

**We enter
a new year
with confidence
of continuing
achievement**



As we enter the Holiday season, we also complete a year of achievement for the manned flight program. Although many problems were faced earlier this year, we can all be properly proud of our achievements since that time. The successful launch of the Saturn V and the perfect performance of the Apollo spacecraft in flight and during reentry at Lunar return speeds make Apollo 4 a major milestone for the entire program.

As we enter a new year, we do so with confidence that our ground and flight test program will continue in the same fashion. In a program as complex as Apollo, we must expect that new problems will continue to arise. We are confident, however, that we can meet and solve these problems with the help of each of you. Our goal continues to be a lunar landing in this decade. With the continued dedication and personal commitment of our entire staff, this goal can be met.

We would like to wish each of you a very Merry Christmas and a Happy New Year.

George Trimble
Deputy Director

Robert R. Gilruth
Director

Thompson Moves Up To Head AAP Office

Robert F. Thompson has been appointed manager of the Apollo Applications Program Office at MSC. Thompson had been assistant manager since July 1966 when the Program Office was established.

George M. Low was appointed acting manager at that time in addition to his duties as MSC Deputy Director. Low is presently manager of the Apollo Spacecraft Program Office, a position he assumed in April

tical engineering from Virginia Polytechnical Institute in 1944. He received the NASA Medal for Outstanding Leadership in November 1966.

CDC Picked for Crew Trainer Computer Pact

The Control Data Corporation, Minneapolis, Minnesota, has been selected by NASA for negotiation of a contract for an Advanced Computer Complex for the Apollo Procedures Development Simulator at MSC.

Decision to award the procurement, assuming negotiations are successful, will not be made until after fiscal year 1968 appropriation and expenditure levels for NASA have been established. It is contemplated that a fixed price contract will be negotiated.

The computer complex will be installed in Building 35, now under construction at the MSC. The contract would require CDC to provide, install and checkout a Model 6400 computer and associated interface equipment. CDC would also provide spare parts, an executive software system, maintenance service and personnel training.

The advanced computer complex will be a high-speed, multi-hybrid system capable of operating the Lunar Module Procedures Simulator and Command Module Procedures Simulator in a simultaneous, real-time mode.

Completion of negotiation will permit early contract award in the event the project as programmed by NASA is carried forward.

Control Data Corporation was chosen for negotiation of a contract from among three firms submitting proposals.



1967, leaving the Apollo Applications Program Office manager post vacant.

The Apollo Applications Program is aimed toward extended manned space missions in earth orbit and on the lunar surface utilizing spacecraft and launch vehicle hardware developed for the Apollo program. An extensive array of scientific investigations is planned for the Apollo Applications missions.

Thompson was previously chief of the Landing and Recovery Division of the MSC Flight Operations Directorate where he planned and directed recovery operations for the Mercury, Gemini and Apollo programs. He has been with NASA and its predecessor, the National Advisory Committee for Aeronautics (NACA) since 1947.

Thompson received a bachelor of science degree in aeronau-

ROUNDUP

NASA MANNED SPACECRAFT CENTER

HOUSTON, TEXAS

VOL. 7, NO. 5

DECEMBER 22, 1967



Apollo V Vehicle Nears OK, MSC Runs Support Testing

Prelaunch testing and flight readiness review meetings were underway this week at Kennedy Space Center for the Apollo V mission scheduled for the first quarter of 1968. The mission will be an unmanned earth-orbit test of the Lunar Module and its systems.

The LM-1 Flight Readiness Review was completed last Friday and the all-up vehicle Flight Readiness Review was scheduled for today. In Mission Control Center-Houston, flight controllers for the Apollo V mission ran launch and network simulations this week in addition to supporting pad tests at KSC.

Apollo Command and Service Module 020 underwent integrated testing atop Saturn V No. 502 in the KSC Vehicle Assembly Building. The stack will be launched in the Apollo VI mission, the second flight test of the Saturn V.

