

The student can also study the type of component failure, or the possibilities that could render a component inoperative, by observing the physical makeup of the component through its schematic layout, or its location along the signal flow route.

Engineers, checkout and operations personnel plan to use the systems trainers extensively.

First of any Gemini trainers to arrive in Houston, the teaching aids display such major systems as electrical power source flow provided by the

without gravity since the fuel may take any imaginable geometric form,

(Continued on Page 2)

fuel cells and back-up batteries; the entire electrical system sequential system, or the electrical sequence of events from lift-off to landing; the environmental control system (ECS) coolant circuit for cooling spacecraft equipment, the cabin and pilot; the ECS oxygen circuit for cabin, and for pilot main and emergency supply; and the attitude and maneuver control system (propulsion) circuit for orbital and re-entry directional control. A pilot's console displaying the layout of the Gemini cockpit instrument panel is equipped with a spacecraft control stick to actuate the attitude and maneuver control circuits.

Project Gemini two-man space flights, scheduled to begin in late 1964, will develop piloting techniques in docking and in rendezvousing in space, and will study the effects of long duration flights—up to 14 days—on men in a weightless environment. Often called the training ground for later, more ambitious Apollo flights, Gemini will lead to the national goal of landing two U.S. astronauts on the moon. Project Apollo's lunar landing is scheduled sometime before 1970.

The Gemini systems trainers were built for McDonnell Aircraft Corporation, the prime contractor to NASA for the Gemini spacecraft, by Burtek, Inc., of Tulsa, Oklahoma.