

Space News

ROUNDUP!

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AUGUST 6, 1965

'A DIFFICULT TASK'

Gemini V Crews Work Long Days To Prepare For Busy 8-Day Flight

The Gemini V prime and back-up crews have been a busy four-some these past weeks, preparing for an even busier eight days in orbit.

Training has included work on several simulators, experiments, briefings, systems reviews and egress training in Galveston Bay.

The launch is scheduled August 19, with Command Pilot L. Gordon Cooper and Pilot Charles Conrad at the controls.

But pursuing the same training schedule with the prime crew is their back-up team, Neil Armstrong and Elliott See.

"Our training program has been pretty intensive. We've had a great number of 20-hour days, and a great many more 16-hour days, never less than a 12-hour day, on a seven day a week schedule," Cooper explained.

"We've got a flight that's going eight days," Conrad added, "and we've got 15 experiments besides the rendezvous evaluation pod (REP), which is about three times as many as any of the other flights. Longer duration, more to do, compressed training . . . It's a difficult task."

"We went through probably 50 hours in the simulator, all in a week's time, chasing that little rascal around," Cooper explained, referring to the rendezvous pod experiment. "This rendezvous is not a real snap. There's a great deal of complexity to it."

Gemini V should make 121 revolutions, taking about 95 minutes for each one. It would be the longest flight ever attempted by the U. S., and would give Cooper more space flight time than any other astronaut. He flew 34 hours and 20 minutes in his earlier Mercury flight in May, 1963.

Two important "firsts" will also be recorded on this flight, including the use of radar to help the crew rendezvous with the REP they will eject into a separate orbit early in the flight. Another is the use of fuel cells for electrical power rather than batteries.

Among the experiments being carried are:

Zodiacal Light Photography—color photographs will be taken of zodiacal light and airglow using 35mm Widelux camera mounted in pilot's window. The command pilot will orient the spacecraft to the zodiacal plane. An automatic 30 second camera sequence will last the entire night period.

Synoptic Terrain Photography—Similar to photography in Gemini IV, a Hasselblad camera will be used to improve and extend the techniques of synoptic geological and topographic aerial photography. Three areas will be photographed; Mexico, East Africa and Arabian peninsula and Australia.

Synoptic Weather Photography—The Hasselblad will be used to obtain selective, high quality color cloud photographs to study the fine structure of the earth's weather system.

Cloud Top Spectrometer—A
(Continued on Page 5)



ALAN L. BEAN

Bean Recuperates After Surgery At San Antonio

Astronaut Alan Bean returned to Houston earlier this week following surgery at Wilford Hall Hospital in San Antonio.

Bean underwent elective abdominal surgery Tuesday a week ago. During the one hour, fifteen minute operation the astronaut's gall bladder and appendix were removed.

The gall bladder was found to be diseased, but the appendix removal was incidental to the scheduled operation, a common medical practice if the patient's appendix still exists.

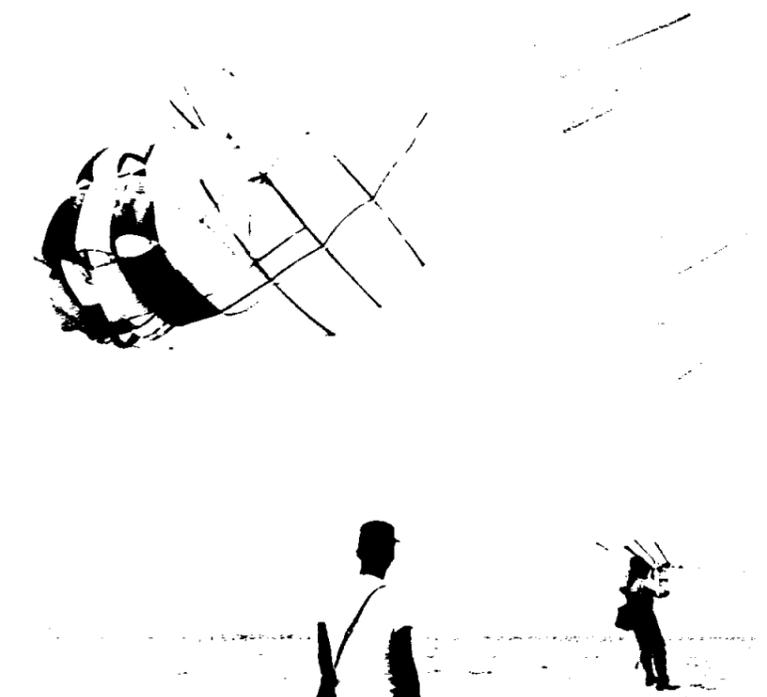
Bean's gall bladder problem was first detected more than a month before the operation. He is the second astronaut to have his gall bladder removed. Gemini V command pilot Gordon Cooper underwent similar surgery in 1960.

Little Odd Balls Needed For Space

The National Aeronautics and Space Administration is looking for someone to manufacture one-eighth inch Ping-pong balls, needed to cushion three tons falling to the bottom of a 500-foot shaft.

The soft-landing is required for a big drop tower being built at NASA's Lewis Research Center. The tower will house a deep shaft in which experiments are dropped and studied in the weightless state achieved during the fall.

A soft landing is needed to prevent damage to the experiments and their sensitive instruments.



ASTRONAUTS' UPS AND DOWNS—While astronaut Elliott See (top) ascends over Galveston Bay for Parachute training for Gemini V, Astronaut Charles Conrad (below) jumps into the Gulf of Mexico during egress training. Conrad is pilot for the flight scheduled August 19; See is his back-up.



Bill Dana (Not José) To Fly X-15

NASA test pilot William H. (Bill) Dana has been named to join the X-15 flight team at the NASA Flight Research Center, Edwards, Calif.

Air Force Capt. William J. Knight, an Edwards Air Force Base test pilot, has also joined the NASA-USAF research program.

Dana, 34, is a civilian pilot-engineer at NASA's Flight Re-

search Center. He has served as project pilot on a variety of flight programs, including the study of supersonic transport operating procedures. Dana, who received his masters degree in aeronautical engineering from the University of Southern California in 1958, has also piloted NASA's M2-F1 lightweight lifting body.

Capt. Knight, 35, is attached

to the Air Force Flight Test Center at Edwards AFB. A 1964 graduate of the Aerospace Research Pilots School, Capt. Knight was project pilot on the F-5 NATO fighter. He was also selected as one of the original pilots for the now-canceled X-20 DynaSoar Program.

Both aviators have served as chase pilots on previous X-15 flights.

15 LAUNCHES SET FOR 1966

More Space Work Ahead For Delta

The National Aeronautics and Space Administration has announced it will negotiate with the Douglas Aircraft Corp., Santa Monica, Calif., for Delta space booster launch support services. The contract is expected to be about \$12 million.

The new contract will cover an anticipated 15 launchings from launch sites at Cape Kennedy and the Western Test Range for a 12-month period beginning Jan. 1, 1966. It will provide for inspection and checkout as well as the actual launch of Deltas from Cape Kennedy and from NASA's new Delta Launch Facility at Vandenberg Air Force Base in California.

The Douglas Aircraft Co. is prime contractor for NASA's Delta space booster. The vehicle has launched more NASA satellites than any other booster and has a success ratio of 90 per cent with 30 successful launches out of 32 attempts.

Delta's most recent success was the launching of Television Infrared Observation Satellite (TIROS X), meteorological satellite.

