Kraft Speaks At Opening of UofH Building

Mystery Splotch?—At liftoff plus 2 min 13 sec in the Apollo VI mission a color change was detected at the side of the Spacecraft-LM Adapter (SLA) by a camera aboard a USAF chase aircraft. The splotch appeared about mid-height of the 28-foot tall SLA and spread over about the SLA diameter. Apollo Program Director Maj. Gen. Samuel Phillips said the marks possibly were caused by chunks of heat-protective paint sloughing off. There was no structural damage to the SLA.

Apollo VI Launch Data Examined To Show Saturn V Misfire Cause

Early evaluations of the data on the April 4 launch of the second Saturn V vehicle provides further information relating to the propulsion troubles in the two upper stages.

Despite propulsion problems, the Saturn V succeeded in placing a total of more than 264,000 pounds into earth orbit. The vehicle was launched at 6 a.m. CST from the Kennedy Space Center.

Preliminary results of the flight were contained in an early report issued by the NASA Marshall Space Flight Center, in charge of Saturn development.

Second stage engines 2 and 3 cutoff prematurely at 408.7 and 410.8 seconds after liftoff, respectively, causing a 58-second longer than normal second stage burn and larger than expected deviations from second stage (S-II) flight conditions.

One candidate cause for the two engines’ cutoff was the possibility of the S-II at interstage having struck the engines when it jettisoned at second stage separation. Onboard camera film recovered after the launch ruled out this possibility by showing a normal separation of the engines.

First burn of the third stage (S-IVB) was 29.2 seconds longer than planned to compensate for the early cutoff of the second stage engines. The result was a high cutoff velocity and an elliptical orbit. The abrupt termination of this orbit was a demonstration of the unusual flexibility delivered by the Saturn V.

All engine and stage restart conditions appeared normal, but the S-IVB’s J-2 engine did not restart in orbit. The restart was to have propelled the S-IVB and Apollo spacecraft into a simulated translunar trajectory.

Evaluation of early data indicated that the first stage (SIC) performed as planned. Stage thrust was essentially the same as predicted during the first portion of the flight.

The data indicated satisfactory S-II H performance through first stage boost, S-II ignition and the early portion of the S-II powered flight.

The earliest observed deviations were decreasing temperatures on the main oxidizer valve and its control line on engine 5 and a steady increase in engine 2 yaw actuator pressure, occurring at 278.4 seconds.

Several engine parameters indicated a sudden 5,000 pound thrust decrease in engine 2 at 318.4 seconds. At the same time there was a sudden increase in pressure in both pitch and yaw actuators.

Analysis of the data indicated the cutoff signal from engine 2 caused the number 3 engine to shut down by incorrectly closing the engine 3 liquid oxygen pre-valve. It is possible that wires carrying cutoff commands to the number 2 and 3 engines were interchanged.

Quick-look data indicates that the third stage performed satisfactorily through first burn and orbital coast. Shortly after orbit insertion a cold helium supply

(Continued on page 3)
Proposed July Federal Pay Hikes Show Gains from 3 to 9 Per-Cent

Proposed Federal salary schedules derived from the Bureau of Labor Statistics 1967 salary survey have been sent by the Civil Service Commission to officials of Federal employee organizations for comment.

Information furnished the unions indicates that salary increases ranging from 3 to nearly 9 percent, to take effect in July, would be warranted under the half-way-to-comparability formula in the Federal Salary Act of 1967.

Increases are larger at the higher grades where the gap between Federal and private salaries is greater.

In grades GS-1 through GS-6 the increase would be 3 percent. At GS-16, it would be nearly 9 percent. Increases in grades GS-17 and GS-18 would be limited by the provision of law which holds career salaries to an amount not above the rate for level V of the Executive Schedule, now $28,000.

In the accompanying table, asterisks indicate what the pay should be to reach halfway to comparability.

The 1967 law provided for pay increases in October 1967, July 1968, and July 1969 to close the remaining gap between Federal and private salaries.

