Space News
NASA ROUNDUP!

VOL. 2, NO. 15 MANNED SPACECRAFT CENTER, HOUSTON, TEXAS MAY 15, 1963

Aviation, Space Writers Gather In Dallas May 21

Cooper Flight To Utilize Live TV Broadcasting

"Live" television will be used for the first time in a U. S. manned orbital flight during MA-9 when a special TV camera will be monitoring the pilot's well being, taking backup readings of the instrument panel, observing tests and occasionally looking through the spacecraft window.

The ten-pound camera can be hand-held or mounted on a bracket to the right of the pilot's hand controller. A special telemetry transmitter has been added to the spacecraft to transmit the TV output directly to the ground during telemetry contact at selected tracking stations.

Mercury Control Center, the *Pacific Command Ship* (south of Japan), and Grand Canary Islands are set up to receive the television output.

The TV camera data can be obtained only when the spacecraft is in telemetry contact with a ground station properly equipped to decode the TV telemetry.

In order to obtain adequate picture definition within the space and weight restrictions imposed on the flight equipment, the scan rate has been reduced to 0.5 frames per

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A SPECIAL TEN-POUND TV camera will be in operation in "Faith 7" during MA-9, transmitting live pictures to the Pacific Command Ship south of Japan, the Grand Canary Islands station and the Mercury Control Center, Cape Canaveral. Here a McDonnell Aircraft engineer assists in placement of the camera, which would normally be focused on the astronaut but could be hand held and focused on other objects or the view outside the spacecraft. The camera, made by Lear Seigler, Inc. transmits one picture every two seconds over an RF communications link.

MA-9 Orbital Track Covers 100 Countries

The 22-orbit track of the MA-9 mission will carry Astronaut Cooper over more than 100 countries, islands and possessions, MSC announced last week.

On his first orbit, the MA-9 pilot is scheduled to leave the United States for Bermuda, Grand Canary Islands, Spanish Sahara, Mauritania, Mali, Algeria, Niger, Chad, Central African Republic, The Congo, Uganda, Kenya, Australia, New Caledonia, Fiji, Samoa, Christmas Island and Mexico.

The second orbit would add Upper Volta, Ghana, Spanish Guinea, Gabon, Federation of Rhodesia and Nyasaland, Mozambique, Malagasy, and the Solomon Islands.

Angola, Southwest Africa, Bechuanaland, South Africa, New Guinea, Marshall and Johnston Islands would be added to the list on the third orbit.

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MA-9 Mission Scheduled Not Sooner Than May 15

Preparations for the sixth United States manned space flight, Mercury-Atlas 9, were in the final stages as the Roundup went to press. Flight date was to be not sooner than today.

Prime pilot for the fourth Atlas boosted manned orbital flight and the first aimed at meeting the original objective of the Mercury program, a one-day flight, is Astronaut L. Gordon Cooper, youngest of the original seven Mercury astronauts at 36. Astronaut Alan Shepard is back-up pilot.

On the day of the flight, Mercury spacecraft "Faith 7," is scheduled to be launched between 8:00 a.m. EST and 10:30 a.m. EST from launch complex No. 14 at Cape Canaveral after a two-day split countdown.

BULLETIN

The MA-9 flight of Astronaut L. Gordon Cooper was postponed when trouble developed in the Bermuda tracking station radar, a critical factor during launch and orbital insertion. The flight may be attempted again today depending on the condition of the radar as of 6 p.m. last night.

Cooper and his spacecraft are to be inserted into orbit on a heading of 072.5 degrees true approximately 498 statute miles from the Cape at an altitude varying from 100 miles perigee to 171 miles apogee. If the mission continues through the 22nd orbit, retro-

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Cooper To Sleep As Much As Eight Hours, Test New Foods

Plans call for Astronaut L. Gordon Cooper to sleep for as much as eight hours as he circles the earth during MA-9, the first time "orbital sleep" has been attempted in U. S. flights. In addition he is to eat a new kind of food and take his own temperature.

The sleep period is scheduled to begin at the option of the pilot in the ninth orbit. During his nap, Cooper would be in drifting flight.

A first period of about two hours is set aside during which the sleep period can start. The ground station at Muchea is scheduled to wake Cooper up with a signal to the spacecraft during the 15th orbit, as determined by the flight director. The end point allows a minimum of two hours for the pilot to awake before retrosequence begins.

A number of other aero-medical studies are being carried out during MA-9, including the use of a new type of food.

The MA-9 food supply consists of two types, the ready-to-eat bite-size foods previously used, in sufficient quantity to

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Flashing Beacon To Help Evaluate Tracking Ability

A flashing beacon, drifting gradually away from "Faith 7" as it circles the globe, may help evaluate the capability of a pilot to see and track a light source at distances of up to 15 miles in space.

The beacon is one of a dozen experiments and studies to be carried out in the longest U.S. manned space flight to

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Association To Mark 25th Anniversary In Four - Day Session

Top officials from all of the United States' armed forces and its civilian aviation and space agencies will gather in Dallas May 21 through 24 to brief an estimated 500 members of the Aviation/Space Writers Association on their latest plans.

The association will mark its 25th anniversary at the meeting and news conference in the Adolphus Hotel, according to M. L. McLaughlin of Dallas, general chairman of the event.

During the four-day session, writers from throughout the United States and Canada will attend briefings by—and will have an opportunity to question—key leaders of the U.S. Defense Department, the Air Force, Army, Navy, Federal Aviation Agency, Civil Aeronautics Board and the National Aeronautics and Space Administration. Most of the major U.S. aerospace manufacturers and airlines also will be represented.

One of the highlights of the meeting will be a silver Anniversary Banquet May 21 at which the presidents or board chairmen of some 40 major companies will be present to receive silver medallions from the association.

The companies—which are being honored for making aerospace news for the last quarter century—include airlines and manufacturers of aircraft and engines. Each firm has been in business for at least 25 years.

Earlier that day, at Dallas Love Field, the writers will see a display of the world's newest business aircraft, including a number of brand-new executive jets.

Also on May 21, officials of the Defense Department from the Pentagon will outline new developments in overall military aviation and space programs.

On May 22 the writers will hear briefings on Army aviation and on new projects in the field of airline transportation.

The Navy will make a presentation on May 23, and the following day the Air Force will brief the writers on such topics as its plans to operate in

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CANISTER which will enclose the flashing beacon for use in an MA-9 experiment is attached to the retropack. William Armstrong (right) of Flight Crew Operations explains the experiment to William Carmines of Langley Research Center.

MA-9 Mission Scheduled

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fire will be initiated about 170 miles southeast of Kyushu, Japan, causing the spacecraft to land bout 80 miles southeast of Midway Island.

MSC's main MA-9 objectives are the study of effects of prolonged flight in space on the astronaut; the verification that man can function in space as a primary "system" aboard the spacecraft for an extended period of time; and the study of the combined performance of the astronaut with a Mercury spacecraft modified for a full-day mission.

As secondary objectives, MSC hopes to obtain the astronaut's in-flight evaluation of the operational suitability of the spacecraft with its supporting elements, and to assess the effectiveness of the Mercury Worldwide Tracking Network and mission support forces during an extended manned orbital flight.

Underlying the entire MA-9 mission is the continued refinement of equipment, systems and procedures leading to the much more ambitious Apollo spacecraft flights which will ultimately, and within this decade, land two U.S. astronauts on the moon.

The 14 other astronauts will serve as flight controllers from vantage points around the world, and as trainee observers. Astronaut Walter M. Schirra, Jr., will serve as Cap Com at Cape Canaveral. Astronaut John H. Glenn, Jr., will serve as Cap Com aboard the Pacific Command Ship, while Astronaut M. Scott Carpenter will be stationed as Cap Com on Kauai Island, Hawaii. Astronaut Virgil I. Grissom will be Cap Com at the Guaymas, Mexico, station.

MSC's nine astronauts, who were selected to augment the original seven astronauts in future Gemini and Apollo flights, will be assigned to Cape Canaveral under the direction of Astronaut Donald K. Slayton for mission orientation. They are Neil A. Armstrong, Frank Borman, Charles Conrad, Jr., James A. Lovell, Jr., James A. McDivitt, Elliot M. See, Jr., Thomas P. Stafford, Edward H. White, II, and John W. Young.

In evaluating the benefits of extended flight time, MSC officials point out that "the text books on theory have been exchanged for text books on fact."

The spacecraft for the MA-9 flight, having shown tremendous flexibility and capability for modification, more closely resembles a true bionics system. The Atlas launch vehicle, having earned additional confidence in its man-rated qualities, has undergone change with its new ignition system. The astronauts have changed through their flight training and actual space flight experiences, proving themselves space pilots rather than spacecraft passengers.

Barring major technical or weather difficulties, the total daily "hold" time prior to launch from Cape Canaveral is limited to a maximum of three and one-half hours in the event that delays in the launch are encountered. The mission then may be rescheduled on a day-to-day basis. "Holds" may range from minutes to days.

Following recovery, the mission pilot will remain aboard the Pacific aircraft carrier for a 48-hour debriefing period. After a six- to eight-hour layover in Hawaii, the astronaut and a small party of accompanying NASA personnel will then be returned directly to Cape Canaveral.

Live TV

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second. This necessitates special equipment on the ground to reconstruct the picture for immediate viewing.

At Mercury Control Center, the flight surgeon will have access to a real-time monitor modified to use the two-second scan speed. Five other TV monitors will also see the picture, but they will view it on the standard scan rate after electronic conversion of the telemetered image.

In addition, 35 mm film will be used to record the picture on the ground.

Both the Pacific Command Ship and Grand Canary will record the telemetered signal on magnetic tape for later playback. The Pacific Command Ship will also have a real-time display at the two-second scan rate.

The MA-9 pilot will turn the TV camera on at approximately the expected telemetry lock-on time for each pass over Mercury Control Center, the Pacific Command Ship, and Grand Canary. He may remove the camera from its mounting at any time targets of interest appear during TV contact times or whenever specific views are requested by ground control.