Cape's ACE Is Only First Of Four-Of-A-Kind At MILA

The first of four Apollo spacecraft test stations has been declared operational by NASA Kennedy Space Center engineers at the Manned Spacecraft Operations building, Merritt Island, Fla.

Called Acceptance Checkout Equipment for Spacecraft (ACE-S/C), the station was conceived and designed by NASA engineers to provide a high speed, accurate, and reliable system for testing sophisticated spaceflight vehicles such as the three-man Apollo spacecraft.

The test station allows a relatively small engineering staff to continually review more than 25,600 spacecraft test samples per second. This system monitors approximately 1,500 spacecraft operational parameters.

Consisting of high-speed computers, display consoles, and recording equipment, ACE-S/C interrogates the spacecraft systems and automatically gathers, processes, evaluates, and displays the test data in split seconds for evaluation and diagnosis by test engineers. Data is also recorded and stored for future analysis.

The ACE-S/C station has been undergoing verification operations by engineers from NASA, the systems prime contractor General Electric Co., and associate contractors Control Data Corp. and Radiation Inc.

A network of cables ties ACE-S/C with the launching pad, the 525-foot Vehicle Assembly Building, and with the static test and fluid test facilities as well as the Manned Spacecraft Operations building.

The ACE-S/C station is located in three rooms overlooking the 106-foot high assembly and

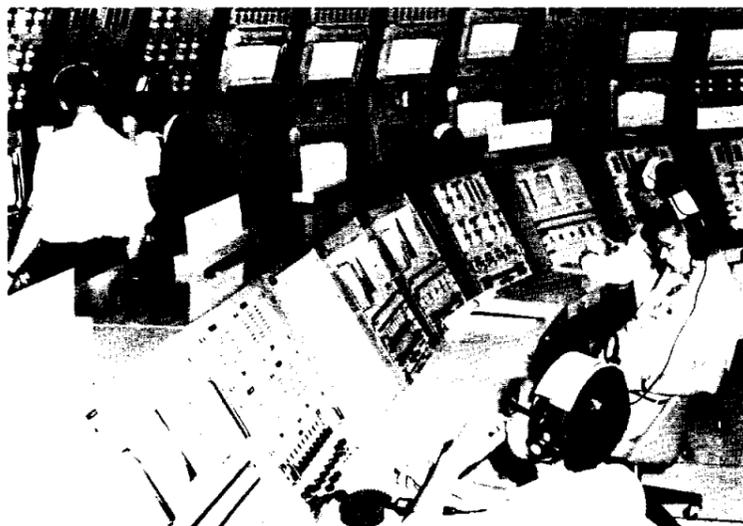
test area of the Manned Spacecraft Operations building.

The ACE-S/C Control Room houses primary controls and displays. From consoles, spacecraft communications, environmental control, and guidance and navigation systems will be tested simultaneously. Using television-like displays and other readout devices, including event lights, meters, and strip chart recorders, test engineers will maintain system status via updated data.

High-speed digital computers and decommutators are housed in the ACE-S/C Computer Room to accept commands from the Control Room and relay them to the spacecraft. These electronic brains also decode test results from the spacecraft and route them back to the Control Room.

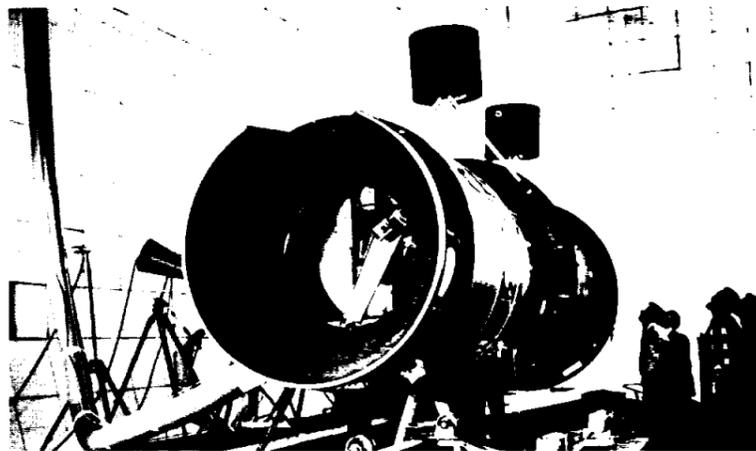
A third room, the ACE-S/C Terminal Facility Room, provides a flexible interface between the remote spacecraft test areas and the ACE-S/C station.

ACE-S/C stations are also being installed at Grumman Aircraft Engineering Corp., New York, for Apollo spacecraft lunar excursion module testing and checkout; here at the Manned Spacecraft Center, for testing spacecraft in simulated space environments; and North American Aviation, Inc., Downey, Calif., for subsystem and integrated systems testing of the Apollo command and service modules.



ACE CONTROL ROOM—National Aeronautics and Space Administration and General Electric engineers monitor consoles, displays, and recorders in the Acceptance Checkout Equipment (ACE)-spacecraft control room at Cape Kennedy during a phase of the station's verification operations.

Rendezvous Vehicle For Gemini VI



GEMINI TARGET—The first Agena target vehicle for the Gemini VI rendezvous program is shown undergoing radio signal tests in an anechoic chamber at Lockheed Missiles & Space Co. in Sunnyvale, Calif. Lockheed produces the Gemini Agena Target (GAT) for the U. S. Air Force, which will launch it for NASA for earth-orbit rendezvous and docking with the two-man Gemini spacecraft. A Lockheed Agena also was the launch vehicle which sent the Mariner 4 spacecraft to Mars. Two views of the anechoic chamber tests at Lockheed are shown above. At top, the Gemini Agena Target is suspended in test position in the insulated chamber, and at bottom it is being lowered to its dolly. The chamber is lined with a plastic foam material which prevents reflection of radio signals.

Fort Worth Firm To Keep Aircraft Flying for MSC

Manned Spacecraft Center has selected the Dynalectron Corporation of Fort Worth, Texas, for negotiation of a contract to provide maintenance support for aircraft assigned to MSC.

The contract will cover field-level aircraft maintenance, modification and repair support for MSC aircraft, as well as supply support and flight-line servicing of MSC and transient aircraft and maintenance and installation of requirements generated by MSC aircraft-oriented research and development programs.

Dynalectron was selected for this negotiation in competition with 12 other companies.

The proposed contract, which will be a cost-plus-award-fee type, will be for a one-year period and will include provisions for negotiations of two one-year renewals. The government's estimate for the first year's contract cost is in excess of \$500,000.

Aircraft assigned to MSC include five T-38A and eleven T-33A astronaut flight-readiness training aircraft, one Gulfstream administrative transport aircraft, one Convair 240 used as an electronics research and development test bed and three helicopters—two H-13's used in astronaut training and one H-34 used in research and development activities.

100 Scientists Look At Apollo's Potential For Lunar Exploration

The United States' manned moon exploration program was reviewed by some 100 scientists in a two week meeting at Falmouth Mass., attended recently by three MSC astronauts.

The scientists will recommend modifications or additions to NASA's Apollo Program and the Apollo Extension System (AES) lunar science program.

Two Firms Contracting To Operate Space-Age Library for NASA Use

The National Aeronautics and Space Administration has announced it is entering competitive negotiations with Documentation, Inc., Bethesda, Md., and Tech/Courier Corp., College Park, Md., for operation of NASA's Scientific and Technical Information Facility.