Apollo Command and Service module 105 was scheduled for delivery this week to MSC from the West Coast aboard the Super Pregnant Guppy aircraft. The spacecraft will be stacked on a Spacecraft Lunar Module Adapter (SLA), a Saturn V instrument unit and an S-IVB upper skirt section for vibro-acoustic testing in Bldg 49 next February.

The test program will include

demonstrating the structural integrity of the spacecraft wiring, plumbing, secondary structure and subsystems under simulated aerodynamic noise and vibration stresses expected during flight. In addition, the C/SM lunar mission vibration criteria will be verified and the redesigned unified hatch mechanism will be qualified in the vibro-acoustic environment.

Also at MSC this week, the first of some 80 flammability tests were begun on an Apollo command module boilerplate in Bldg 353 Thermochemical Test Facility. The tests are aimed at determining if fireproofing modifications are adequate for manned chamber tests and manned flight. The cabin interior

of boilerplate 1224 duplicates the configuration of test and flight spacecraft.

A series of about 40 flammability tests will be run at cabin pressures simulating orbital conditions—6.5 psia. The tests will be repeated at 16.2 psia launch pad cabin pressures.

The command module flammability tests will be similar to a series of tests recently run on Lunar Module Mockup M-6. Ignition points have been selected to occur in the vicinity of at least one sample of combustible materials in the cabin. As in the M-6 test program, fires will be started by intentionally overloading electrical conductors and specially designed electrical igniters.

C/SM Contract Drafted Through Program End

Negotiations have been concluded with North American Rockwell for the continuation of the Apollo Command and Service Module Program from December 4, 1966, through program completion.

The agreement reached includes the engineering, design, manufacture, analysis and testing pertaining to spacecraft of

improved design and associated equipment required for the spacecraft through that identified as S/C 115A. Improved plans for quality, reliability assurance and safety are also incorporated in the agreement. The contract price for this continuation effort has been negotiated at \$812 million.

It is expected that the formal contract documents will be executed within the next 45 days. The contract will be awarded on a cost-plus-fixed-fee basis. In addition to the negotiated contract price, the contract will include provision for an award fee based on the achievement of specified management objectives.

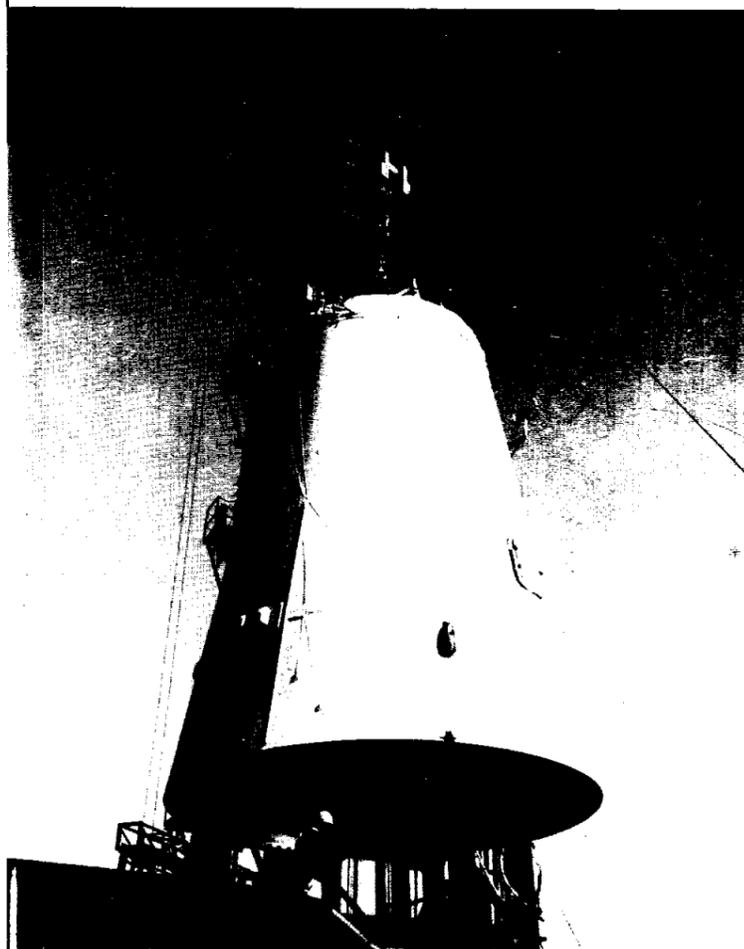
The principal portion of contract work will be performed at the North American Rockwell Space Division in Downey, Calif. Other divisions of the contractor and many subcontractor organizations will participate. In addition, launch support operations will be performed at the Kennedy Space Center, Fla., and related test activities will be carried out at MSC and at the White Sands Test Facility in New Mexico.