In its mounted position, the camera is normally directed at the pilot. The choice of the appropriate lens will depend on subject matter and will be determined during flight by the pilot with advice from the monitoring ground station.

The initials LEM stand for Lunar Excursion Module, the spacecraft in which two U. S. astronauts will land on the Moon.

Cooper To Sleep, Test Foods

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satisfy all caloric requirements; and experimental Gemini-type dehydrated food and drink, prepacked in plastic containers for reconstitution during flight.

Preparation of the dehydrated food requires the addition of water. The containers have nozzles through which water can be added. After it is mixed, the food or drink can be forced out through the same nozzles. The rehydrated food requires about five minutes of mixing.

Other aeromedical studies include a study of the pilot's water balance and kidney function, comparing body weight before and after the flight, recording water intake during flight, and analyzing urine samples collected at intervals.

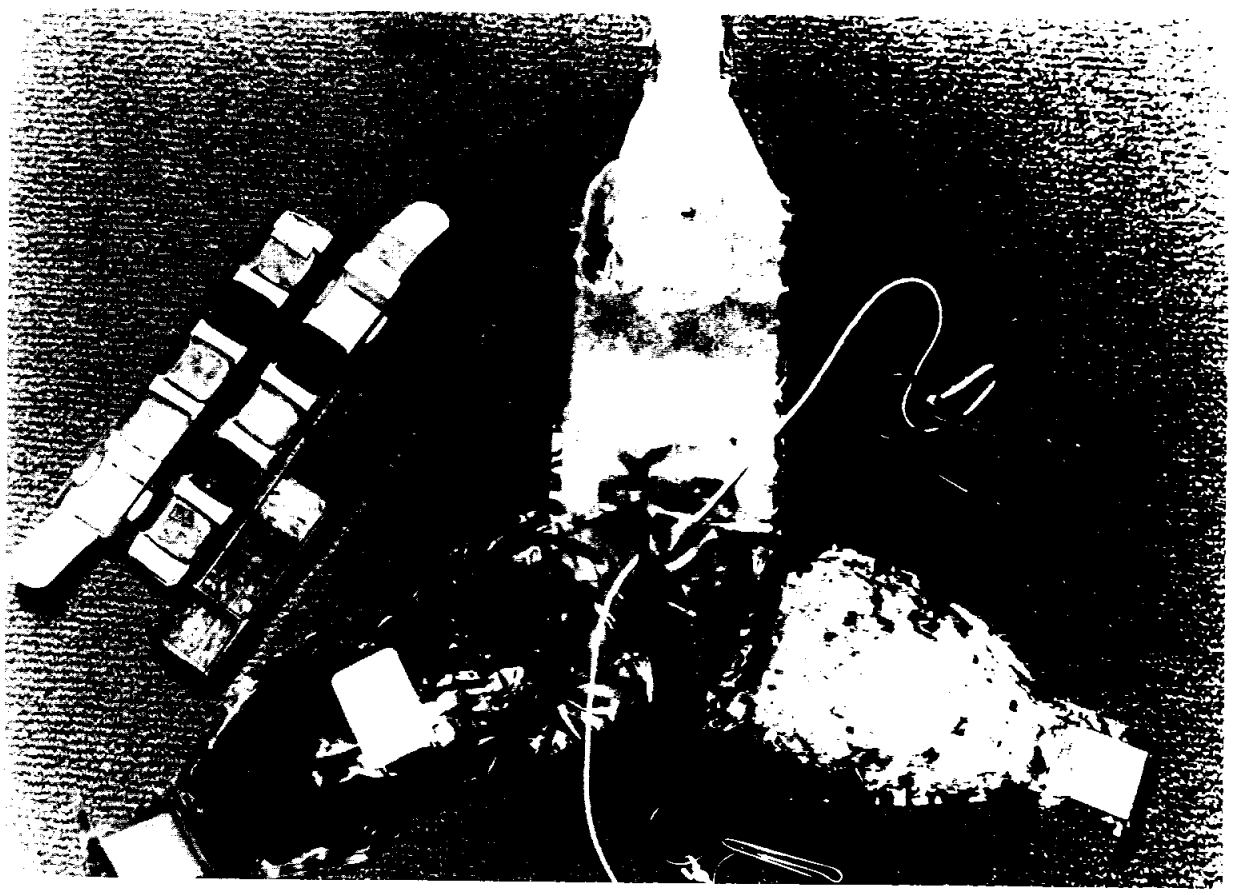
The oral temperature measuring device for the mission consists of a thermister imbedded in a latex probe, stowed on the right ear muff inside the helmet. Cooper will open his helmet visor to insert the probe under his tongue. Four measurements of temperature are planned.

Blood pressure readings are scheduled with a tailored, occluding cuff on the upper left arm. There is a microphone under the lower edge of the cuff, over Cooper's brachial artery. The pilot will depress the blood pressure "start" button on the left instrument panel to inflate the cuff.

Cooper's electrocardiogram readings will come from four sensors located on his torso, at upper and lower chest and right and left sides. Two pneumograph sensors for determining his respiration rate will be carried at the sixth rib level under each of Cooper's arms.

Cooper will exercise twice during the flight to provide a study in measured stress on the cardiovascular system. The exercise will also serve to tone his body during the long inactivity of the flight.

Cooper will use a two-hand grip anchored to his spacecraft by a stretchable or bungee cord for exercise. Pulling the hand-grip as far out as is allowed by a loose tether line requires 60 to 65 foot pounds of work per pull, at the rate of one pull per second.



THE FAMILIAR bite-size portions of ready-to-eat food will be used by Astronaut L. Gordon Cooper during MA-9, but in addition he will carry and test a new Gemini-type dehydrated variety, prepacked in plastic containers to which water must be added. Above are three packages of the food, labeled (left to right) shrimp, apple juice, and potatoe salad.

Cooper To Take Photos of Zodiacal Light, Night Airglow Layer On MA-9

Photographic data on two dim light phenomena which are best seen from outside Earth's atmosphere will be gathered during MA-9. They are the Zodiacal light and the night airglow layer.

Photographs of Zodiacal light will help scientists to determine the light's exact origin, geometric distribution, and its usefulness in studying solar radiation and flare activity. Data on the airglow will provide further information on the solar energy conversion processes occurring in the upper atmosphere.

The nature of Zodiacal light is believed to be sunlight reflected from free electrons and large dust particles in the ecliptic plane, distributed outward from the sun in interplanetary space, or in geocentric orbits about Earth. The intensity of the Zodiacal light is relatively weak, and measurements from Earth's surface are inhibited by scattering and absorption of light in our atmosphere.

Measurements of corona intensity within two degrees of the sun's disk during solar eclipses show a bright halo; other measurements near the plane of the ecliptic up to 30 degrees ahead of sunrise or behind sunset indicate a possible light intensity relationship to the solar halo.

During the MA-9 flight, Astronaut L. Gordon Cooper will attempt to obtain time exposures on color film covering the ecliptic region after sunset on the 16th orbit between two degrees and 30 degrees from the sun, to ascertain if Zodiacal light is a continuous phenomena or if it arises from the two distinct processes.

Airglow Layer

The airglow consists of a weak continuum in the visible spectrum and has three distinct colors—yellow from the sodium D lines and green and red lines, the latter two being attributed to "forbidden" transitions in the energy states of atomic oxygen.

In order to perform these studies accurately, the pilot will make maximum use of the ASCS (automatic control) so that he can devote most of his attention to the timing of his photographs.

Just after sunset, the pilot will begin the first of four sequences of Zodiacal light photographs. The photographs will begin 15 seconds after the sun disappears below the horizon.

The airglow will be photographed in sequences throughout the remainder of the night phase with five minute intervals between sequences. Each sequence will consist of three photographs — a two-minute exposure, a 30-second exposure and a ten-second exposure with a minimum of delay between exposures.

At morning twilight, the sequence will be changed to one final series of a 30-second exposure immediately followed by a seven-second exposure taken every two minutes.

Infrared Film Will Be Used For Special Weather Pictures

Weather phenomena from orbital altitudes will be photographed during MA-9 using infrared film and filers.

Purpose of the experiment is basic information in infrared reflectance from the atmosphere and design data of the instruments in future meteorological satellites.

Film results should provide valuable information on spectral characteristics of the cloud and Earth radiances, of sunlight scattering by large aerosols, and of contrast variation with wave length.

A Hasselblad camera with 70 mm film and 80 mm lens will be used for this photography. A holder containing the three filters will be inserted into the magazine loaded with infrared sensitive film. The U. S. Weather Bureau proposed this task and is responsible for processing and sensitometric calibration of the film.

Execution of this experiment is planned during the 17th and 18th orbits; at his own discretion, the pilot may choose additional times. The control mode for this study will generally be drifting flight.

Experiment Set To Measure HF Antenna Output

A first-time experiment will provide measurements of antenna polarization and atmospheric effects associated with HF communications between an orbiting vehicle and ground stations during MA-9. Results will be directly applicable to the vertically polarized HF antenna to be used on the Gemini spacecraft.

The operational procedure for this test requires two HF transmissions from the spacecraft, one with a 28-foot-long antenna in a horizontal position (horizontally polarized), and the other with the spacecraft rolled 90 degrees so that the dipole points toward the center of Earth (vertically polarized).

The test of the two orientations will be performed over an area just north of Panama so that the spacecraft is fairly close to receiving stations where reasonable reception and good coverage of the region just beyond line-of-sight are expected.

This test will be conducted a second time over the South Atlantic in a remote area where long ranges well beyond line-of-sight are required for station contact.

Spacecraft Coatings

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Astronaut L. Gordon Cooper.

The coatings are six-inch squares baked onto a test shingle located at the small end of the spacecraft's conical section. The three pigments to be tested have a titanium oxide base, a zirconium oxide base and a zinc oxide base.

The test will provide data on changes in pigment reflectivity caused by reentry heating.

Flashing Beacon

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date.

The experiment is associated with Gemini and Apollo missions where visual sighting will serve as a means for rendezvous.