Wage employees in trades, crafts, and laboring occupations are unaffected by this adjustment.

Even though the 1967 law provides for an automatic increase in July, Congress can be automatically effective in July 1968.

Increases of 6 percent for postal workers and 4.5 percent for other Federal workers whose salaries are fixed by law went into effect last October.

Under the Federal Salary Act of 1967, the rates approved last October will be adjusted in July of this year to close half the remaining gap between present salary rates and private rates determined on the basis of the 1967 BLS survey. No employee covered by the Act, however, will receive less than a 3 percent increase this year.

The Act provides that rates will again be adjusted in July 1969 to close the remaining gap between Federal and private pay.

Wage employees in trades, crafts, and laboring occupations are unaffected by this adjustment.

Even though the 1967 law provides for an automatic increase in July, Congress can approve new legislation to prevent it from going into effect. Members are discussing cutting the average raise from 5 to 2.5 percent, or postponing its effective date to October 1 or even January 1.

MSC employees will be kept informed of the progress.

AFGE Lodge Elects Officers

Lodge 2284 of the American Federation of Government Employees May 13 will elect officers for the 1968-69 lodge year.


Ballots have been mailed to each lodge member.

Sagan Says Mars Life Question Answered Only by Direct Contact

By Aneta Davis

Conditions on Mars are such that life can definitely occur, according to Professor Carl Sagan, one of the world’s leading investigators in exobiology and planetary physics. Direct contact with the surface of the planet offers the only probable means of resolving the question.

“Without direct contact,” Professor Sagan told an MSC audience, “all observations of the planet can be explained with equal compatibility either with or without the existence of life.”

Although it is possible, Professor Sagan said, that unique evidence for life might be obtained from fly-by or orbiting satellites, it is highly unlikely that any definite observations can be made at a distance which would label a phenomenon organic or inorganic. Since it is difficult, if not impossible, to second-guess extraterrestrial life, the problem is in knowing what to look for. The clues would be valuable but not definitive.

As an example of dual explanations, Professor Sagan referred to the seasonal darkening of certain areas of Mars. If the phenomenon is biological, we may be seeing the growth and reproduction of Martian organisms comparable to the algae and lichens known on earth. Since Mars is a sunblown planet, springtime winds may scour the finer, brighter particles off the hills, causing a change in the intensity of light reflection.

One possibility for clues of life lies in the analysis of the chemical composition of the planet’s atmosphere. A chemical imbalance might indicate a life source as responsible. For example, on earth one source of the gas methane is its production by methane bacteria in the stomachs of cows. A spectrometer in orbit around earth would detect the gas, and would hence be able to observe the abundance over India, the home of a quarter of the world’s cows.

Now we would not be able to deduce from such observation that there are cows on earth,” Sagan said, “but we would certainly suspect life in India.”

But, as a definite indication of life the observation is complicated by the fact that marsh gas can also be responsible for methane.

In response to a question of whether color photography would aid the research, Professor Sagan stated that it would be of little value. For instance, he said the color green seems to be a mistake made by earth plant life. Therefore, since green is not the optimum life-producing color, we cannot disprove life by the color’s absence.

Professor Sagan feels that the comparison between the moon and Mars has been overdrawn. The fact that both have craters, definitely does not indicate that because the moon is barren, Mars also is barren and lifeless. The dissimilarities are too great.

On Mars there is “wind and water; carbon dioxide and sunlight; clouds, rolling hills, and deserts, winter frosts and balmy summer afternoons.”
What Does the Inspector Inspect?

A box labeled "NASA Regional Inspections Office" on the MSC organizational chart jogs the curiosity and makes one ask, "I wonder what they inspect?"

The NASA Regional Inspections Office at MSC, headed by Glenn L. McAvoy, is assigned the responsibility for establishing and conducting a comprehensive program at MSC designed to prevent and detect illegal and unethical conduct by NASA employees as well as to detect fraud or other illegal activities by contractors or others which affect NASA.