Apollo Suit Test Slips 3 Weeks

Manned testing of the new Apollo pressure suit has been delayed for three weeks because of a failure of ground support equipment in the Crew Systems Division eight-foot altitude chamber. The problem has been traced to collection in the suit loop of lithium hydroxide from the Environmental Control System.

It is expected that it will take three weeks to purge the loop and prepare for the tests.

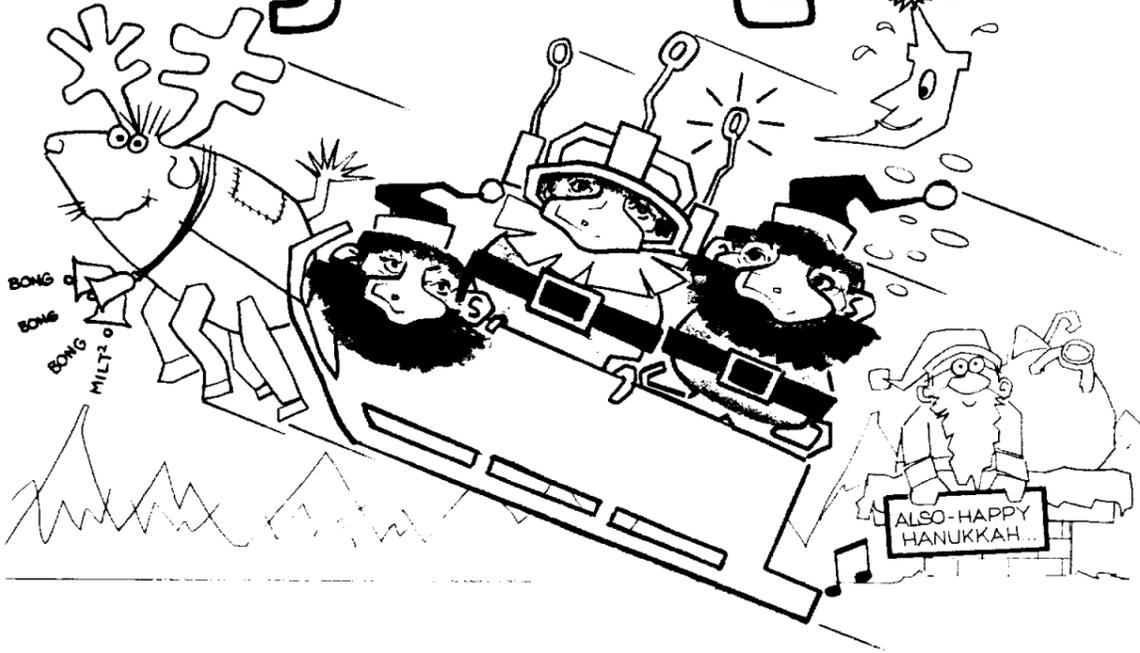
LM-1's Temporary Quarters



HOIST TOWARD ORBIT—Lunar Module-1, scheduled for launch in the first quarter of 1968 atop Uprated Saturn I launch vehicle 204, is hoisted in its Spacecraft LM Adapter (SLA) to the top of the stack at Kennedy Space Center Launch Complex 37. The unmanned LM-1 will be exercised in earth orbit, including a fire-in-the-hole abort staging of the ascent stage from the descent stage.

Long fight with short stick . . .

Merry Christmas!