Two flashing xenon lights will be used, battery powered and mounted on opposite sides of a 10-pound sphere. The lights radiate about one flash per second, and are designed to equal a star magnitude of plus two at a distance of six to eight nautical miles. Plus two is about the same magnitude as Polaris, the North Star, has from earth.

The sphere is mounted on a canister on the retropack. It will be launched down at an angle of 92 degrees from the flight path 15 minutes before sunset. Under these conditions, it will move along with the spacecraft at a gradually widening angle. The pilot will repeat sightings at 10-minute intervals during the next three night phases, and if possible during the first daylight phase.

Cooper will comment on the appearance of the light against the star or Earth background and estimate its relative position from the spacecraft.

ASWA Meeting

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space. Maj. Gen. William K. Martin will moderate the Air Force news conference.

The National Aeronautics and Space Administration will conduct a news briefing on May 24 with Public Affairs Officer John A. Powers as moderator. Plans call for several astronauts to be present. NASA will exhibit one-fourth scale models of its Gemini orbital spacecraft and the Apollo moon vehicle.

Final event of the meeting will be a party at Six Flags Over Texas, a $10 million entertainment center, for the 500 visiting writers.

JAMES McBARRON of Crew Systems Division points out a few of the changes made in the Mercury pressure suit worn by Astronaut Gordon Cooper during the MA-9 mission. One of the changes is the boots, which now are an integral part of the pressure suit rather than being laced over it as separate items.

Horizon To Be Investigated As Navigational Reference

Can Earth's sunlit horizon and atmosphere be used as a reliable sextant reference during the midcourse phase of lunar missions?

Astronaut L. Gordon Cooper will attempt to answer this question during the nation's sixth manned space flight with photographs, which could be of direct use to Massachusetts Institute of Technology in the development of the Apollo guidance and navigation system.

This experiment is a continuing effort to define an invariant horizon line in the atmosphere near the Earth's surface, one that remains independent of changing atmospheric conditions.

Photographic observations of Earth's horizon and atmosphere were made on MA-7 through blue and red filters, to discover if there is a point of sharp cutoff in either spectral region of the horizon or the atmosphere which can be used for accurate navigation. The results, however, were not conclusive.

Photographs to be taken on the MA-9 flight will be used to investigate two specific problems:

(1) to indicate a specific altitude for a well defined line, and

(2) to resolve uncertainties arising from the atmospheric scattering of incident sunlight.

Useful data will include red and blue filtered, daylight photographs of the horizon and atmosphere taken at even intervals as the spacecraft crosses the sunlit portion of Earth.

Photographs will also be taken during a short period of all four quadrants of Earth's surface and, if possible, at a known time when the rising or setting moon would also appear in the picture. The first two series of photographs would provide excellent comparisons of the horizon and atmosphere through varying sunlight-scattering angles.

Radiation

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concerning preferential direction on the incoming radiation. Data obtained should provide a qualitative test of the assumption that radiation near the spacecraft is isotropic.

A pocket ion chamber stowed in the pilot's ditty bag prior to launch is scheduled to be secured to the hatch about ten minutes after launch. A radiation detecting film patch will also be attached to the hatch. The ion chamber and the film patch will give a rough measurement of the total interior radiation.

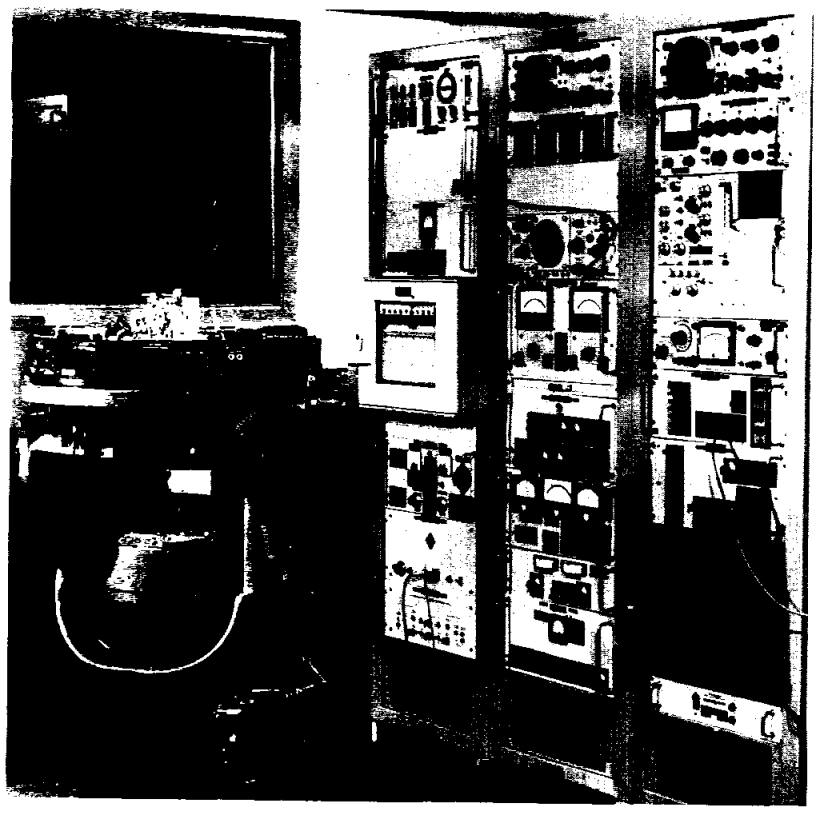
The radiation reaching the pilot will be measured by four film patches worn beneath the astronaut's pressure suit—one inside the helmet near the left ear muff, one on the right thigh, and two in the chest region.

In addition, one photographic emulsion pack will be carried in the spacecraft cabin and will be located above the left instrument panel. This high-energy particle detector has been provided by the U.S. Navy School of Aviation Medicine.

M. I. T.'s Instrumentation Laboratory Teams Up W

DR. STARK DRAPER (left), founder and director of the MIT Instrumentation Laboratory, is also professor and head of the Department of Aeronautics and Astronautics at M.I.T., and a pioneer in the development of inertial guidance systems for ships, submarines, airplanes, missiles and satellites. At right is Dr. Walter Wrigley, M.I.T. professor and education director.

OUTSIDE VIEW of the MIT Instrumentation Laboratory building where the work on the Apollo navigation-guidance system is being performed. The building, one of seven used by the Instrumentation Laboratory in Cambridge, Mass., was acquired in 1961 from ITEK Corp. when MIT accepted the assignment of designing the Apollo guidance-navigation system.



A VIEW OF THE SYSTEMS LAB at M. I. T.'s Instrumentation Laboratory shows banks of electronic equipment and a stand used for rotation equipment. The instrumentation laboratory was started just before World War II to develop lead-computing gyroscopic gunsights for heavy anti-aircraft guns.

In a three-story building of buff-colored brick at 75 Cambridge Parkway, overlooking the Charles River in Cambridge, Massachusetts, 300 engineers and scientists are teamed in an extensive mingling of university and industry talent to help send American explorers to the moon.

The team is engaged in designing both the guidance-navigation system three U. S. astronauts will use to steer their Project Apollo spacecraft to an orbit around to moon and back, and also the guidance-navigation system two of them will use to steer their Lunar Excursion Module from the mother ship to the moon's surface and back.

Two hundred of the professional force are staff members at the Massachusetts Institute of Technology's Instrumentation Laboratory, which has primary responsibility for the system design. The other 100 are on-site representatives of the participating contractors NASA has assigned to support the design effort—AC Spark Plug Division of General Motors Corp., Milwaukee, Wis., and Wakefield, Mass., for the inertial measuring unit systems assembly, and testing; the Raytheon Co., with headquarters at Lexington, Mass., and Apollo work being done at its Sudbury, Mass., plant, for the system's digital computer; the Kollsman Instrument Corp., Elmhurst, N.Y., for the optical unit; and the Sperry Gyroscope Co., Great Neck, N.Y., for the system's force-measuring accelerometers.

Supporting this fully-integrated university-industry design team are another 300 Instrumentation Laboratory technicians, machinists and administrative personnel assigned to the Project Apollo program, plus representatives from other major Apollo contractors, including North American Aviation, Inc., Downey, Calif., the spacecraft contractor, and Grumman Aircraft Corp., Bethpage, N.Y., the LEM contractor.

The building that houses the Apollo guidance-navigation design work formerly was occupied by an electronics firm—ITEK—which moved to new quarters on Greater Boston's Route 128. The building is one of seven used by Instrumentation Laboratory in Cambridge and was acquired in 1961 when the Laboratory accepted the assignment of designing the Apollo guidance-navigation system.

The Laboratory's founder and director is Dr. Charles Stark Draper, Professor and Head of the Department of Aeronautics and Astronautics at M.I.T. and a pioneer in the development of inertial guidance systems for ships, submarines, airplanes, missiles and satellites.

Dr. Draper started the Laboratory just prior to World War II to develop lead-computing gyroscopic gunsights for Navy anti-aircraft guns. The Mark 14 gunsight was the first of its kind to reach the fleet and played an important role in the naval engagements of World War II.

Toward the end of the war, Dr. Draper and his associates developed gyro-stabilized gun-bomb-rocket sights for Air Force fighter planes and one of these saw extensive service in the Korean War aboard F-86 fighters.

Following World War II, Dr. Draper began applying knowledge about gyroscopic stabilization systems and feed back control in the original work done in this country on inertial navigational systems and inertial guidance systems.

Essentially, these are systems that have a gyro-stabilized inner member on which force-measuring accelerometers are mounted. Information from the accelerometers—isolated from short term disturbances by gyro and gimbel stabilization—can then be computed into information about changes in speed, position and direction of movement—all without reliance on any information from outside the vehicle. Navigation systems essentially read out this information while guidance systems actually control the vehicle automatically and guide it to a predetermined terminal or target.

Two accomplishments that played key roles in making such systems possible were Dr. Draper's development of what has come to be called the hermetically-sealed floated single-degree-of-freedom integrating gyro, and the Laboratory's development of light-but-rigid beryllium as a structural material. Together, these made possible the kind of precise, reliable and rugged instruments needed for inertial system use.