McAvoy is assigned to NASA Headquarters and reports administratively to the Director of Inspections at Headquarters level. His functions are independent of MSC management.

"We are as much concerned with disproving as we are with proving allegations of wrongdoing leveled against NASA employees and we do this in a straightforward type investigation without use of covert devices or gimmicks," said McAvoy. "About half of our investigations of wrongdoing discloses that the allegations were either false or exaggerated.

Among the activities of NASA employees which come under the eye of the Inspector are using job-related information for personal gains, such as prior knowledge of contract award for stock speculation; use of Government property — cars, telephones, and equipment — for personal use; favoritism in the awarding of contracts; contract irregularities: theft of Government property; and acceptance of gifts and gratuities. Also, some types of moonlighting or outside employment may get an employee into trouble, especially if the outside employer does business with NASA.

"During an investigation," said McAvoy, "the Government employee has a responsibility to answer questions relating to his job. In any investigation, we have to first determine whether NASA regulations or Federal laws have been violated. When we have reason to believe that a Federal law has been violated, we are obliged to tell the matter to the Department of Justice. Violations of NASA regulations are handled administratively within the agency.

McAvoy is a graduate of Cornell University, Ithaca, New York. He was a special agent with the FBI from 1951 to 1960. McAvoy was an investigator-in-charge for the Ohio Department of Liquor Control from 1960 to 1963. In 1963, he joined NASA and was assigned to the NASA Regional Inspections Office at the Manned Space Flight Center, which at that time handled MSC inspections functions. He was appointed Regional Inspector of the MSC office when it was created in 1965.

McAvoy and his wife, Beverly, live in Clear Lake City. She is a nurse with the Clear Creek School District. Their only child, Gloria, is a junior at the University of Houston. For relaxation, McAvoy plays golf and volleyball.

JIM THRIFT SAYS...

GET IN THE SWIM

JOIN THE COST REDUCTION TEAM

Mars Lander Model In Dry Lake Drop Test

A model of a wheel-shaped planetary landing craft, sterilized by heat and dropped from an altitude of 250 feet has operated successfully after impacting the ground at 80 miles per hour.

The test conducted recently for NASA's Jet Propulsion Laboratory, Pasadena, Calif., was a major step in an advance development program to demonstrate the feasibility of sending a lightweight scientific landing capsule to Mars in a future mission.

For a simulated Martian surface, JPL engineers selected the "hardpan" bed of a dry lake near NASA's Goldstone Space Communications Complex in the California Mojave Desert.

The 63.5-pound craft was released from a hovering helicopter and allowed to free-fall to the lake bed. In the thin atmosphere of Mars the lander would be slowed to the same velocity by a 20-foot parachute. No parachute was used in the test.

Three minutes after impact, a tiny anemometer — to measure wind velocity — deployed auto-

CO-OP OF MONTH

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TRIMBLE SPEAKS TO AAS-ISA

MSC Deputy Director George S. Trimble May 28 will address a joint meeting of the American Astronautical Society and the Instrument Society of America. Trimble will speak on the "NASA-Industry Partnership.

The meeting will be at the Nassau Bay Motor Hotel starting at 6 p.m. with cocktails and a buffet dinner ($3.50/person) at 7, and the program at 8.

Masters Job — Mississippi State University civil engineering major Joe H. Wilson is assigned to the Flight Support Division Systems Engineering Branch where he has had such assignments as operating Gemini command tape and other computer programming tasks. "His abilities to accomplish a task were surpassed only by the interest he takes in accomplishing the task," says his supervisor.

APRIL 26, 1968
FLIP-TOP HATCH—MSC pilot Jack R. Lousma boosts himself over the sill of Center. Lousma was suspended from a six-degree-of-freedom simulator to design review. The fully-equipped spent-stage Workshop will have crew at

PHOTO ROUNDUP

...the space,

Another Skirmish in the Battle Against the Sea

ERSATZ SEAWEED—Metal frames with artificial plastic seaweed attached are lowered from a barge offshore of the NASA Wallops Station, Va., as part of an experiment to develop means of retarding sea erosion. The fake seaweed fronds float underwater like the real thing and attract barnacles, water blister and sea ferns as well as inducing sand particles in suspension to drop to the bottom. The reefs also attract fish where there were none earlier.