I AM PERSONALLY CONVINCED THAT EVERYONE HAS A SPARK OF GREATNESS IN HIM. I SEE IT EVERYDAY IN APOLLO. I SEE MEN AND WOMEN IN ALL FIELDS OF WORK SHOWING THIS QUALITY - THE ABILITY TO DO SOME JOB BETTER THAN ANYONE ELSE IN SIGHT. APOLLO REQUIRES EXCELLENCE - AND CHALLENGES

THE BEST IN EACH OF US

TO SERVE THE NATION IN A VERY IMPORTANT WAY.



Reliving the Good Old Days



THIRTY-YEAR MAN — Pictures in an album presented at a retirement party to Kemble Johnson hark back to the days of NACA at Langley Research Center. Johnson, of the Administration Directorate staff office, recently retired after 30 years in federal service. Behind Johnson is Technical Services Division chief Jack Kinzler, Photographic Technology Laboratory chief J. R. Brinkman and Mrs. Johnson and Deputy Director of Administration Philip H. Whitbeck.

Winds Damage WSTF Buildings

Winds of 84 mph December 14 did an estimated \$10,000 to \$20,000 damage to two vehicle preparation buildings at the MSC White Sands Test Facility. The greatest damage was to the upper sections of the side panels. In one building, a 10x30-foot section was blown out; and a 6x30-foot hole blown in the other building.

No roof damage estimates had been made at *Roundup* press time.

The buildings are built of structural steel and corrugated steel sheathing, and are each 50 feet wide, 120 feet long and 50 feet high.

The winds came through the facility at 4:20 in the morning.

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 Officer Paul Haney
Editor Terry White
Staff Photographer A. "Pat" Patnesky

Credit Union Straight Talk

By Paul M. Sturtevant
What are you going to do with your new pay raise? It's going to be easy to spend it! But, as this is money you never have seen before, it will also be ever so much easier to save it! Why don't you consider this aspect and send a regular check to the Credit Union. Use our "round trippers" — they're the easy way. Think about it . . . money you've never seen. Start saving before you spend . . . it works!

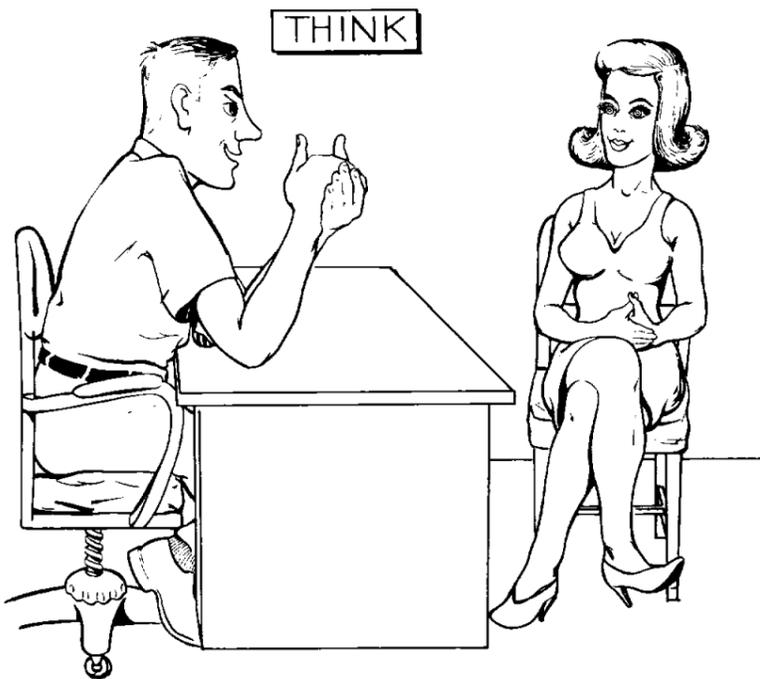
certain contractor employees to become members of the MSC Federal Credit Union has been adopted. The first new member under this plan was really helped by becoming a member.

She had attempted to borrow a total of \$367 from a local finance company. The loan was to be for a period of 24 months. The total charges to borrow this amount were as follows: \$1 fee, \$35.47 insurance, \$124.55 interest! While this may seem unbelievable, these were the items listed and the amounts shown.