The Facility organizes worldwide technical reports in the aerospace sciences, indexes and abstracts items of value in the exploration of space, prepares announcement journals, processes selected items on microfilm for economical reproduction and distribution and provides reference services to NASA and its contractors.

About half the scientists were associated with university and private research laboratories and the remainder were from NASA and other agencies.

Participating in the working sessions were six of the seven working groups of NASA's Manned Space Science Coordinating Committee, established by Dr. Homer E. Newell, NASA's associate administrator for Space Science and Applications.

Working group chairmen were: bioscience, Dr. Melvin Calvin of the University of California; geology, Dr. Eugene M. Shoemaker, U.S. Geological Survey; geochemistry, Dr. James Arnold, Scripps Oceanographic Institute; particles and fields, Dr. Wilmot Hess, Goddard Space Flight Center; geophysics, Dr. Frank Press, California Institute of Technology; and geodesy/cartography, Dr. Helmut Schmid, U.S. Coast Geodetic Survey.

Participants in the sessions included three astronauts — R. Walter Cunningham, a member of the geology working group, and scientist astronauts Dr. Harrison H. Schmitt and Dr. Frank C. Michel.

LOCKHEED, DOUGLAS

Aerospace Firms Say Hybrid Rockets Offer More Energy

Successful static firing of a hybrid rocket motor, reported this week by Lockheed Propulsion Company, exceeded the highest energy output ever obtained previously from a solid/liquid hybrid propulsion system.

The solid fuel motor utilizing a liquid oxidizer was the fourth in a series of company funded tests to exceed sea level delivered specific impulses well over 325 sec. Two different hybrid rocket propellant combinations have been used in the static tests; they were designed to demonstrate the feasibility of high performance hybrid rocket systems.

According to Lockheed's vice president and technical director, G. R. Makepeace, "These motor firings demonstrated, under test stand conditions, the feasibility of using hybrids for high energy requirements associated with space missions utilizing space storable oxidizers."

These motor tests climaxed the latest phase of a development program, started in 1960, that has seen Lockheed Propulsion demonstrate ballistic scaling of propellant grain internal configurations from circular ports to non-circular port grains, and to motors of increasing diameter with non-circular port grains.

Lockheed's hybrid development activity has also been enhanced by exhaustive studies of the prediction of hybrid fuel regression rates and their subsequent verification.

Studies to determine if hybrid and high energy solid motors will be practical for use on upper stages of future medium launch vehicles are being conducted for NASA by the Douglas Missile & Space Systems Division.

A \$79,513 contract issued by the Office of Advanced Research and Technology calls for Douglas MSSD to investigate performance and cost factors for such applications and to define the sizes, structures and operating characteristics which should be demonstrated in experimental programs.

Potential advantages of hybrid motors over conventional solid propellant motors include restartability in orbit and higher specific impulse. In addition, throttling is readily attained by regulating the oxidizer flow rates. Hybrid motors make use of a liquid component and a solid component.

NASA's Jet Propulsion Laboratory at the California Institute of Technology has been designated the supervising agency to technically direct the conduct of the studies.



CREW SYSTEMS DIVISION is evaluating the Portable Life Support System (PLSS) back-pack, hidden beneath the thermal overgarment worn by suit subject in this photo.

Airline Tickets Available Here

Travelers can get airline tickets at MSC now, even for personal trips, and get on an airplane without checking in at the airport ticket desk.

A new office—the NASA Airline Ticket Office—has been opened in Building 2. The new service is in support of the Administrative Service Division's Travel Office, and is the first of its kind.

Operated under the auspices of the Air Transport Association of America, which represents all major airlines in the country, ATO offers tickets for employees traveling on business or personal trips.

A. A. Verrengia, chief, Plans and Control Office, worked on the arrangements with Clarence Johnson, passenger travel section supervisor, since early this year with ATAA officials.

"We owe a debt of gratitude to ATAA, and particularly Stuart Tipton, president, and Phillip Archer, director of its military bureau, for their efforts on our behalf," Verrengia said.

It is the first such service to a civilian agency, though ATAA has serviced the military since before World War II.

Prototype Back-Pack Here; Use Planned For EVA, Moon

The first prototype of a liquid model of a portable life support system (PLSS) has been delivered to the Crew Systems Division.

The unit, which weighs approximately 60 pounds, is designed for use with the water-cooled undergarment which the astronauts will wear beneath the Extravehicular Mobility Unit or space suit on the lunar surface.

The water-cooled undergarment cools the astronaut by conducting the metabolic heat generated by his motions into

water which is circulating through a network of plastic tubing in contact with the skin. The water carries the heat into the PLSS, which recools and recirculates the water.

Interface testing with the undergarment will be conducted here, followed by performance testing on a treadmill and control and display checkout. A total of 52 units, including flight hardware, are scheduled for delivery by Hamilton Standard, Windsor Locks, Connecticut, prime contractor for the PLSS.



RIBBON CUTTING—Stewart Tipton (third from the left), president of the Air Transport Association, Washington, D.C., presides over the ribbon cutting to officially open the Airlines Traffic Office in Building 2. Shown are (l. to r.) Tony Verrengia, chief, Plans and Control Office; Douglas R. Hendrickson, chief, Office of Administrative Services; and Clarence W. Johnston, passenger traffic manager, Office of Administrative Services.

New Electronics Research Center Attracts Top Scientific Talent

Dr. Winston E. Kock, director of the NASA Electronics Research Center, Cambridge, Mass., says the challenge of space research has proven a strong attraction to young scientists across the nation.

He cited the recent addition of five top honor doctorate recipients to the staff of the space agency's new center in the greater Boston area as an example of space program interest to young researchers.

"The ability of our nation's space effort to draw outstanding younger talent signifies most forcibly the existence of a challenge of great attraction in research in the new frontier of space exploration," he said.

Dr. Kock told the annual meeting of the American Institute of Aeronautics and Astronautics last week that this challenge has for a lure "its demand for manifest courage from those who would face it."

"It is not surprising that America, with her great heritage of freedom, should have demonstrated courage so magnificently, by the architects, past and present, of her imposing space program, by the astronauts who willingly placed so grave a risk on their lives, and by the scientists who gave to the program long hours of toil and

travail," he said.

Dr. Kock outlined the progress of the Electronics Research Center's 11 months of operation during which \$2.5 million in contracts and grants have been awarded to firms and universities. The contracts went primarily to aerospace companies, electronic firms and research institutes in California, New York, Massachusetts, Minnesota, New Jersey, Connecticut, Florida, Maryland, Missouri, Ohio, and Pennsylvania.

The Center, since its inception on September 1, 1964, has grown to 244 persons, including 92 scientific and engineering technical personnel.

Top officials of the center include such scientists as Dr. Albert J. Kelley, formerly director of Electronics and Control at NASA Headquarters, Deputy Director; Franklyn W. Phillips, formerly a special assistant to NASA Administrator James E. Webb, as Assistant Director for Administration; and assistant directors for research, Dr. Crawford Dunlap, formerly a director of research for Raytheon Corp.; Dr. Lester Van Atta, formerly director of research for Hughes Aircraft; and Dr. Robert Langford, formerly director of the research center of General Precision, Inc.



TRAVEL EMPLOYEES—The staff of the Travel Reservations Office are (l. to r.) Maureen L. Cruz, Sandra L. Wright, Shirley Welsh, Marie Valverde, Leona Gallagher, Brenda Sifuentes, and Joan Landon.