NORTHERN LIGHTS—Arctic aurora at NASA Ames Research Center scientific Aurora Expedition flying out of Church. The lower edge of the aurora is some 160 miles a center is the planet Jupiter—made for exposure.

SPACE PALETTE—Artist Peter Hurd captured the nighttime activity at a Kennedy Space Center launch pad. Hurd is one of several noted American artists taking part in the NASA Artists' Cooperation Program which is aimed toward documenting space history through works of art—a practice that had fallen into disuse since the advent of photography. Other artists who have taken part in the program include Dong Kingman, Paul Sample, Mitchell Jamieson and Jamie Wyeth.

Check out ease of ingress during a week-long Orbital Workshop crew station, food area, laboratory work spaces and a waste management area.

Program in Pictures

Captured by a camera aboard the aircraft Galileo during the 1968 NASA Research Range, Manitoba, Canada.

FREE FALL MODEL – A one-ninth scale model aircraft hangs from a strut on a helicopter prior to drop at the NASA Langley Research Center, Va.

The dynamically-scaled models duplicate not only the mass of the full-scale aircraft, but also have other features exactly proportional. The model's flight path after drop is geometrically similar to that of a full-size aircraft in similar conditions. Control surfaces are activated by ground radio command, and a parachute in the tail section allows the models to fly another day.

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HATCH ACT Q & A

What Kind of Political Activities Are Open to Federal Employee?

Many election-year questions come up concerning Federal employees’ rights and restrictions under provisions of the Hatch Act. Some of the questions and answers have been prepared for the guidance and information of Federal employees.

Specifically, an employee covered by the Hatch Act cannot run for any office as a partisan political candidate or campaign for any partisan political candidate or engage in any partisan political management. By partisan candidate is meant one representing a national or state political party such as the Democratic or Republican Party. A federal employee may not run for office, even as an independent, in an election in which partisan political designations are used, unless he lives in one of the communities which the Civil Service Commission has given partial exemption in connection with specific elections.

Q. What employees are prohibited by the Hatch Act from any political activity in general?

A. Employees of the executive branch of the Federal Government and the Government of the District of Columbia, including temporary and part-time employees. The political activities of employees of a state or local agency whose principal employment is in connection with the execution of Federal rules and regulations is also restricted.

Q. Please explain for employees affected by the Hatch Act just what their responsibilities and rights are under the act.

A. They have the right to vote and to express their political opinions, but are forbidden to take an active part in partisan political management or in partisan political campaigns. In connection with Federal employees’ rights under the Hatch Act, the Commission emphasizes that political-activity restrictions do not relieve employees of their obligation as citizens to inform themselves of the issues and to register and vote.

Q. What is the penalty for violation of the Hatch Act by a Federal employee?

A. The most severe penalty for violation is removal from his position. The minimum penalty is suspension without pay for 30 days.

Q. Is it possible for a Federal employee to run for public office on the ticket of a national or state political party?

A. No. Federal employees cannot be candidates for any national, state, county, or municipal office in partisan elections. They may run for local office only in elections that are nonpartisan.

Q. If employees covered by the Hatch Act can attend political rallies and join political clubs, but they cannot take an active part in the conduct of the rally or operation of the club. Other things they are prohibited from doing are becoming involved in soliciting or collecting political contributions, distributing campaign material, and selling dinner tickets, or otherwise actively promoting such activities as political dinners.

Q. Many an employee who is subject to the Hatch Act write a letter to the editor of a local newspaper, expressing his opinion on a partisan issue?

A. Yes, but he must not solicit votes for or against any political party or partisan candidate. If he solicits votes, it is a Hatch Act violation.