Dr. Draper made his first inertial transcontinental test in a flight from Massachusetts to Los Angeles in 1953, demonstrating the feasibility of such systems. Since then, from the Laboratory have come the designs for the inertial guidance systems used in Air Force Thor and Titan missiles and the Navy's Polaris missile plus the design concepts for the ship's inertial navigation system (SINS) used aboard nuclear-powered submarines. The Laboratory is continuing its work on advanced inertial guidance, navigation and control systems for the military services.

Vice President James McCormack of M.I.T. has noted that although the Apollo task is the largest single undertaking in the 24-year history of Instrumentation Laboratory, the Institute looks on the Laboratory as a national resource of special talent and skill has pledged the Laboratory to realization of Project Apollo as a national goal in space.

The Apollo guidance-navigation system actually is more than an inertial system alone. Designers are incorporating into this system (the Apollo and the LEM systems will be very similar, under present planning) virtually all available means of navigation—celestial star-sighting, radiation tracking and inertial measurements.

As in all of its program, the Laboratory works closely with participating contractors in developing system designs, fabricating prototypes and carrying out engineering tests. Actual system production, of course, is performed by industry.

Assisting Dr. Draper in overall supervision of the Labora-

Secretaries' Salute

Three of these cheerful young ladies represent MSC's Mercury, Gemini and Apollo programs as secretaries to the project managers; the fourth is secretary to one of the Center's assistant directors.

At top left is Miss Connie Critzos, secretary to Project Mercury Manager Kenneth Kleinknecht. Born in Newport News, Va. she graduated from Newport News High School and attended Mary Washington College of the University of Virginia in Fredericksburg. She began her Government service with NACA in 1946 and has been with MSC since May of last year. Connie, whose brother, Chris, also works for MSC, likes bridge, hiking, and most of the fine arts, especially music.

The voice on the telephone at top right is Mrs. Margaret Marshall, secretary to Charles W. Matthews, acting manager of Project Gemini. She, too, is a Virginian, born in Phoebus, which is now part of Hampton, where she graduated from Hampton High School. Margaret has had 11 years of Government service, five of them with the Veteran's Administration, and celebrated her four-year anniversary with MSC last week. She is the mother of four, Stacy, 11, Stephen, 10, Cynthia, 7 and Donald, 5. What little spare time she has is devoted to sewing and reading.

At lower left is Mrs. Helen Statz, secretary to former Apollo Project Manager Charles Frick until recently and now secretary to the acting manager. Born in Gary, Indiana, Helen grew up in nearby Whiting, where she graduated from high school before attending the Chicago College of Commerce, University of Chicago and Indiana University. At Indiana University she met and married Charles Statz, also an employee of MSC, and they have two children, Charles II, 14 and Sally, 11. Helen has eight years of Government service, having come to MSC last June from Redstone Arsenal. In her spare time she reads and is active in community activities.

At lower right is Mrs. Lois Bradshaw, secretary to G. Barry Graves, assistant director for information and control systems. A native Texan, she was born in Baytown and graduated from Trinity High School, Trinity, Texas, and Lee College in Baytown. Lois also attended business college in Lufkin. She has been with MSC for a year. Before that she was secretary to the chief of the contract accounting branch at Humble Oil for five years, and has worked for Shell Oil and for several attorneys. Her husband is William D. Bradshaw, a chemical operator with Ethyl Corp. in Pasadena. Lois says her hobbies are swimming, duplicate bridge, and "entertaining a two-year-old," daughter Sandra Leigh Bradshaw.

MSC Bowling Roundup

Editors Note; Team standings, and high averages, series and games for the four MSC bowling leagues will be listed in each issue of the Roundup provided they are turned in by Wednesday afternoon one week before publication. Space requirements prohibit publishing individual averages. Winners of end-of-season trophies and awards will be listed. Those groups establishing summer leagues after the end of the regular season are urged to turn in standings.

NASA FIVE O'CLOCK LEAGUE
(Male personnel from Financial Management, Logistics and Procurement Divisions. Bowls Monday nights at Ellington Lanes.)

Team	Won	Lost
SUPPLIERS	87	33
BANKERS	74	46
ALLEYGATORS	63	57
ALLEYCATS	61	59
PROCURERS	39½	80½
PRICING	35½	74½

Hi Series: George Elder, 599
Hi Team Scratch Game: Alleycats, 909.

MSC MEN'S LEAGUE
(Personnel from all divisions. Bowls Monday nights at Meadowbrook.)

Team	Won	Lost
COSMONUTS	41	15
TIGERS	39½	16½
STRIKES & SPARES	34	22
CEE GEES	32	24
BLIVITS	28½	27½
PLUMWOOD HOMES	28½	27½
WHIRLWINDS	25	31
SHERLOCK HOMES	17½	38½
STATION MASTERS	17	39
FIZZLERS	17	39

Hi Team Series: Plumwood Homes, 2574; Tigers, 2496.
Hi Team Handicap Series: Plumwood Homes, 2895; Tigers, 2829.
Hi Team Scratch Game: Strikes and Spares, 899; Station Masters, 854.
Hi Team Handicap Game: Strikes and Spares, 1010; Station Masters, 1007.
Hi Individual Scratch Series: Garino, 627.
Hi Individual Handicap Series: Cairl, 661.
Hi Inidvidual Scratch Game: Cairl, 245.
Hi Individual Handicap Game: Cairl, 265.
Week's Highs: Sandars 518, Jevas 549, Garino 201-201 (570), Reaves 200 (528), Hensley 541, Lambert 201 (523), T. Lewis 201, Henderson 503. By Special Request: Koplin 376.

Rigid astronomical timetables, based on the motion of the planets around the Sun, dictate the opportunities during which launches can be made to the planets. Space scientists call these opportunities "windows." The next window for Venus will open in the spring of 1964, and the window for Mars in the winter of the same year.

Classified

1 ACRE WOODED LOT IN SHOREACRES – Beautifully wooded (pines, oaks, sweet gum). Cleared. Water, gas, electricity. Sewers this year. Restricted. Shell roads, pavement planned. Schools 3 miles (La Porte District). Houston Yacht Club, Galveston Bay – 1-1/2 miles. NASA Clear Lake site – 6 miles. $3900 cash. Call Houston – PA 3-1311.

* * *

WINDOW AIR CONDITIONING UNIT – Hotpoint, 3/4 ton, 9,000 b.t.u., 115 v. a.c., used one season. $95.00. Call HU 6-6967.

* * *

HOUSE FOR SALE OR LEASE – Brick, 3 bedroom, family room, 1-1/2 baths, two-car garage in Fairmont Park. Three blocks from beautiful sub-division swimming pool and park; convenient to schools and shopping. For information call John McLeaish, GA 1-3210, LaPorte in p.m.

* * *

HOUSE FOR SALE – 3 bedroom, all brick, air conditioned, two-car garage. Purchase equity, take over payments. For information call John Jones – GA 1-2638, 10330 Carlow Lane, Fairmont Park, La Porte, after 5 p.m. During day call Ext. 7495.

* * *

PITCHER WANTED – MSC Softball Team needs fast pitcher. Anyone interested in trying out please contact Randy Hester, Ext. 4318 or 4319.

The Indianapolis (Indiana) News is planning an aviation and aerospace column by staff writer H. C. Brown to begin running weekly in the near future. Mr. Brown would like to know how many persons from Indiana are working in the Center's programs.

In that connection, those MSC employees who are natives of Indiana or who have lived in that state are asked to telephone the Roundup office, Ext. 3671, or send in their names and addresses by interoffice mail as soon as possible.

WINNERS OF THE "MISS TRANSPORTATION" contest sponsored by the Houston transportation industry during Transportation Week included two MSC girls. They were announced on the Ames Brothers television show last month. Left to right are Vic Ames; Miss Sharron Tipton of Security, the first place winner; Miss Judy McCallum of Security, a runner-up; and Gene Ames.

C & G Hoopsters Rack Up Seventh Consecutive Win Over SEDD

The Control and Guidance hoop team from the Spacecraft Technology Division racked up their seventh consecutive win May 1 as they trounced an Energy Systems team from Systems Evaluation and Development Division 90-37.

C & G took an out-of Center team, the "Edgewood Unmentionables," 96-68 April 17 and then defeated a mixed team of co-op students and engineers from the Lane Wells Building 55-45 at Mason Park April 24th in their fifth and sixth wins.

In the game against SEDD, C & G established a lead early in the first quarter and lead throughout the remainder of the game. The final quarter saw C & G score 36 points against SEDD's 11.

Claud Edmiston lead C & G scoring with 27 points, followed by Paul Horsman with 19. Jim Cioni and Max Daugherty shared scoring honors for Energy Systems with eight points each.

C & G also lead all the way against the Edgewood Unmentionables in a game highlighted by a third quarter scoring drive that netted 30 points for C & G against their opponent's 12.

The game took on the aspect of a family feud at times as Jimmy Smith, C & G's right guard, found himself confronted by his two brothers, both playing for the Unmentionables. Team captain Edmiston again led the C & G sharpshooters with 34 points followed by John Dale with 22. Roland Hayes led the Unmentionables with 20.

Against the Lane-Wells team, essentially the same group that downed Energy Systems 90-34 in January, the C & G five was haunted by bad passing and an initial inability to clear the boards and was trailing 19-14 by the end of the first quarter. The Lane-Wells lead increased to nine points midway through the second quarter before C & G tigntened its defense. At halftime the score stood 28-25 for Lane Wells. In the third quarter C & G got their second wind and captured a five-point lead. The final play saw the Lane Wells team tiring rapidly and the decision went to C & G by 10 points.

John Bell led the Lane Wells hoopsters with 21 points while Edmiston racked up 31 for the winners.

Another game was scheduled May 7 when the Computing and Data Reduction Center had a return match at the East End YMCA.

Glenn, Family Will Vacation After Mission

Astronaut John H. Glenn, Jr., plans to take about ten days' vacation in Japan with his family following the orbital flight of L. Gordon Cooper.