IN LANGLEY EFFORT

Convair Researchers Catch Their Breath, Use it Again

For the first time, oxygen has been regenerated from the carbon dioxide exhaled by researchers at the Convair division of General Dynamics Corporation, San Diego, Calif.

Test of an integrated carbon dioxide removal and an oxygen regeneration system has been successfully completed in a sub-system being developed for the National Aeronautics and Space Administration's Langley Research Center.

The oxygen/carbon dioxide units are part of a life support system designed to support four astronauts in space for a year with 90-day resupply. All of the systems and sub-systems in the operating prototype are designed for a zero gravity environment.

The tests of the carbon dioxide removal and conversion to oxygen were conducted in a closed environment with four crew members aboard, under the direction of R. C. Armstrong, M.D., manager of the Life Sciences section at Convair.

Because space flights of long duration would require too much weight if the oxygen sufficient for the flight had to be carried, it is necessary to provide a means of converting the carbon dioxide (CO₂) breathed out by the space crew into oxygen (O₂) that could be used over again. In addition, CO₂ exhaled by the crew must be removed from the cabin before a dangerous toxic level is reached.

When the carbon dioxide is drawn into the system it goes through a series of separators with hydrogen added. The CO₂, combining with hydrogen at high temp. makes water (H₂O) plus carbon. The H₂O is separated into H₂ and O₂. The oxygen is returned to the cabin for breathing and the hydrogen is recirculated to be used over again.

David Krause, deputy project manager for the NASA life support system, said that the three sub-systems, (1) a molecular sieve unit, (2) a carbon

dioxide reduction unit, and (3) a water electrolysis unit, all functioned perfectly and continuously in the first extended test.

While there are many systems for the collection and removal of carbon dioxide from a cabin atmosphere (such as a submarine or in the Mercury and Gemini manned space flights), this was the first program to reclaim the oxygen contained in the carbon dioxide in a closed cabin so it could be returned to the cabin atmosphere for re-use.

Surgeons Find Use For Space Probes; Kill Brain Cells

Plasma probes developed for the U.S. space program are being put to radical use in modern surgery, according to Walter T. Olson, an assistant director at NASA's Lewis Research Center, Cleveland, Ohio.

The temperature-sensing elements of these tiny probes are used in a cryogenic or very low-temperature cannula for treating Parkinson's Disease. This disease involves control centers in the brain and is characterized by loss of muscle control, peculiar gaits and other debilitation. The surgical probe, through which very low-temperature liquid nitrogen flows, is used to destroy parts of the brain by freezing without affecting adjacent tissue.

Cryogenic freezing techniques have been used for some time, but thermocouples developed for NASA have allowed a radical change in method. Using these micro-thermocouples, it is now possible for the neurosurgeon to probe at an intermediate temperature until he senses the control area in the brain. Once located, the selected brain tissue can be taken down to final freezing using the thermocouple to monitor the temperature.

Dr. Irving S. Cooper, St. Barnabus Hospital, New York, described this procedure recently in the *Journal of Neurosurgery*.

The same micro-thermocouples are also used in a surgical technique to repair lesions in the eye by "welding" at cryogenic temperatures. The insulated probe, as small as six-thousandths of an inch in diameter, observes the temperature change at the precise point where the probe tip is inserted.

James F. Morris, project engineer at Lewis, reports that this type of miniature probe was first developed by the High-Temperature Instruments Corporation, Philadelphia.

Career Man Appointed To Headquarters Post; New Goddard Director

NASA Headquarters has announced that Willis H. Shapley, a career civil servant, will become Associate Deputy Administrator effective Sept. 1, 1965. He will transfer from the Bureau of the Budget where he has been deputy chief of the Military Division.

Dr. Harry J. Goett, director, Goddard Space Flight Center, Greenbelt, Md., will become special assistant to Administrator James E. Webb effective immediately.

Dr. John F. Clark, associate director of sciences in the Office of Space Science and Applications, will become acting director, Goddard Space Flight Center.

Dr. John W. Townsend, assistant director, Goddard's Office of Space Science and Satellite Applications, will become deputy director at Goddard. The position of Deputy Director is a new post at the Center. Eugene Wasielewski will continue as associate director.



A RARE SIGHT is this volcano erupting near Iceland.



A COMMON SIGHT is the powerful F-1 engine firing in Alabama.

Rocket, Volcano Display Muscles

Astronauts attending a geology field trip to Iceland recently witnessed a rare volcanic eruption of smoke and flame while flying over the country's south coast.

But powerful eruptions of smoke and flame are getting commonplace at NASA's Marshall Space Flight Center near Huntsville, Ala., where the 1.5-million pound thrust F-1 engine is undergoing tests.

A new test stand at Marshall (bottom photo) is operational, and has been inaugurated by two long-duration firings of single F-1 engines. Five such engines, generating 7.5 million pounds thrust, will lift the huge Saturn V rocket on the first stage of Apollo's journey to the moon.

Boeing Engineers Say Spacecraft Should 'Sweat' Through Re-Entry

A cooling concept which would "sweat" a spacecraft back through the searing heat of re-entry was described in San Francisco by Boeing research engineers.

Called transpiration cooling, the "cold nose, healthy vehicle" system was explained in a paper presented at the annual meeting of the American Institute of Aeronautics and Astronautics by co-authors R. W. Evans, F. J. Crossland and W. A. Baginski of Boeing's Aero-Space Division.

The skin of the space vehicle would consist of a porous metal surface cooled during re-entry by water circulating under the surface and supplied from internal storage chambers. Re-entry heat would be dissipated in the form of superheated steam.

The authors pointed out that three methods for dumping excess heat have received considerable attention by space engineers. Ablation and radiation have been thoroughly evaluated, and both concepts have performed well when flight-tested. Transpiration cooling has been explored in theory, but little experimental work has been accomplished.

Advantages of the transpiration system, according to the authors, would be low weight and cost factors, plus the advantage of reusing the system for additional space missions.

To gain experimental data on the water-cooled system, Boeing built a model nose cone 2 feet long and 16 inches wide at the base.



WET MOCK for Gemini V had prime crew in spacecraft during dual countdown of Atlas and Titan. Scene at Pad 19 white room will be repeated this month.



EGRESS DRESS is less than formal, but a hat is required to keep cool in the hot Texas sun. Command Pilot L. Gordon Cooper (left) converts his suit neck dam, while Pilot Charles Conrad prefers straw with a plaid brim.

Distinguished Visitor



SHOWS SPACE UNIT—John Macy, chairman of the U.S. Civil Service Commission, Washington, D.C., was among the many visitors to MSC during July. Dr. Robert Gilruth, MSC Director, shows him how the maneuvering unit used by Astronaut Edward White during his "space walk" works.

Experiments

(Continued from Page 1)

hand held spectrometer will be used to obtain spectrograms of cloud formations. Each cloud formation must be at least ten miles square and will be photographed two times. Ten passes will be made, three over the Philippines-Guam area, five over the Caribbean, and two over the Eastern Pacific.

Cardiovascular Reflex Conditioning—The pilot will wear pneumatic cuffs on his thighs in order to determine the effectiveness of cyclic application of venous pressure as a preventive for cardiovascular deconditioning caused by prolonged weightlessness.

The thigh cuffs will be automatically pressurized for two minutes every six minutes. The system will be activated during the awake cycle each day and may be left continually activated if desired.