Q. May he make a campaign contribution to his party?

A. Yes, but he cannot be required to do so. The contribution cannot be made in a Federal building or to some other employee who is prohibited by Federal law from accepting contributions. Of course, as a Federal employee, he cannot solicit political contributions.

Q. Does an employee violate the Hatch Act by merely wearing a campaign button or displaying a campaign sticker on his car?

A. No. This is not prohibited by the Hatch Act.

Q. May an employee use a Government employee's wife who is not a Government employee engage in political activity?

A. Yes. The Act does not restrict the activities of an employee’s wife or other members of his family in any way as long as the activities engaged in are done independently, upon the family member’s own initiative, and in the member’s own behalf.

Q. What is the Commission’s general philosophy with regard to the individual’s participation in registration?

A. The Commission, over the years, has expressed the view that it believes all citizens should be encouraged to register and to vote, and that no impediment should be permitted which would hamper an individual from participating in registration activities and voting.

Q. May a Federal employee participate in nonpartisan registration drives?

A. Yes, to the fullest extent.

Q. May a Federal employee serve as an election officer?

A. Yes, provided that in doing so he discharges the duties of the office in an impartial manner as prescribed by State or local law, except that he may not become a candidate for such office in a partisan election.

Q. May a Federal employee serve in any capacity at polls in behalf of a partisan political candidate or political party?

A. No. He may not assist such candidate in any way at or near the polls.

Q. May a Federal employee use his auto to take voters to the polls on election day, or lend it, rent it for this use?

A. Generally, no. Of course, the employee’s auto may be used to transport himself and members of his family to the polls. In addition, the employee’s pool may stop at the polling place to cast their votes on the road from their places of employment.

Q. In most States a registrar is appointed by the County Clerk or Clerk of the Court. Can a Federal employee accept such appointment?

A. Yes, if in doing so he gets permission from his agency and the work does not interfere with his agency’s business. It is a matter for each agency to decide.

Q. May a Federal employee be excused for a reasonable time to vote or to register to vote?

A. Yes. As a general rule, employees are not open at least three hours either before or after an employee’s regular hours of work. He may be granted an amount of time off that will permit him to report for work three hours after the polls open or leave three hours before the polls close, whichever requires the lesser amount of time off. If an employee’s voting place is beyond normal commuting distance and vote by absentee ballot is not permitted, the employee may be granted sufficient time off to make the trip to the voting place, not to exceed a full day.

For employees who vote in jurisdictions which require registration in person, time off to register may be granted on substantially the same basis, except that no such time is granted if registration can be accomplished on a workday and the place of voting is within reason- able one-day round-trip travel distance of the employee’s place of residence.

The Roundup is an official publication of the National Aeronautics and Space Administration Manned Spacecraft Center, Houston, Texas, and is published every other Friday by the Public Affairs Office for MSC employees.

Director ........................................... Dr. Robert R. Gilruth
Public Affairs Office ............................ Terry White
Editor ............................................ A. “Pat” Patnemsky
Staff Photographer .............................. A. "Pat" Patnemsky

Your Job in Focus

Gillespie Judge At Science Fair

Warren Gillespie, Jr. of the Engineering and Development Directorate staff will serve as judge in the 19th International Science Fair in Detroit’s Cobo Hall May 15-17. Sponsored by Science Service, Inc., the ISF attracts high school youngsters in the tenth, eleventh and twelfth grades from more than 200 re- gional science fairs.

Student entries are grouped in seven categories for boys and girls. Emphasis is on originality and applied science disciplines.

Gillespie recently was elected director-large in the American Astronautical Society.

Organ Club Meets

The MSC Organ Club will meet May 1 at 5:30 pm in Rm 188, Bdg 1. Bring Notebook.

Credit Union Straight Talk

Get smart: stretch a dollar's buying power.

For example, financing a new auto on time payments from savings on deposit up to $2000. Another free insurance coverage pays off the unpaid portion of a loan automatically that the borrower dies.