Glenn will be voice communicator between Cooper and a Project Mercury tracking ship stationed about three hundred miles off the coast of Japan. He passed through Tokyo early in May enroute to Nagasaki where he will board the tracking ship, the Coastal Sentry. About four days after the Cooper flight, Glenn will be joined in Japan by his wife, Annie, and two children, David, 17, and Lynn, 15, who will arrive from their home in Houston.

NASA has successfully launched four communications satellites—Echo, Telstar, Relay, and Syncom.

Looking around for a bargain in engagement rings?

If you can hold off for a few years, you may be able to adorn your fiancee's finger with a ring that is capped with a diamond-like gem from the moon. Or you might buy yourself a chunk of meteorite diamond.

According to Dr. Eugene B. Konecci, NASA's director of biotechnology and human research, it is quite possible that the moon contains such rare diamonds and other gems.

He told a group of chemists recently that nuclear fuel in the launch vehicles would reduce the cost of each pound of payload spacecraft and allow for the recovery and return to earth of lunar ore and possibly precious materials.

Dr. Michael E. Lipschutz, an astrochemist at NASA's Goddard Space Flight Center in Greenbelt, Md., has already discovered diamonds in a meteorite which fell in India some 90 years ago.

He made the discovery while using an X-ray analysis technique on minute samples of the Dyalpur meteorite which fell on earth May 8, 1872. A tiny fragment of the meteorite is in the Chicago National Museum which allowed Dr. Lipschutz to remove about one-thousandth of a gram for his research project.

Rep. Kenneth Hechler of West Virginia has requested that all Manned Spacecraft Center personnel native to that state turn in their names and addresses to Gene Lindquist, assistant for Congressional relations, at Ext. 5233, immediately.

The request is in connection with West Virginia's July centennial.

Federal Employees Share In Armed Forces Observance

Federal employees who serve as a "vital link in America's defense chain" are sharing honors with members of the uniformed Armed Forces at many special events throughout the country and abroad during the 14th annual observance of Armed Forces Week, May 11-19.

Featured at many open houses and other special events at defense installations are exhibits and displays that spotlight the vital role civil servants play on our Nation's defense team. In addition, more than 1,000 community programs in the United States are featuring parades, displays, and demonstrations, providing the public and Federal employees an opportunity to make an inspection of the defense system's mission and achievements.

"Power for peace," a slogan adopted in 1953 and used for 10 of the past 13 Armed Forces Day observances is being spotlighted again as the theme in 1963. Civil service theme for the event, "Vital Link in America's Defense Chain," highlights the important support Defense Department civilian employees give daily to our Armed Forces.

In an Armed Forces Day tribute, Civil Service Commission Chairman John W. Macy, Jr., said: "We of the U.S. Civil Service Commission proudly join in saluting the members of our Army, Navy, Air Force, Marine Corps, and Coast Guard who stand as a formidable force in our Nation's 'Power for Peace.'

"We also salute our Government's civilian workers who are dependable partners of our uniformed forces in maintaining our 'Power for Peace.' The more than one million civilian employees of the Department of Defense, stationed around the world, serve as a vital link in America's defense chain."

He urged members of the career civil service and their families to join other citizens in their communities in honoring the defense team, especially in view of these days of critical world tensions.

Nearly half of all Federal employees work in direct support of our air, ground, and sea forces. More than 380,000 are employed with the Army, nearly 345,000 with Navy, and some 306,000 with Air Force at outposts of freedom throughout the world.

Deputy Director's Roles Are Specified In MSC Memo

All line organizations now report either to the deputy director for development and programs, James C. Elms, or to the deputy director for mission requirements and flight operations, Walter C. Williams, according to an MSC announcement circulated early this month.

Elms is responsible for the management of all MSC projects. In this capacity, he will be responsible for total project planning, but will solicit, consider, and act upon suggestions and recommendations of the deputy director for mission requirements and flight operations. In addition, the deputy director for development and programs is responsible for planning, organizing, and directing those Center activities relating to providing administrative and technical support for the entire MSC operation.

Reporting to Elms are the following: assistant director for engineering and development, assistant director for information and control systems (other than IMCC and GOSS), assistant director for administration, Apollo Spacecraft Project Office, and Gemini Project Office.

Williams is responsible for the development of mission plans and rules, crew training, operations inputs into the developmental effort, development of ground and control complexes and other related activities.

He is responsible for the management of all flight operations conducted by the Center and for developing necessary working arrangements and agreements with the DOD.

In carrying out the operational phase of development programs he will solicit, consider, and act upon suggestions and recommendations of the deputy director for development and programs.

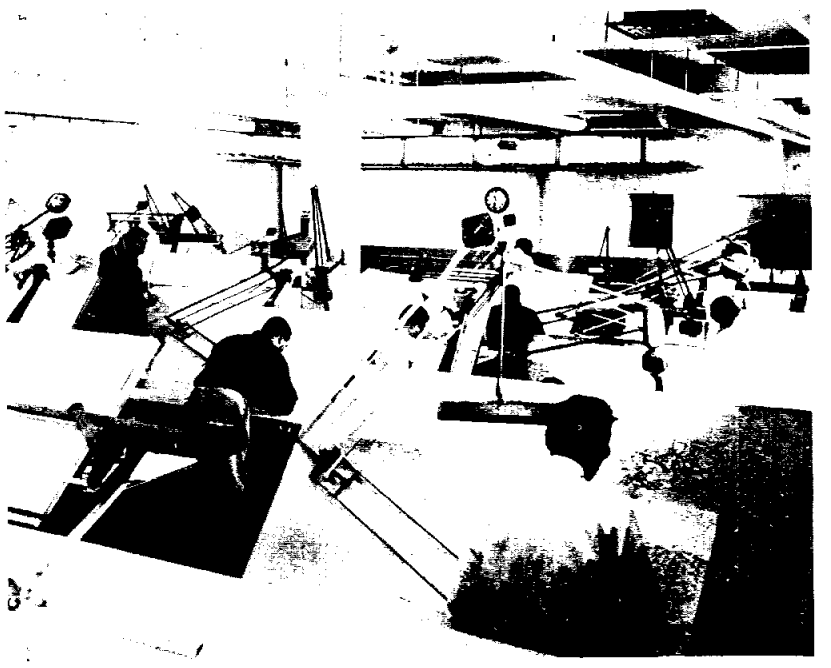
The Mercury Project Office will report to Williams in view of the fact that upon completion of this project these personnel will assume new responsibilities in the mission requirements and flight operations area.

Details of the organization reporting to the deputy director for mission requirements and flight Operations will be issued shortly. For the interim, the following organizational units will report to Williams: MSC manager of Atlantic Missile Range operations, Preflight Operations Division, Flight Operations Division, Flight Crew Operations Division, Mercury Project Office, Center Medical Operations Office, MSC manager of White Sands Missile Range operations, assistant director for information and control systems (for purposes of IMCC and GOSS implementation).

h Industry To Design Apollo's Navigation System

ASTRONAUT JOHN H. GLENN peers through an early prototype of the space sextant to be incorporated into the guidance-navigation system aboard the Apollo spacecraft. Glenn inspected the equipment during a visit last December to the MIT Instrumentation Laboratory. Kollsman Instrument Corp., AC Spark Plug Division of General Motors and Raytheon Co. are participating in the system design and development of the Apollo guidance system.

WELDING OPERATIONS are not usually thought of as being done under a microscope, but the minute precision welding being done in this photograph is part of the highly sophisticated technology required in space-age development. MIT designed both the guidance-navigation system for the Apollo command module and that of the lunar excursion module.



DRAFTING ROOM W-7 is one of three in the Massachusetts Institute of Technology Instrumentation Laboratory building given over to designing the Apollo guidance and navigation system. Three hundred engineers and scientists are teamed in an extensive mingling of university and industry talent.

tory's design programs, including Apollo, are the Laboratory's two Associate Directors—Roger S. Woodbury, who was a principal engineer in development of inertial guidance systems from their early beginnings, and Forrest E. Houston, who was a Laboratory leader in development of navigational systems and who is a co-holder of patents on SINS.

Directing the specific Apollo effort at the Laboratory is Milton B. Trageser, who joined the Laboratory staff in 1951 after graduation from M.I.T. and who participated in development of the Thor and Titan systems. Technical director of the Apollo design is David G. Hoag, who held a similar post in the Laboratory's development of the Polaris missile guidance systems.

Under present design concepts, the Apollo system will have three major subsystems—the optical unit containing a telescope and space sextant, the inertial measuring unit containing the gimbals, gyroscopes and accelerometers to measure force changes, and the digital computer.

The three major subsystems will be mounted as a unit in the lower equipment bay of the Apollo spacecraft. In earth parking orbit, during the transfers from earth-orbit to a moon-orbit, and from the moon orbit back to the earth, the system will be under the direct control of the astronauts, who will need to make star, moon and earth sightings, maintain the equipment and carry out similar tasks. The system will function either automatically or manually during re-entry.

The Apollo mission will begin at Cape Canaveral, Fla., with the three astronauts inside the spacecraft atop a 300-foot Saturn rocket. During lift-off and the launch phase, with the rocket arcing eastward over the Atlantic Ocean, another inertial guidance similar to that in a missile will control the Saturn to a five-miles-per-second velocity and to a circular earth orbit.

In orbit, the astronauts will make celestial sightings and other observations in preparation for blasting away from the earth and into a translunar trajectory. This injection into the translunar orbit will again use inertial guidance to achieve the precision needed. When the injection rocket cuts off and is staged, the spacecraft will have achieved its highest velocity of the trip—almost seven miles per second. From here is it coasting uphill away from the gravitational pull of the earth.

On the moonward trip, the vehicle will be in a free-fall trajectory, which the astronauts will check carefully with their guidance-navigation system making such course corrections as are necessary in order to assure they meet the moon. This is mid-course navigation.

The navigator uses special instruments to measure angles between fixed stars and the earth or moon and computes position in much the same way a mariner uses his sextant to measure angles between stars and his local vertical. The only real difference between earth-bound celestial navigation and that used in space is that each measurement with the former is used to determine position on the earth's surface, while each measurement in space will determine a conical surface or which the spacecraft lies. Three of these measurements can determine three intersecting cones in space, the common point of which locates the vehicle.