In-Flight Exerciser—A bungee cord which produces 60 foot pounds of pull will be used to assess the general capacity of performing work during space-flight conditions and for cardiovascular monitoring. Three exercise periods per day per man are scheduled. They consist of thirty pulls, one per second.

In-Flight Phonocardiogram—A biosensor phonocardiogram or heart microphone will be used to monitor heart sounds and serve as a sensitive indicator of heart muscle deterioration when compared with electrocardiogram. Readings will be recorded on magnetic tape and will always be obtained from a sleeping crewman.

Vestibular Effects — Both astronauts will use a vision tester and attempt to determine pitch axis of the spacecraft.

Three devices will be aboard to gather radiation emission information.

50 MILES ROUND TRIP

Portable 'Hopper' May Take Astronauts On Lunar Trips

A versatile rocket propelled flying vehicle has been designed by Textron's Bell Aerosystems Company, Buffalo, N.Y., to transport Apollo astronauts on exploration flights over the lunar surface.

Bell arrived at a preliminary design concept of the Lunar Flying Vehicle (LFV) commonly referred to as the "Hopper," as a result of a 12-month study conducted by NASA's Marshall Space Flight Center (MSFC), Huntsville, Ala. This is one of many concepts being investigated by NASA for possible use following the initial Apollo moon landings.

The four-legged LFV designed by Bell is rectangular in shape and is about the size of an average desk. Astronauts equipped with back pack life support systems would ride in an open cockpit above the propulsion unit.

A cluster of five 100-pound thrust throttleable rocket engines would provide propulsion. Both the main engines and the six attitude control rockets—used to steer the vehicle—would use the same fuel used in the Lunar Excursion Module.

The 400-earth-pound vehicle will be able to fly 50 miles non-stop.

The control console can be shifted from one astronaut to the other during flight or locked in the center during a solo mission. When folded, the LFV is a small package of only 38 x 60 x 61 inches.

"We have established during the NASA study that the flying mobility concept is feasible and a vehicle can be designed using present state-of-the-art, and modified components from other space programs," reported Kenneth L. Levin, Bell's project director for Lunar Flying Systems.

He also disclosed that Bell has been awarded a follow-on NASA contract from MSFC for \$489,898 to design a Manned Flying System (MFS) capable of carrying one astronaut-scientist and 300 pounds of scientific equipment or two astronauts. This vehicle will be able to fly 15 statute miles round trip without refueling.

In connection with the follow-on contract Bell will build a simulator to study the guidance and control concepts for a MFS. The simulator will enable astronauts to make simulated MFS flights without leaving the ground.

Other lunar and planetary programs in which Bell is engaged include the Lunar Excursion Module ascent engine, and design and fabrication of two Lunar Landing Research Vehicles for researching lunar landing problems and training astronauts.

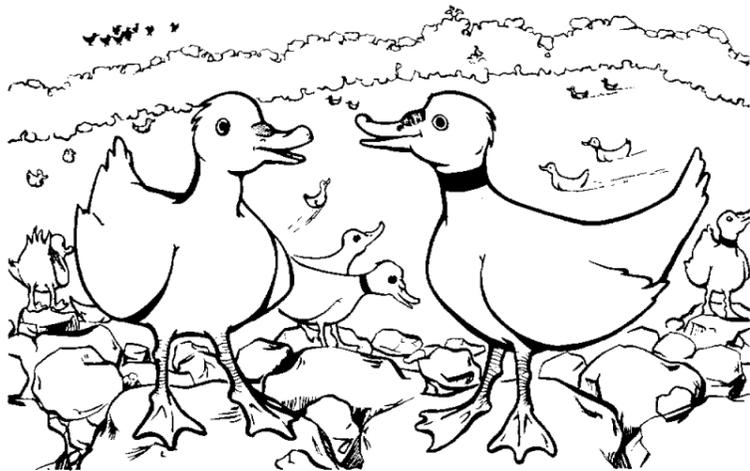
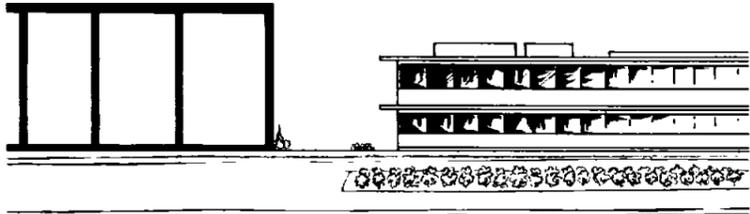


BACK-UP COMMAND PILOT Neal A. Armstrong during ingress exercise at Pad 19, Cape Kennedy, and back-up pilot Elliott M. See (lower photo) preparing for parachute training in Galveston Bay, reveal variety of crew activities prior to a flight.

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Director Robert R. Gilruth
 Public Affairs Officer Paul Haney
 Editor Milton E. Reim
 Staff Photographer A. "Pat" Patnesky

On The Lighter Side



"Have you noticed how thick the people are getting around here?"

Welcome Aboard

During the last reporting period, 76 new employees joined the Manned Spacecraft Center.

Center Medical Programs Office: Michael C. DeBerardinis and Wesley M. Sokolosky.

Legal Office: Fern L. Macha.
Center Medical Office: Duane E. Graveline, John W. Lewis and George H. West.

Procurement and Contracts Division: John R. Gilpin, Thomas G. Mancuso, Elliott Manferd, Larry D. Rannals and Richard J. Smith.

Technical Services Division: Richard E. Stanton.

Management Services Division: Ann K. Thurman.

Personnel Division: Frederick T. Boyes, William D. Branson, Frazier L. Coffie, Sam W. Davis, Grover Ellis, George T. English, David J. Frilis, Nealy R. Glenn, John I. Lovejoy, Ann M. McClung, Philip H. Rogers, Robert P. Soens, John E. Wortman and Anne Walker.

Resources Management Division: Charles W. Bridges, Darby L. Bryant, Robert C. Ellis, J. C. LeFlore and Larry R. Martin.

Flight Crew Support Division: A. Lee Barrett, Peggy A. Broussard, Marsh L. Hagerman, Lawrence W. Maxwell, Clark M. Neily and George M. Schwab.

Crew Systems Division: Patricia L. Riggs and James L. Tyler.

Computation and Analysis Division: Charles B. Garner.

Instrumentation and Electronic Systems Division: Stephen M. Derry, Robert E. Munford and James F. Pawlowski.

Guidance and Control Division: Clyde Hill Paulk, Indulis Saulietis and Robert C. Duncan.

Propulsion and Power Division: James J. Hinds, C. Donovan Hyatt and Sandra K. Lightfoot.

Structures and Mechanics Division: Ray L. Dewey and Thomas N. Moody.

Advanced Spacecraft Technology Division: Jesse M. Walker.

Flight Control Division: Dorothy B. Elledge, James Allen Joki, Joseph M. Langan and Michael L. Olson.

Space News Of Five Years Ago

AUG. 11, 1960 — The first manmade object recovered from an orbiting satellite, the 85-pound instrumented capsule of DISCOVERER XIII, was recovered from the ocean off Hawaii after 16 orbits. A silken 50-star American flag it carried was presented to the President on August 15.

AUG. 11, 1960 — Representatives of NASA, McDonnell, Ballistic Missile Division, Space Technology Laboratories, and Convair met at Cape Canaveral and later at Convair Astronautics (Aug. 30, 1960) to discuss the Mercury-Atlas (MA-1) mission malfunction. James A. Chamberlin of the Space Task Group was appointed chairman of a joint committee to resolve the problems and to provide a solution prior to the MA-2 mission.