The credit union shareholder receives a fair interest rate policy that pays off dollar for dollar upon his death the interest in the form of dividends instead of interest going to someone else’s credit union.

Credit Union Straight talk is spoken — not double talk.
Roundup Swap-Shop

(Demand for classified ads is the Friday preceding Roundup publication date. Ads received after the deadline will be run in the next following issue. Send ads in writing to Roundup Editor, AP. Ads will not be reprinted unless requested. Use name and home telephone number.)

Judokus Host AAU Judo Meet

The NASA Judo Club and the
Clear Lake City Judo Club jointly will host the Gulf Coast AAU Junior Olympics May 11-13 in the Clear Lake City Recreation Center.

Competition starts at 1 P.M.
and no spectator fees will be charged.
More than 15 youngsters 5 to 16 will compete.

Third degree Black Belt holder
Jim Gilmore will be tournament director.
Scorers will be the NASA Judo Club president and assistant Dave Moore, coach of the Clear Lake City Judo Club coach Kit Cantrel, NASA vice president Dale Moore, treasurer Tom Murtagh, and secretary Ray Lundin.

Prospective Black belts will be from the Kemper Judo Club in Bellaire.

Houston-area judo has seen considerable growth since the Club was first formed in 1967. The League hosts monthly matches for adults and children.

The NASA Judo Club recently
ordered $900 in special judo mats, and delivery is expected shortly. Offering a means of staying in shape, the club dues are $6 a month—how to
ward the cost of mat and equipment. If interested in the "gentle art" call Murtagh at Ext. 3151 or Lundin at Ext. 3300 Ext. 3271.

Presen Retires, Plans to Travel Before Settling

Gerard J. Pesen retired today after 24 years service with NASA and its predecessor, NACA. He is manager of the Flight Experiments Control
Center, a division of the Biomedical Research Center.

Pesen joined NASA Lewis Research Center on May 4, 1949 as a flight research engineer investigating engine performance and controls. In 1959, he joined the Space Task Group at NASA's Langley Research Center.

Pesen, who turned 62 Tuesday,
said, "My wife and I plan to travel
for a year or two until we decide
where to put down roots. We will have a travel trailer on order, but we
have to sell our house in Freedonville first.

For the sake of a permanent. home
likely will be in the western part of the country.
Antarctic Soil Probed For Mars-Life Clues

Despite the warming Califor- nia sun, there is a small cor- ner of the NASA Jet Propulsion Laboratory that is Antarctica. In a small walk-in freezer laboratory, simulated antarctic cold keeps antarctic soil acclimated. Here more than a ton of dirt is kept in hibernation by Dr. Roy E. Cameron and his JPL soil sciences group in Pasadena, Calif.

This week Dr. Cameron and his colleagues received another handful of antarctic soil, collected in the 1967-68 summer season. Along with many samples returned the year before, this material will be tested and cultured to see what types of micro-organisms live in extreme cold.

The JPL team is seeking clues to help determine whether life exists on Mars. The studies are sponsored by NASA and the National Science Foundation. Thus far, experiments show that a group of protozoa and algae begin to grow within two weeks when antarctic soil kept laboratory-frozen more than a year is subjected to room temperature 68 degrees or above. They also grow more slowly at temperatures just above freezing.

The JPL soil samples came from high, dry valleys in Victoria Land near the US base at McMurdo. Some were taken from the surface, others six to 12 inches deep.

This year, Dr. Cameron and two assistants used a jackhammer to dig samples from the permafrost as deep as two feet, where they found an abundance of micro-organisms.

"It is permafrost on Mars," the JPL scientist says. "The chances of life will be increased.

In some antarctic soils, micro-organisms occur almost double the usual numbers in the perma- frost. The frozen layer preserves soil bacteria, some quite ancient. If the subsurface soil occasionally thaws, the released water aids their growth.