Ten hours after being boosted onto a translunar orbit, the spacecraft will be a third of the way to the moon, but its velocity will have dropped to 20 per cent of its original value, due to the influence of earth gravity. This means the rest of the trip will take considerably longer.

After two days, the spacecraft will be 70,000 miles from the moon and moon gravity will begin changing the shape of the vehicle's trajectory from the long earth-elliptical trajectory to a hyperbolic pass close to the moon.

After three days, the spacecraft will have curved around to the back side of the moon to its closest approach on this trajectory. If nothing were done, the vehicle would continue around the moon and start back to earth. Hence, the crew will employ inertial and optical sensing all contained within the guidance-navigation system to achieve a lunar orbit from which two astronauts will descend to the moon surface in their LEM, likewise equipped with similar equipment for guidance and control during descent and ascent and rendezvous.

The trip back to earth is similar to the outgoing leg, but now the earth's gravity causes velocity to increase. The earth's atmosphere will be used to reduce this velocity before earth landing in a re-entry similar to that of a ballistic missile nose-cone. However, the velocity and energy will be much higher and heating and deceleration forces will be critical. Success depends on hitting the atmosphere at the right angle: too deep a cut would cause excessive heating and acceleration, too shallow a cut would result in a skipout. Because of careful navigation, neither is likely to happen.

During all phases of the Apollo mission, the crew will be directly involved in the navigation, guidance and control, enhancing the success of the mission with their training and with their ability to make decisions in the face of unpredictable problems.

Editor's Note: This is the fifth 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 Office of Public Relations, Massachusetts Institute of Technology.

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 . . . . . John A. Powers
Chief, Internal Communications . Ivan D. Ertel
Editor . . . . . Anne T. Corey

On The Lighter Side

Will Moon Colonizers Be Cave Men?

Men may have to start their civilization on the moon pretty much as they started it here on earth—as cave men.

Dr. Roy G. Brereton, senior geophysicist at Aerojet-General Corporation, suggests the strong likelihood that (1) there will be caves, or lava tunnels, on the moon, and (2) that moon colonizers will have to seek refuge in them from deadly radiation.

Periodically, he points out, the moon will be bombarded with atomic fragments caused by solar and cosmic storms, making the immediate surface of the moon a death-trap of biologically lethal radiation.

During certain cycles of solar activity, the moon pioneers can expect 10 or 11 such storms a year, some lasting for several days.

The earth would be similarly imperiled were it not for the fact that the atmosphere surrounding the earth filters and traps the atomic fragments.

With no such protective atmosphere on the moon, the settlers there will have to head for the caves as bomb shelters and hibernate like the dinosaur-threatened Flintstone family of early earthly civilization.

If a lunar cave man wanted to venture abroad during such a storm, he'd have to wear an all-enclosing loincloth of thick lead, so heavy he'd probably not be able to move anyway.

So old lead-in-his-pants will probably have to resign himself to his lot and make the best of it, chiseling interesting little cave-side murals and dragging his wife around by the hair until the storm subsides.

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

WELCOME ABOARD

Thirty-one personnel joined MSC between April 21 and May 3.

Flight Crew Operations Division: Joseph J. Kolnick, and Diane C. Dore.

Flight Operations: Jackson B. Craven, Jr.

Computation and Data Reduction Division: William N. Trahan, Harold Stephenson, Roy L. Eason, Jr., Kenneth G. Truman, and Clay E. McCullough.

Instrumentation and Electronic Systems Division: Charles L. Ritterhouse, and Sharkey Baghdasarian.

Logistics Division: Kelly G. Parden.

Ground Systems Project Office: Nannette H. Chapman.

Procurement and Contracts: William H. Yarborough.

Systems Evaluation and Development Division: Gerald L. Shinkle, Charles D. Reno, and Frank A. Knox.

Personnel Division: Lois M. Nelson, and Richard E. Hall.

Apollo Project Office: Richard J. Kowalczyk, Lonita L. Roach and Bruce A. Coker.

White Sands Missile Range Operations: Mary J. Till.

Gemini Project Office: Harmon L. Brendle.

Spacecraft Technology Division: Joe M. Thames and Carl W. Blair.

Space Environment Division: Bruce C. Stephenson.

Technical Services Division: Rees H. Unclerhill.

Technical Information Division: Barbara A. Pawlak, and Iris A. Garner.

Administrative Services Division: Paulene R. Kline, and Pete D. Strahl.

SPACE ALMANAC

A CHRONOLOGY OF EVENTS IN SPACE EXPLORATION AND RESEARCH.

Five Years Ago

May 1, 1958 — Scientific findings from two Explorer satellites disclosed the Van Allen radiation belt.

Four Years Ago

May 12, 1959 — Training program for nation's first group of seven astronauts announced by National Aeronautics and Space Administration.

Three Years Ago

May 19, 1960—TIROS I weather satellite spotted a tornado storm system in the vicinity of Wichita Falls, Texas.

Two Years Ago

May 25, 1961 — President Kennedy asked the Congress to provide funds to meet a national goal before the end of this decade of landing a man on the Moon and returning him safely to Earth.

One Year Ago

May 24, 1962 — Astronaut Scott Carpenter completed three orbits of the Earth in Mercury spacecraft.

MSC PERSONALITY

Robert E. McKann Trained As A Naval Architect In NYC

A native Virginian who began his career as a naval architect has shifted from seagoing ships to space ships with Manned Spacecraft Center. He is Robert E. McKann, chief of the Engineering and Data Measurement Office for Project Mercury.

Born April 20, 1920 in Norfolk, McKann shifted to Augusta, Ga. Philadelphia, Penna. and back to Norfolk during his high school years. After one year at VPI in 1938-39, he transferred to the Webb Institute of Naval Architecture in New York City, from which he graduated in 1943 with a B.A. in naval architecture.

Far from idle during his college summers, he had already worked as carpenter's mate in a Norfolk shipyard, a shipfitter's mate in a Newport News shipyard and a deisel mechanic for the Rogers Diesel and Aircraft Co., Bronx, N.Y.

Immediately following graduation he went to work for the Marinship Corporation of Sausalito, Calif., as an assistant marine engineer working on engineering drawings of piping and machinery aboard U. S. Navy tankers.

A year later, he was hired by NACA at Langley Research Center's hydrodynamics laboratory, which was involved in seaplane research.

During McKann's more than 15 years with LRC he designed much of the equipment used to investigate landing characteristics of land planes forced down in water, and participated in full-scale ditching tests of B-24's. He drew plans, worked out test programs and analyzed and reported on test results in a number of flying boat research series.

In 1951, he supervised a group of aeronautical research scientists concerned with submerged and partially-submerged bodies, working out techniques for evaluating the stability and control characteristics of submarines, determining boundary layer profiles in water on the RM-10 missile, and investigating forces on struts for use with hydrofoils and hydro skis.

He conducted an investigation into the hydrodynamic qualities of the Convair "Skate" and a number of NACA low-drag planing type hulls for seaplanes.

For several years he was in charge of a high speed seaplane research program involving transonic and supersonic water-based aircraft, and in 1959 was appointed branch head of the Large Scale Hydrodynamics Branch.

In January of 1960, McKann transferred to Space Task Group as an aeronautical research engineer in the Flight Systems Division. Later he transferred to Project Engineering and took over his present job upon the formation of Mercury Project Office in 1961.

"Anytime you are involved in something like a Project Mercury flight a lot of data comes out which must be put in workable form quickly and accurately, because other launches are coming up," McKann explained. "Our job is making sure the information from the flights is available in easily understood form as soon as possible. One measure of the effect this data has is the number of changes in the spacecraft, based on what we found out was good and what was bad about it. Making measurements and getting answers is the lifeblood of research. My background at LRC was therefore a great help to me in the Mercury program."

Robert E. McKann

McKann is married to the former Betty Hewitt, born in Kendall Nevada but raised in Utah. The McKanns have five children, Mary, who will be 18 in August; Mike, 16; Christopher, 13; Robert, Jr., 11; and Kathy, 4.

To the remark that he has a basketball team there, McKann replies that he has the court to play in, too—a project he set up on the two and a half acres of land surrounding the "old house" where the McKanns live in Houston. When he isn't working or supervising a basketball game he can sometimes be found tinkering in his home workshop.

Echo is the only man-made satellite than can be seen without the aid of special optical instruments.

"We can hardly expect to achieve pre-eminence in space if we content ourselves with Earth-orbital experiments while the Russians proceed to the Moon, and beyond."

James E. Webb
NASA Administrator

"FAITH 7" was the name Astronaut L. Gordon Cooper picked for his spacecraft. Here the name is being applied by B. R. Schuster, McDonnell Aircraft Corp. engineering draftsman. The name designated faith in the contribution of the mission to man's knowledge to the universe, no matter how long it goes.

Tethered Balloon Experiment

(Continued from page 8)

tions of the balloon. The balloon should be relatively stabilized within about 90 seconds; the camera will be turned off at this point.

During the towed phase of this experiment, motions of the balloon induced by attitude changes of the spacecraft will be kept to a minimum. The pilot will comment on all observations and spacecraft maneuvering for onboard recording; this will include times, spacecraft attitudes and rates as well as the position of the balloon, whether or not the line is taut, period and amplitude of balloon oscillations, apparent color or shape changes, angle of lighting, and its appearance against the sky or Earth backgrounds.

The 16 mm camera with wide angle lens will also be used for four or five sequences of the balloon and its motions during the towed phase.

Just prior to balloon jettison, the 16 mm camera with telephoto lens will be started. The precision tracking task requires that the pilot hold the retro attitude horizon scribe mark in the window on the balloon for approximately two minutes as it recedes and drops below the spacecraft. Thereafter, the pilot will note the appearance and ease of sighting from general observations; in about five minutes, the balloon should be near the visual limit on the horizon and nearly three miles away.

Apollo Drop Test Is Successful At Northrop Ventura

The first drop test of the Project Apollo earth landing system was accomplished successfully by Northrop Corporation, EL Centro, California May 3.