AUG. 11, 1960 — The Mercury spacecraft landing system qualification test program was completed. The entire qualification testing program consisted of 56 airdrops of full-scale engineering models of the Mercury spacecraft from C-130 aircraft at altitudes up to 30,000 feet and from helicopters at low altitudes to simulate off-the-pad abort conditions. This test program, under contract to Northrop, had spanned one and one-half years.

AUG. 12, 1960 — NASA's ECHO I, the first passive communications satellite, was successfully launched by a Thor-Delta. It reflected a radio message of the President across the Nation, thus demonstrating the feasibility of global radio communications via satellites. The 100-foot diameter aluminized Mylar-plastic sphere was the most visible and largest satellite launched to date.

AUG. 13, 1960 — The Army announced completion of a project for mapping lunar landing sites.

AUG. 16-18, 1960 — At the design engineering inspection of Mercury Spacecraft No. 7, a number of requests for changes in the control panel area were made by the astronauts to facilitate pilot operation. Later, meeting procedures for design engineering inspections were standardized and conducted by a permanent team at appropriate intervals.

Landing and Recovery Division: William A. Swyer.

Mission Planning and Analysis Division: Kenneth E. Cave, Edwin G. Dupnick, Edell Lydia, Christopher A. Penick, Herbert A. Perkins, Joseph K. Wheatley and Gary L. Wise.

Flight Support Division: James L. Hall and Walter J. Steets.

Gemini Program Office: Ernest G. Ingram.

Apollo Spacecraft Program Office: Karl R. Eckhardt, David W. Gibson, Bobby R. Huffman, Paul C. Redman and Franklin A. Swanson.

White Sands Operations: Gene W. Frye.

Supply Branch Starts Own 'Employee of Month' Program

The Supply Branch, Administrative Services Division, has instituted a new program of employee performance recognition called, "Employee of the Month."

There is no established criteria for selection but above-average performance, appearance, neatness in dress and habits, promptness, participation in civic and church activities are factors of consideration supervisors are using for their nominations.

On the first of the month, section chiefs nominate two employees and submit their recommendations to a reviewing panel of three branch employees. The selected employee of the month receives a letter of appreciation from Branch Chief Hazen L. Walker. Also, captioned posters containing a picture of the honoree are placed in prominent locations in buildings occupied by the Supply Branch.

Employee of the Month for July is Mrs. Elsie M. Easley. Mrs. Easley is in charge of locating and acquiring excess material for MSC.

Mrs. Easley transferred here

in April 1964, from White Sands, New Mexico. She and her husband Kenneth, also an MSC employee, and their two daughters, Pat and Tammie, live in Friendswood.



MSC-EAFB SOFTBALL LEAGUE

Standings as of July 25

Fast Pitch					Slow Pitch				
TEAM	W.	L.	Pct.	G.B.	TEAM	W.	L.	Pct.	G.B.
CG-Choppers	10	2	833	—	Hustlers	11	1	917	—
Rams	10	2	833	—	Animals	11	1	917	—
Lone Stars	9	3	750	1	MPAD-RAB	10	2	833	1
2578th AB SQ	9	3	750	1	Mets	8	3	727	2 1/2
Colt 38's	9	3	750	1	Mis-Fits	8	4	667	3
Weather	8	4	667	2	8-Balls	8	4	667	3
FCD	7	5	583	3	RMD-Plus	7	5	583	4
IBM	7	5	583	3	CSD	7	5	583	4
Comm. SQDN	7	5	583	3	Machinists	6	6	500	5
Wolfs	5	7	417	5	LRD	4	8	333	7
ID	4	8	333	6	Fabricators	4	8	333	7
LoBos	4	8	333	6	Odds-Ends	3	8	273	7 1/2
Lockheed	3	9	250	7	Virginians	3	9	250	8
Hustlers	2	10	167	8	Moonrakers	3	9	250	8
Rag Mops	1	11	083	9	Lunartechs	2	10	167	9
Firemen	1	11	083	9	USCG(H)	0	12	000	11

SPACE QUOTES

COMPETITION IN TECHNOLOGY CLOSELY RELATED TO COOPERATION. James E. Webb, Meeting of EUROSPACE, Washington, D. C., April 30, 1965.

"Since we in the United States and you in Western Europe do in a sense move forward together to meet man's newest challenge, I think it is of the greatest importance to recognize that the pattern of the U.S. national program in space exploration is one in which we are striving to work with other peoples so we can all participate in the opportunities and benefits of the new age. We are developing the enormous power implicit in space activity in such a way as to use it with others for the benefit of all. This is true not only in programs for direct international cooperation but also in the application of our own projects. Yet, we do not close our eyes to the real world. Competition in technology is a fact of life and walks side by side with cooperation."

Award For Twenty Years Service



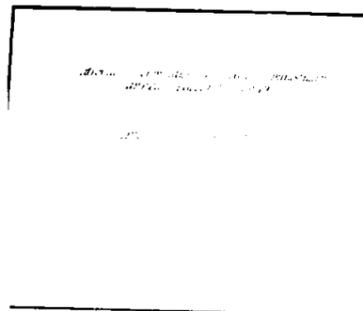
TWENTY YEAR AWARD—M. L. Raines, manager, White Sands Test Facility, pins a 20-year award pin on Howard W. Feindel (right) of the Flight Test Office, WSTF.

Space News ROUNDUP!

MANNED SPACECRAFT CENTER, HOUSTON, TEXAS

EMPLOYEE NEWS

Quick Thinking



COMMENDATION—Mame Elizabeth Evans, R. N., Zia employee at the MSC White Sands Test Facility, is the recipient of a Certificate of Commendation, "For her positive and effective action in providing emergency treatment and first aid for two technicians who had suffered severe facial and eye burns as a result of accidental release of nitrogen tetroxide rocket propellant," on May 4, 1965.

NASA Golfers Take First, Third At 36-Hole WSTF Scratch Match

The first White Sands Test Facility golf tournament, a 36-hole scratch match played at the Las Cruces Country Club, has ended with a NASA man on top just four strokes ahead of his nearest competitor.

Winner with a first-round 81 and a final total 158 is Bill Gantz, chief of the Propulsion Engineer-

Seek Registration For G-N Classes

A series of classes on the Apollo Block II-LEM Guidance and navigation systems is scheduled for presentation September through December (courses will be conducted by instructors from AC Electronics Division in the systems training rooms, second floor, Building 4.

In order to satisfy requirements for training, AC is offering both familiarization briefings and detailed systems courses ranging in length from 16 hours to 56 hours. Course descriptions and schedules have been distributed at branch level throughout the center.

It is requested that all interested personnel submit attendance requirements through branch or division offices. These offices will forward complete attendance lists to the subsystem manager for Apollo Systems Training, CF-22, Extension 4374.

Family Picnic At Galveston September 25

Galveston County Park has been reserved for the annual EAA-MSA Family Picnic on Saturday, September 25, according to Tony Yeater, chairman.

Many of the popular features of last year's picnic—a merry-go-round, ferris wheel, pony rides, snow cones, popcorn and cotton candy—will be included in this year's program. Two girls' baseball teams are being formed by Voula Tsitsera, and various recreational equipment will be available.