The loan obtained from the credit union was for \$350 for two years and the total charge was \$43.75 — and this was interest only.

With this new policy it is expected that your Credit Union will be making many new friends as the word gets around. Check with the Credit Union . . . we can help!

On The Lighter Side



I've been watching you closely, Miss Finch, and I'm putting you in for a Sustained Observance, er . . . Performance Award.

Pay Rates for Federal Employees

Grade	Annual rates and steps									
	1	2	3	4	5	6	7	8	9	10
GS-1	\$ 3,776	\$ 3,902	\$ 4,028	\$ 4,154	\$ 4,280	\$ 4,406	\$ 4,532	\$ 4,658	\$ 4,784	\$ 4,910
GS-2	4,108	4,245	4,382	4,519	4,656	4,793	4,930	5,067	5,203	5,341
GS-3	4,466	4,615	4,764	4,913	5,062	5,211	5,360	5,509	5,658	5,807
GS-4	4,995	5,161	5,327	5,493	5,659	5,825	5,991	6,157	6,323	6,489
GS-5	5,565	5,751	5,937	6,123	6,309	6,495	6,681	6,867	7,053	7,239
GS-6	6,137	6,342	6,547	6,752	6,957	7,162	7,367	7,572	7,777	7,982
GS-7	6,734	6,959	7,184	7,409	7,634	7,859	8,084	8,309	8,534	8,759
GS-8	7,384	7,630	7,876	8,122	8,368	8,614	8,860	9,106	9,352	9,598
GS-9	8,054	8,323	8,592	8,861	9,130	9,399	9,668	9,937	10,206	10,475
GS-10	8,821	9,115	9,409	9,703	9,997	10,291	10,585	10,879	11,173	11,467
GS-11	9,657	9,979	10,301	10,623	10,945	11,267	11,589	11,911	12,233	12,555
GS-12	11,461	11,843	12,225	12,607	12,989	13,371	13,753	14,135	14,517	14,899
GS-13	13,507	13,957	14,407	14,857	15,307	15,757	16,207	16,657	17,107	17,557
GS-14	15,841	16,369	16,897	17,425	17,953	18,481	19,009	19,537	20,065	20,593
GS-15	18,404	19,017	19,630	20,243	20,856	21,469	22,082	22,695	23,308	23,921
GS-16	20,982	21,681	22,380	23,079	23,778	24,477	25,176	25,875	26,574	
GS-17	23,788	24,581	25,374	26,167	26,960					
GS-18	27,055									

—Retroactive to October 1, 1967

Roundup Swap-Shop

(Deadline 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, AP3. Ads will not be repeated unless requested. Use name and home telephone number.)

FOR SALE/RENT—REAL ESTATE

4-bedroom house in Pasadena-Huntington, very clean, 3 yrs. old, may assume GI loan if qualified. Otto Weiler, HU 7-1546.
Clear Lake City, For sale or lease: 4 bedroom, corner lot, large walk-in closets, central air and heat, less than 3 miles from MSC. By owner, Col. Harold S. Croys, 488-3784.

Contemporary Brick, 3-2-2, fenced yard, heated pool, all new built-ins, 2000 sq. ft. living area, south Glenbrook Valley, 20 mins. from MSC. \$30,000. Harold Smith, MI 3-2182.

4-2-2 contemporary, excellent condition, 3 years old. Walnut paneled family room with fireplace. Fenced backyard. Available for immediate occupancy. For sale by owner, \$23,000. Al Watkins, Dickinson 534-5427.

FOR SALE—AUTOS

63 T-Bird, Landau, Caspian blue, excellent condition, air, power, new tires, 50,000 mi. Best offer. Duane Mosel, 644-7210.

66 Oldsmobile 4-4-2, scarlet red inside and outside, top condition, 23,000 miles, loaded with extras, new red and white lined extra wide oval tires, radio with reverb, and 8 track stereo 6 speakers, air conditioned, heater, tach, vacuum gauge, both lights and gauges for amps, oil pressure, and temperature. Reclining right seat, tilt-away steering wheel, Hurst 4-in-the-floor, full console, bucket seats, 3.9:1 differential, automatic trunk release. Selling to buy a new 4-4-2. Best offer gets this beauty. Stan Spaeth, 944-3170.