Released from a specifically modified U. S. Air Force C-133 cargo plane at altitude, a boilerplate test vehicle, duplicating the size and weight of the Apollo spacecraft command module, was safely landed by a Northrop Ventura cluster of three ringsail parachutes.

It was the first in a series of tests in qualifying the system for earth landing, after return from a lunar mission.

Operation of the landing system was initiated at 25,000 feet by an altitude switch that fired a small explosive charge separating the apex cover located at the top of the command module from the vehicle. One second after apex cover separation, a mortar was automatically fired deploying a 13-foot diameter conical ribbon stabilization drogue parachute. At approximately 15,000 feet the drogue chute was disconnected and three 16-foot diameter ringslot pilot chutes were deployed.

Fifteen seconds after pilot chute deployment, a cluster of three Northop Ventura 88-foot main ringsail parachutes were deployed in a reefed condition for six seconds, the reefing lines on the chutes were automatically cut and the main ringsail parachutes were fully deployed, safely landing the boilerplate test vehicle at a rate of approximately 30 feet per second, well within human tolerance.

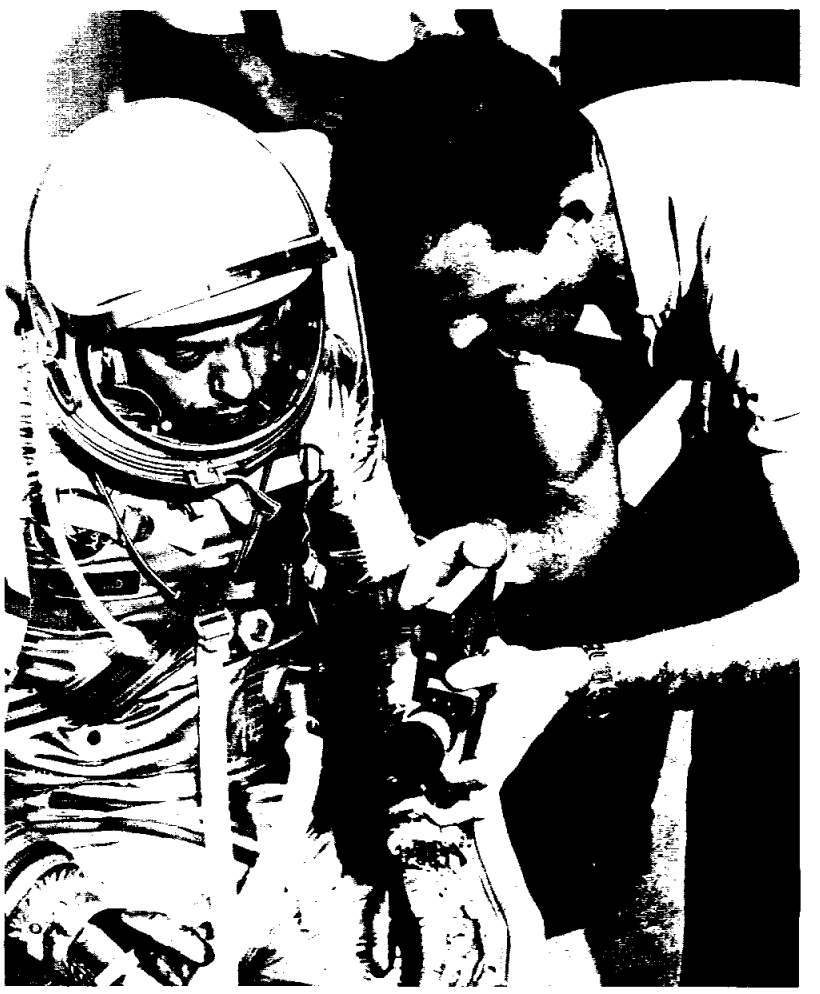
Cabin Cooling

(Continued from page 8)

Prior to the start of the test, the pilot will record cabin air temperature, cabin and suit heat exchanger dome temperatures, suit temperature and the coolant valve settings for both the cabin and the suit. He will then switch the cabin fan off and close the cabin temperature control.

At several minute intervals and whenever suit coolant valve changes are necessary, he will record time and the above mentioned temperatures and coolant valve settings. Electrical loads and inverter temperatures will be checked frequently until temperatures are stabilized, to insure that no failures are immiment from overheating equipment.

If temperatures remain stable within test limits, the cabin fan and water coolant will remain off until approximately two hours before retrosequence. This will include the rest period, if temperatures remain at a safe level and have been stable for several hours.



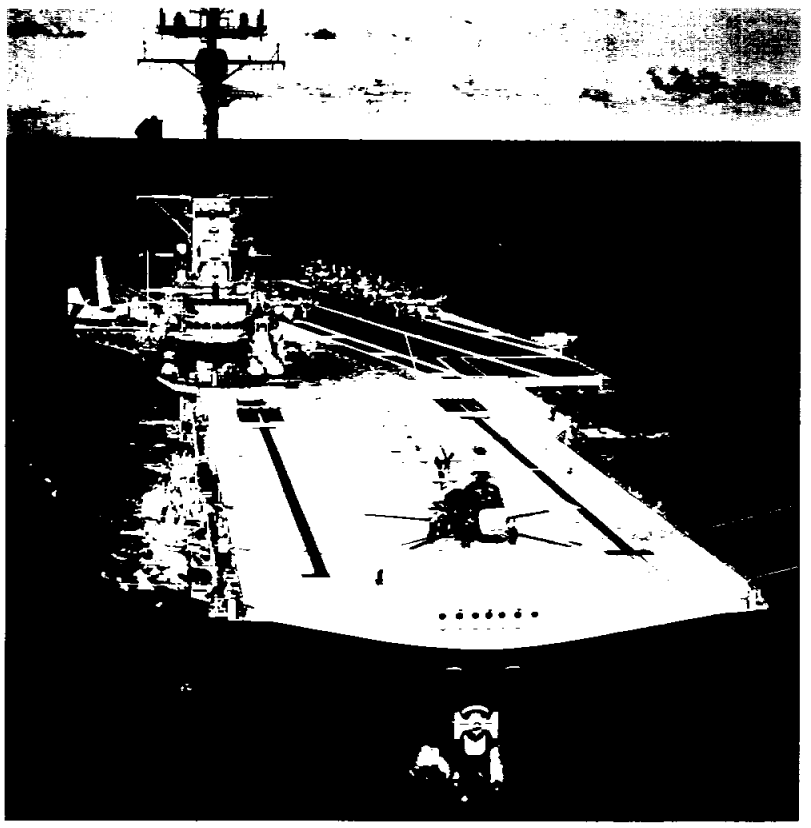
ASTRONAUT L. GORDON COOPER explains the 16 mm handheld camera which will be used aboard "faith 7" during MA-9 to his back-up pilot, Astronaut Alan Shepard. The camera, designed by McDonnell Aircraft Corp., is one of several special cameras which will be used during the mission.

Track Covers 100 Countries

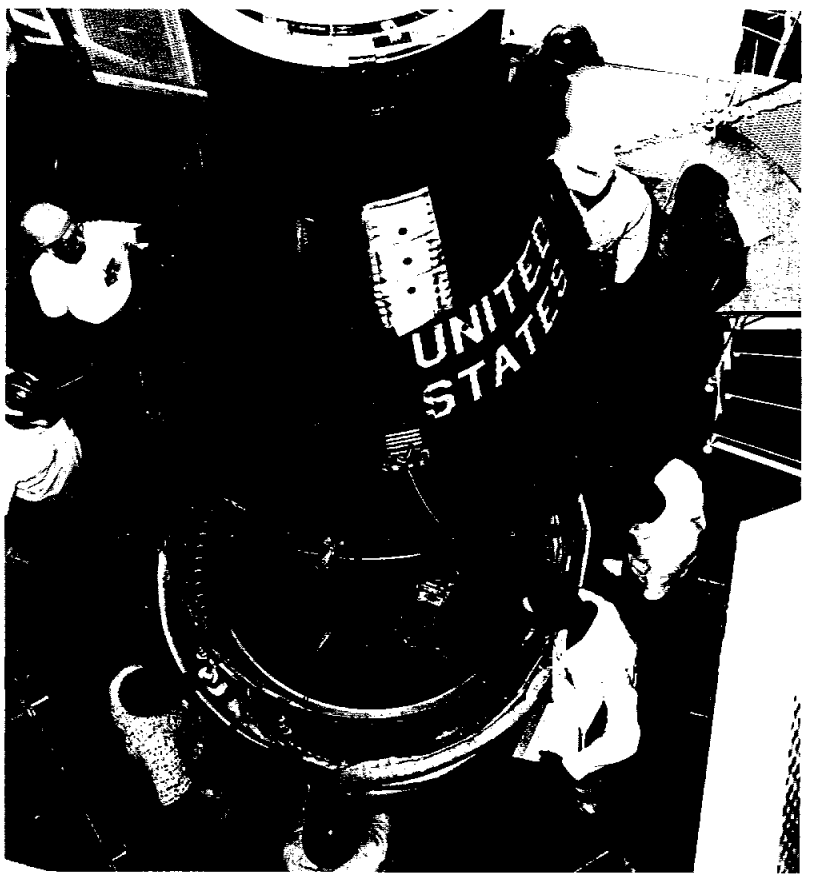
(Continued from Page 1)

The fourth through the fifteenth orbits should include Bahamas, Indonesia, Carolina, Wake Island, Midway Island, Colombia, Venezuela, Brazil, British Guiana, Philippines, Mariana Island, Marcus Island, Ecuador, Peru, Basutoland, Thailand, Viet-Nam, Chile, Bolivia, Argentina, Paraguay, Maldive Islands, Ceylon, Burma, Laos, China, Japan, Hawaii, Uruguay, Tanganyika, Somalia, India, (East) Pakistan, Marquesas Islands, Sudan, Ethipia, Yemen, Saudi Arabia, Oman, (West) Pakistan, Nepal, Tibet, Tuamotu Archipelago, Egypt, Iran, Afghanistan, Republic of China, Ellice, Samoa, Cook Islands, Sierra Leone, Guinea, Libya, Jordan, Iraq, New Hebrides, Peru, Mauritania, Algeria, Israel, Syria, Cambodia, Maorcco, Tunisia, Panama, West Indies, Aden, Guatemala, British Honduras, and Cuba.