The MSC Exchange Council, in cooperation with the Employees Activities Association, has arranged for the picnic to be catered by the MSC Cafeteria. Backup systems will be provided so that there will be no shortage of food or beverages of any kind.

Maggie Taylor, of the Dance Committee for the picnic, said there will be dancing all afternoon, with special shows and dance contests to be announced later.

ing Office. Just behind with a 162 was E. D. Tubbs of Grumman Aircraft Engineering Corp. Another NASA man, Bob Colston, was third with 164.

The tournament, sponsored by the WSTF Recreation Council and open to NASA contractor employees at the New Mexico site, also recognized three separate flight winners and runners-up.

They were J. O. Richardson of the Zia Co., F. E. Baerst from Grumman, and R. P. Quinn, also of Grumman. Second and third spots in the first flight went to L. N. Bennett of North American and W. S. Ford of Grumman.

Model Airplaners To Organize Unit

Radio control model airplane enthusiasts at MSC will meet August 11 to discuss forming a club for MSC employees, both civil service and contractor.

Topics to be discussed at the first meeting will be organization, charter and by-laws, financial planning, officer nominations, flying sites and sanctioning requirements by the Employees Activities Association.

The meeting will be in room 651, Bldg. 2, at 5 p.m. All persons interested are requested to contact B. J. McCarty at HU 3-5411.

Awards Reward Long Service, Performance



30-YEAR AWARD—Wayne Loomis (second from left) recently received a certificate marking 30 years of service to the government. Loomis works in the Aircraft Operations Office. On hand for the presentation were (from left), Donald T. Gregory, executive officer, Office of the Assistant Director for Flight Crew Operations; Loomis; Paul E. Purser, special assistant to the Director; and Joseph S. Algranti, chief, Aircraft Operations Office.



15-YEAR AWARDEES—Six employees of MSC were recently honored for 15-year service by presentation of certificates and 15-year pins by Maxime A. Faget (third from left), assistant director for Engineering and Development. Shown during the presentation are (from left), Arthur D. Crabtree, Structures and Mechanics Division; Robert H. Moore, Advanced Spacecraft Technology Division; Faget; Catherine S. Slavik, Advanced Spacecraft Technology Division; Joseph H. Tilghman, Instrumentation and Electronic Systems Division; Stanley L. Bachman, Guidance and Control Division; and Doran E. Schnell, Computation and Analysis Division.



SSP AWARD—John R. Brinkmann (left), chief, Photographic Division, receives the Sustained Superior Performance Award. The presentation was made recently by Dr. Robert R. Gilruth, director, Manned Spacecraft Center.

Max Cone Champ At Bridge Event

Max Cone topped a field of 36 players who participated in the first Individual Championship event held on July 20 by the MSC Duplicate Bridge Club. Second was David Gibson; third, Bud Parschall; and fourth, Charlie Brown.

Winners at the July 13 rating point game were Larry and Marilyn Gallagher, first; John Hawkins and Alden Mackey, second.

Duplicate games are played each Tuesday at 7:15 pm at the NCO Club at Ellington AFB. Club Master Point games are held the first Tuesday of each month.

New members J. G. Olmsted and F. Tawil were first at the July 6 Master Point Game, with Sara and Bill Stewart coming in second.

Lee Pearson and Bob Hodgson placed high in the Lone Star Regional Tournament held at the Rice Hotel over the Fourth of July weekend. Against some of the strongest competition in the country, they placed third overall in the Open Pairs and tied for tenth overall in the Men's Pairs. Mrs. Richard Reid came in second overall in one of the special pair games, missing first place by just a fraction.

The Club series which ended on June 29 was won for the second time by Charlie Brown. The next series is scheduled to begin August 31.

Members Sought For Science Unit

Membership applications for the Texas Academy of Science, a non-profit organization devoted to promoting science education, are available at the Educational Programs and Services Branch, Public Affairs Office, Room 154, Bldg. 1.

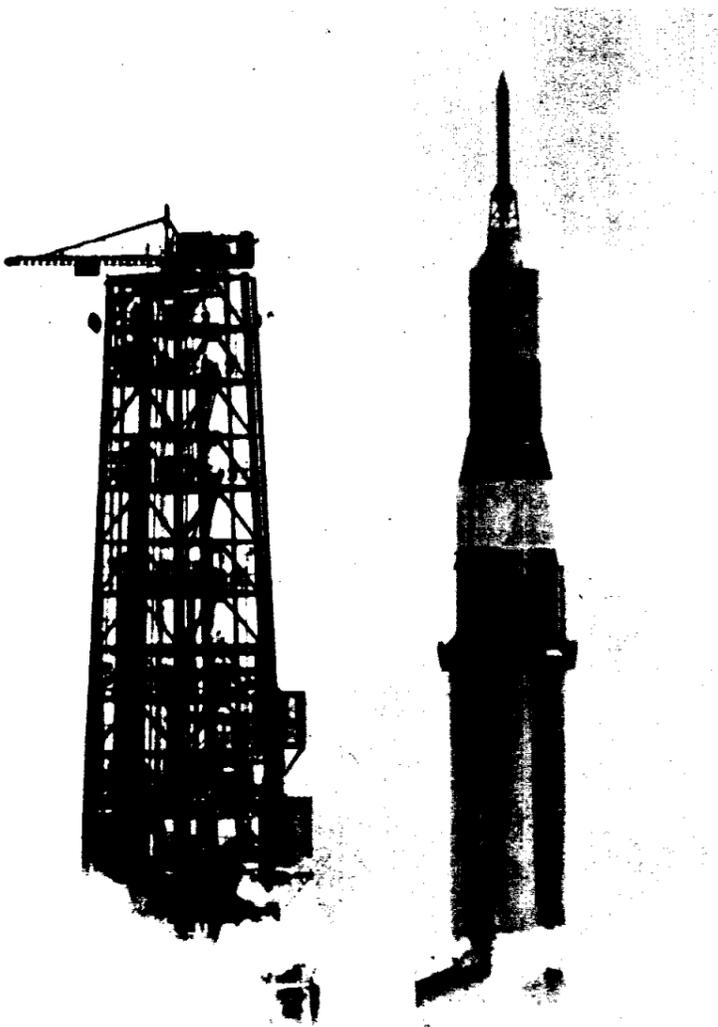
The Academy, affiliated with the American Association for the Advancement of Science, states as its purposes the stimu-

lation of scientific research in Texas, promotion of science interest and education at all levels and publication of scientific investigation reports. Membership is open to anyone engaged in scientific work or who is interested in promoting science education.

The Academy publishes the quarterly *Texas Journal of Science*.

PEGASUS WRITES LAST THREE CHAPTERS

Saturn I Success Story Ends Happily at Cape



The mighty Saturn I horsed an Apollo-clad Pegasus into a near-perfect circular orbit 330 miles high last week, leaving a bright trail for manned flights to follow.

When the smoke cleared at Cape Kennedy's Launch Complex 37, jubilant observers could still hear the rumbling of Saturn I's tenth straight successful launch—ten out of ten.

It was the final chapter of the Saturn I story, begun in October, 1961. Future Saturns will be the improved Saturn IB, with the more powerful S-IVB second stage—the launch vehicle scheduled to begin flying unmanned

Apollos in 1966, manned spacecraft the following year.

Last week's launch was also the third and final for Pegasus, an engineering experiment to determine meteoroid flux in earth orbit. Two earlier Pegasus satellites have been gathering valuable meteoroid "strike" data since earlier this year, orbiting between 308 and 464 statute miles.