Corvette 1967, air, pwr. steering, positraction, very clean. Charles Briden, Dickinson 534-4279.

67 Mustang-2 plus 2 fastback, yellow with black interior, 200 horsepower, V-8, automatic, factory air, power steering, tinted glass, radio, white walls. Jim Howell, MI 9-0905.

66 VW sq. back wagon, white, 31,000 mi., ex. clean, good tires, \$1950, Billy G. Smith, 591-3069.

67 Tempest Sprint, loaded, low mileage. \$100 and \$72.50 payments. Jim Cooper, 591-2723.

59 Triumph TR3. New tires & black paint, telescoping steering wheel, radio, heater, tonneau cover, boot, and convertible top. Runs very good. Extra Clean. \$550. Clayton Pollard, HU 7-0024.

53 Jaguar MK 7 Salon. Body and running gear perfect; new tires. Needs paint and upholstery. Perfect hobby car. \$250 or offer. William C. Douglas, HU 7-0446.

65 Mustang, 2 plus 2 fastback, 289 hp, auto trans, air cond. GTO package, pwr brakes and steering, rally pack, low mileage, one owner. \$1495. Don Heywood, Dickinson, 534-3979.

63 Dodge 440 wagon, needs body work air cond., auto trans., 383 V8 with automatic, low mileage, good condition, complete \$185. Don Heywood, Dickinson 534-3979.

64 VW fastback, sunroof, AM radio, etc, excellent condition. \$1000 full price. B. Stanton, 944-8279 after 5.

64 Galaxie 500 2-door hardtop, radio, heater, V-8. Jim Allen, ID 3-3115.

65 Mustang with red upholstery. Excellent condition. 25 mpg. R and H. Good tires, \$1,495. Hooper, ext. 5126 (no home phone).

59 Jaguar X-K-150 steeltop roadster, new silver metallic paint, remanufactured engine, new mufflers, \$950. Will consider trade and cash for other sports car in good condition. Dave Peterson, GR 4-3681 after 5.

64 Pontiac Catalina 2-door hardtop, 2 plus 2, \$1150. Elbert Prine, 946-8735.

60 Chevrolet Impala, 2-dr. HT, 283 cu. in. V-8, automatic transmission, pwr steering, radio and heater, good tires, clean, excellent work car. Must sell-sacrifice. J. S. Gorman 944-6440.

62 Studebaker GT Hawk. V-8, 4 speed, air, radio, excellent tires. Bob Schwartz, MI 3-1986 after 6.

1965 Austin-Healey 3000, 16,800 miles, xclnt condition. \$2195. Scott Millican, HU 8-2384.

FOR SALE—MISCELLANEOUS

Baby bed with mattress, baby stroller, baby walker, junior bed rails, and misc. baby clothing. In very good shape. Sell everything for \$30 or sell separately. Faye Abston, GR 1-0718.

Year old Dressmaker electric sewing machine. \$100. Hazel Shepherd, 477-2978.

Dining room table and chairs, Broyhill, Walnut, 1 yr. old, 1/2 price, \$180. Twin bed, 1 yr. old, 1/2 price, \$60. Colt 45 commander, holster, 200 rounds ammo, like new. Jim Cooper, 591-2723.

Early American Furniture. Orange and brown tweed chair/one half with matching ottoman, \$135; Sprague and Carlton hard-rock maple coffee and two end tables, \$90; Maple dinette set, round table with formica top and four captains chairs, \$60. James W. McBarron, 591-3778.

Set of three Wilson (X-31) staff golf woods, used less than one year, perfect shape, \$50. Bob Regelbrugge, 944-4982.

Girl's or lady's barrel racing saddle, 23 lbs. Very good condition; 4 yrs. old. \$75. D. Shank, OR 4-0407.