Cameron and Howard Conrow, a JPL technician, built the walk-in freezer lab addition from a converted refrigeration unit. The super-cooled 12x20-foot box keeps samples at their native temperatures until the scientists are ready to put them to the growing test. Minimum tempera- ture inside varies from minus-15 to -22 degrees F, depending on the Sun's heat on the flat roof. Walls and ceiling are about six inches thick.

The soil scientists wear parkas and full antarctic gear whenever they go into the box to work. Samples are weighed, sifted and cataloged there. Dirt is carefully kept in labeled containers until ready for testing. Hundreds of samples are under culture, thou- sand more will be within months.

The work probably will continue right up to the time the US lands a soil sampler and be- gins digging on supposedly frigid Mars, possibly sometime in the 1970's. Scientists hope to link up with the Surveyor lunar craft.

What results have been obtained from the antarctic soil thus far?

Seven types of micro-orga- nisms live, if not flourish, in the so-called dry valleys. Three are in the bacterial group, four are in the algae family. These are among the smallest microflora (sub plant life) yet discovered on Earth being only one micron (1/25,000th of an inch) in diam- eter.

As many, if not more, micro-organisms were found below the surface, especially at the level of hard, icy permafrost, as at the surface. Subsurface bacteria are generally nonpigmented. Col- ored bacteria usually have been found at the surface. Pigment protects them from adverse radia- tions.

The ice-desert of Antarctica has less life than any other desert soil investigated on Earth.

Cameron and Dr. Norman H. Horowitz, JPL bioscience sec- tion manager who suggested the antarctic studies, believe they will help scientists inside what type of life-detection equipment should be sent to Mars. Dr. Horowitz says the studies also will provide relevant information on spacecraft quarantine and sterilization problems.

On the Mariner 1969 Mars twin spacecraft, only fly-by experiments will be performed. However, NASA and JPL scien- tists hope a Mars landing will be achieved by the US in the next decade.

Yo, Ho, Ho and a Bottle of Marezine

Command Module Takes Its Lumps At MSC's Impact Test Facility

By Doug Ward

The Apollo Spacecraft Com- mand Module has been taking its knocks recently at MSC to as- sure the safety of crewmen when they fly the vehicle for the first time.

The rough treatment is being served out by MSC's full-scale land and water impact test facility, a 100-foot-long, 39-foot-high steel framework resembling a railroad trestle. The device can subject full-scale Apollo test vehicles to impact forces like those of normal water landings or of almost any conceivable emergency landing on water or land. A 33-foot-deep, 160-foot-long pool at one end of the struc- ture is used for water drop tests. At the other end a surface of sand closely matched in grain size and structure to Cape Ken- nedy beach sand is used for land impact testing.

A pneumatic aircraft carrier- type catapult rigged to steel cables and pulleys propels the spacecraft either direction down the 100-foot length of the facility on an overhead monorail. Shortly after release, main jets are fired and the spacecraft is moved 28 feet above the pool by a pyrotechnic charge, allowing it to float at a precisely con- trolled and monitored speed to- ward its planned landing point. At impact, motion picture camera- ers and electronics sensors monitor the effects of the "land- ing" on anthropomorphic dummies strapped into the three crew couches, while other instru- ments record the effects on the spacecraft structure.

A series of land-landing im- pact tests duplicating off-the- pad aborts started last fall, is continuing, while the first of a series of water impact tests began April 6.

The current series of tests at MSC is to prove that the Command Module, with its added weight of fireproofing and other safety modifications, still lands softly enough to prevent injury to crewmen.

In a related program, the Apollo parachute system has been beefed up with larger drogue chutes to slow and stabil- ize the vehicle prior to opening three main chutes. The main chutes have also been modified to open in three stages instead of two, allowing them to handle CM recovery weights of up to 13,000 pounds, 2,000 pounds more than the previous system was designed to handle.

Apollo is the second genera- tion of spacecraft to be tested on this facility. The structure, which was originally located at the McDonnell Aircraft Corporation, was designed to handle 100-pound weights and was used in water impact studies for the Gemini space- craft.