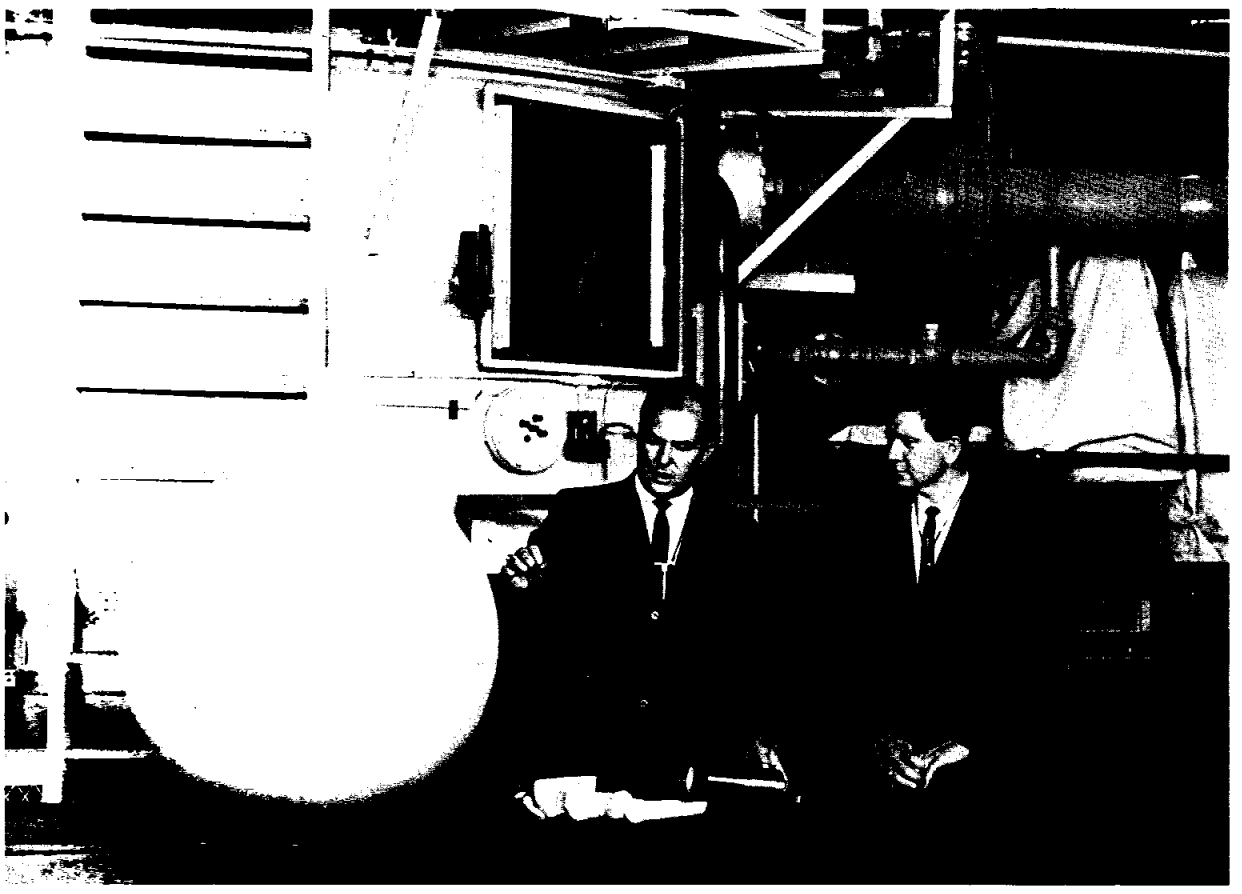
Beginning with the sixteenth orbit, the MA-9 spacecraft will fly along the tracks of the initial seven orbits.



PRIME RECOVERY SHIP for MA-9 is the U. S. S. Kearsarge, at sea about 60 miles south of Midway Island. The Kearsarge was also prime recovery vessel for the "Sigma 7" spacecraft of Astronaut Walter M. Schirra during MA-8. Schirra splashed down within sight of the vessel, the closest mission-ending to any recovery vessel so far in U.S. space flights.



MATING OF SPACECRAFT 20 to the Atlas launch vehicle took place on Pad 14 at Cape Canaveral last month as preparations for MA-9 went into high gear. "Faith 7" is programmed for a 22 orbit mission lasting more than 30 hours.



THIRTY-INCH TETHERED BALLOON which will trail behind Faith 7 during part of MA-9 in a double experiment involving aerodynamic drag and tracking is shown to William Armstrong (right) by William Carmines, of Langley Research Center, who developed it. The canister which will house the balloon lies on the table to the right of the inflated sphere, which is colored a bright orange.

MA-7 Tethered Balloon Experiment To Be Repeated With A New Twist

The tethered balloon first used during the MA-7 flight of Astronaut Scott Carpenter will be employed again during MA-9 in another attempt to measure aerodynamic drag.

The drag portion of the experiment during MA-7 failed when the balloon did not fully inflate. The balloon's multi-colored segments, however, did indicate that flourescent "day-glo" orange is one of the most-visible colors in space, and the entire balloon will be of that color during MA-9.

A second portion of the MA-9 experiment will involve the tracking and ranging of the balloon after its release from the towed position.

The balloon and small nitrogen inflation bottle are packaged together in a three-inch-diameter container in the antenna canister. The container door will open, and the deflated balloon and bottle will be ejected by a compressed spring and piston, tethered by the 100-foot-long, five-pound test, nylon line.

When the package clears the container, a spring-loaded valve on the nitrogen bottle will open, and the balloon will inflate to a 30-inch-diameter sphere in less than one second.

One end of the nitrogen bottle is attached to the balloon while the other end is fastened to a roll of annealed aluminum foil eight feet long. This foil serves as a shock absorber by unrolling during deployment.

The outer end of the tethering line is attached to the shock absorber, and its other end is connected to the free end of a cantilevered strain gauge beam located in the spacecraft. Aerodynamic drag on the balloon causes a pull which is registered by the strain gauge and recorded onboard. (The maximum drag force will occur at perigee and is expected to be on the order of 0.015 pounds.)

At the completion of the experiment, the balloon will be cut free and tracked. This will give some idea of fuel usage versus accuracy during precision tracking in space and also will provide the pilot with a known object for estimations of range and appearance.

Balloon deployment is proposed for approximately five minutes after sunrise on the sixth orbit. Prior to deployment, the 16 mm camera with wide-angle lens will be mounted in its bracket and turned on to record the balloon extension sequence.

After deployment, the pilot will pitch down five to ten degrees—slowly—in order to observe and comment on mo-

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Cabin Coolant To Be Turned Off In MA-9 Mission

What happens in the Mercury spacecraft when the cabin cooling system is out operation?

MA-9 may determine this when for the first time the cabin cooling system is turned off. MSC engineers predict that the maximum stable temperature in the cabin with be within tolerable limits for both equipment and the pilot. The pilot will be using his suit cooling circuit only during the experiment.

The test is designed to provide design data for future heat exchanger systems.

It will begin during the fifth orbit after the cabin has achieved generally stable temperatures. Both pilot and ground stations will monitor the cabin and suit temperatures, and the pilot will adjust his suit cooling system appropriately.

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Faith 7 To Test New Spacecraft Coatings

As much as 10 to 15 degrees might be taken off the cabin temperature if a spacecraft were protected with a low absorptivity coating instead of the present dark colored oxide, according to theoretical calculations.

To test the theory, three types of white coatings will be exposed to reentry heating during the MA-9 mission of

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Space News NASA ROUNDUP!

SECOND FRONT PAGE

Cooper Will Try To Observe High Intensity Ground Light

A high intensity xenon light at Bloemfontein in the Union of South Africa will be turned on for a three-minute period during MA-9, when Astronaut L. Gordon Cooper's "Faith 7" is within range on the sixth or 21st orbit.

The spacecraft will be oriented to observe the light on only one occasion, depending on that best weather conditions over Bloemfontein during the two possible times.

The information obtained will indicate the feasibility of using ground or high altitude lights as navigation fixes for midcourse and near-Earth corrections during Project Apollo.

It is also designed to produce rough data on light attenuation through the atmosphere.

In the latter respect, data will be used in conjunction with the window attentuation experiment to obtain accurate results.

The pilot needs only the extinction photometer and standard light source in the spacecraft.

The purpose of the window attenuation experiment is to obtain data for an evaluation of the transmission of light through the spacecraft window.

Readings are to be obtained at opportune moments for the pilot and whenever identifiable stars are in view during either the daylight or night phase.

John W. Young, 32, of San Francisco, is NASA's youngest astronaut trainee.

Radiation Levels At Orbit Height To Be Measured

Radiation levels at Mercury orbital altitudes will be measured during MA-9 to give additional data on the decay of the artificial radiation belt created by high altitude nuclear detonations.

One of two Geiger counters mounted on the retropack will view radiation flux from a hemispherical area. This Geiger counter surveys a region unobstructed by the spacecraft, and is unaffected by radiation scattered by the spacecraft structure. The second Geiger counter is shielded to register incoming radiation directly ahead of the heat shield region.

Useful data from these Geiger counters will be recorded any time when the radiation experiment switch is ON, when the tape recorder is running, and when the radiation levels are within the range of the instruments.

Trapped fission electrons spiraling along Earth's magnetic flux lines will be the primary source of the radiation to be measured. When the spacecraft attitudes are known, a crude estimate may be made

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WATCHING AND WAITING during America's sixth manned space flight will be Mrs. Trudy Cooper, wife of Astronaut L. Gordon Cooper, and the couple's two daughters, Jan, 12 (left) and Cam, 14 (right). Cooper's flight is to be the longest of any U. S. astronaut to date.