Pegasus III's 23,100-pound bulk contains one refinement over previous meteoroid detection satellites. Forty-eight aluminum sub-panels, called "coupons," have been attached to the

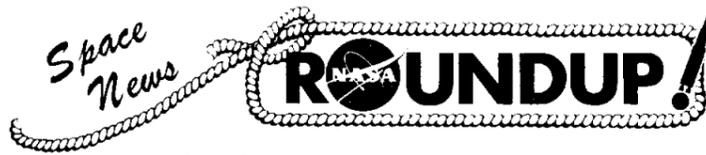
spacecraft's 96- by 14-foot expanded "wings," and may possibly be retrieved by an astronaut late in the Gemini program. Pegasus III should orbit three years or more.

The Saturn I vehicle's appearance matched that of the previous four. Atop the launch vehicle was the Apollo spacecraft: boilerplate command and service modules plus the launch escape system tower. Pegasus was folded inside the service module. After injection into orbit, the command and service modules were jettisoned and the Pegasus satellite deployed its panels. The two Apollo modules will enter a similar but separate orbit.

The weight of the two Apollo modules, plus associated "hardware" in a separate orbit is 10,100 pounds, so the total "hardware" weight in orbit as a result of this launching is 33,800 pounds.

Pegasus will be visible to the unaided eye under favorable conditions near dawn and dusk. As in the cases of previous large satellites, NASA plans to issue predictions of possible sightings for major cities.

The Marshall Space Flight Center under the direction of the Office of Manned Space Flight is in charge of Saturn development. Marshall is also responsible for development of Pegasus under direction of the Office of Advanced Research and Technology. The Kennedy Space Center is in charge of launchings, and MSC provided the Apollo hardware.



SECOND FRONT PAGE

Four Scientist-Astronauts Take First Steps To Space

Four of six new scientist-astronauts named by NASA in June have begun 51 weeks of pilot training at Williams Air Force Base, near Phoenix, Ariz.

Doctors Owen K. Garriott, Edward G. Gibson, Duane E. Graveline and Harrison H. Schmitt will train alongside members of an Air Force class of 64 students.

Two others, Lt. Cdr. Joseph P. Kerwin and F. Curtis Michel, are qualified pilots with jet experience.

Garriott, a physicist, and Graveline, a physician, are private pilots, but Gibson, a physicist, and Schmitt, an astrogeologist, have never flown planes.

The men will receive more than 300 hours of classroom work and about 240 flying hours during training. All but 30 of these hours will be in T-37 and T-38 jet trainers.

They will begin 12-hour days for the next year at 5:30 a.m., attending classes in navigation, radar, weather, aviation physiology and other related subjects. As all students are required to do, they will fly every mission in

a Link trainer before actually flying it in an airplane.

Except for some military officer training, the scientist-astronauts will participate in all phases of student activity, including a confidence course, calisthenics, and supervised sports.

Upon return to MSC next year, the newly qualified pilots will join Kerwin and Michel in specialized astronaut training.

Mariner Photos Leave Unanswered Question Of Life On Red Planet

Scientists at NASA's Jet Propulsion Laboratories, Pasadena, Calif., are reviewing the 22 photographs taken by the Mariner IV spacecraft July 14 during its journey around Mars.

But Dr. William Pickering, JPL director, said he does not expect Mariner's photography to answer the age-old question

of whether life exists on the mysterious planet.

He said the photos, taken from a few thousand miles altitude, will offer scientists much valuable information, but that discovery of life in any form on Mars will be a job for more sophisticated spacecraft which can actually land there.

LAST BLAST FOR SATURN I took place July 30, ending a perfect 10-launch series which included several Apollo boilerplate test flights. Saturn 7 lift-off was typical.

Parasail Drops From Plane, Glides To Perfect Landing

A 70-foot Parasail carried its full-scale Gemini boilerplate to a perfect, rocket-attenuated landing just 40 feet from its test point at Fort Hood last Friday.

John Kiker, chief of the Landing Technology Branch, Structures and Mechanics Division, called it a "perfect test," and said another may be conducted in September.

It was the third test of the Parasail-landing rocket system on land at Fort Hood, and overshadowed the two previous tests in performance. In all, Parasail has made a dozen flights.

In one test a turn motor failed, causing the boilerplate to tip over after landing because of winds; the other test was plagued by a broken suspension line and failure of the altitude sensor.

The spacecraft was dropped from a C-119 from 10,000 feet. The Parasail inflated perfectly, and the spacecraft was maneuvered with remote control radio by Lee Norman of the Landing Technology Branch.

Norman steered the Parasail in turns—upwind, downwind—and brought the boilerplate spacecraft down on target.

Kiker said no decision had been made concerning another possible Parasail-landing rocket test with a Gemini boilerplate. He hinted that he would like to try the system on larger vehicles.

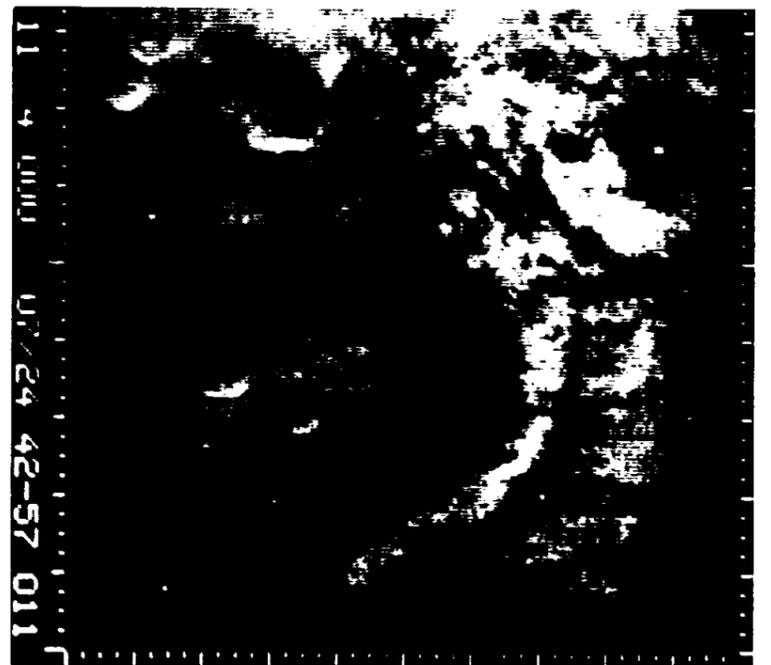
Parasail, manufactured by Pioneer Parachute Co. to MSC specifications, is a research and development project, unrelated to either Gemini or Apollo programs.

Webb Named to Help In Goddard Memorial

James E. Webb, NASA administrator, and Mrs. Robert Goddard, widow of the scientist, have been named honorary chairmen of the Robert Hutchings Goddard Library Program at Clark University.

Dr. Robert R. Gilruth, MSC director, has been asked to serve on the program's International Sponsors Committee.

The program seeks to secure \$5.4 million to build and endow the library as an academic memorial to Goddard, well-known "Father of Modern Rocketry."



MARINER PHOTOGRAPH—Mars just prior to Mariner's closest approach of about 6,000 miles from the planet. North is at top. Area covered is: East-West: 170 miles; North-South: 150 miles, Atlantis, between Mare Sirenum and Mare Cimmerium.