12-inch Atlas Lathe, floor-model cabinet, quick-change gears, 36 inch centers. J. D. Bradley, 944-4349.

Coppertone Lady Kenmore Sears best washing machine, 1 1/2 years old, excellent condition, moving, \$190, Bill D. Sturm, GR 2-6787.

New Firestone 6.70-15 4-ply nylon white-wall tire. J. Whiteley, 946-3804 after 6.

Nice dresser, night stand and lamp, good condition. J. Whiteley, 946-3804 after 6.

Portable gasoline powered engine/generator. 3000 watts, 230/115 volts—less than one hour running time. Industrial unit. L. P. Spencer, 534-5313, Dickinson.

Girl's bicycle, 26 in., 3-speed, hand brakes, saddle-bag baskets, \$25. Room air conditioner, 3/4 ton, Westinghouse, good condition, \$40. Room air conditioner, 1 ton, not working but repairable, Frigidaire, \$30. Dishwasher, 15 yr. old, not working, Kitchenmaid, make offer. Set of dishes, like new, 51 pieces, \$15. J. Williamson, MI 3-2729.

Roller skates, Chicago, boys, size 6. Very good condition. \$15. R. Hill, 471-4305.

Fender Mustang Electric Guitar, red, excellent condition, with case, \$100. Surfboard, "Surfboards Hawaii Noserider," 9'8", 8 months old, excellent condition, \$100. Alfred Martin, HU 8-2776 or 591-3951.

Interested in Viviane Woodward cosmetics? Flossie D. Leggett, 591-4591 after hours.

Seven-piece ranch oak den furniture ensemble made by A. Brandt Co. Rod Bass, 534-3663, Dickinson.

Stereo, Zenith, 3 yrs. old, w/AM-FM radio, \$100. Mickie Grier, 946-5542.

Sparkling silver evening slippers (high heel pump) size 7 1/2 AA, worn only twice, cost \$15, sell \$6; 3 tents or maternity dresses, size 10, royal blue voile lined in taffeta, hot pink silk, yellow silk brocade, all 3 sleeveless, 3 for \$12; Manchester's Death of a President, cost \$10, sell \$7.50 (like new, nice gift); Misc. boy's clothing fits 2-4 years, 2 pair black western boots size 7 1/2 D and 10 1/2 D worn very little; platform rocker (needs recovering) \$5. David Bell, 591-2340.

English Pointers, AKC reg. Top show and field stock, liver and white pups. \$75 and up. Rita Heywood, Dickinson 534-3979.

G. E. refrigerator and freezer, 18.2 cu. ft., turquoise, just like new, runs perfectly. Orig. cost \$500. Sacrifice for \$195. Hooper, Ext. 5126 (no home phone).

Bar-bell set, 170 pounds, \$18. Ray Johnson, 944-7020.

Tape recorder Webcor 3 speed with about 130 rolls tape \$100; Wetsuits and dry suits, \$10 each, Polaroid print copier for series 30 film, \$10; Garrard Model A with base, cartridge and diamond needle, \$50; Stereo, Sears, needs external speaker, \$100; Dishwasher, \$40; Gas dryer, needs work, \$20. D. R. Osgood, 946-3404.

Brittany Spaniel puppies, national champion sire, four generation pedigrees furnished. Good pointers, retrievers, and family

dogs. David O'Brien, 946-3570.

Pair of 40-in. brass candlestick holders made in Thailand, including candles. \$35. One brass Korean barbecue pot. \$15. Joseph Vilgos, 643,2062.

Southcoast 21 ft. keel sloop. Cost \$3200, 9 months old. Will sell for \$2500. Will accept centerboard and trailer in trade. R. Hymer, MI 9-0416.

New Winchester 30.30 Model 94, \$80. Winchester Model 101, 20 ga. magnum over/under, \$250. 20 ga. shotgun shells Super-X, #6 shot. Gary Wilgus, 474-3918.

Shetland pony, saddle, bridle, blanket. Price negotiable. Joe Pirtle, GR 4-2138.

67 Honda 65, like new, recent valve job and complete tuneup. #170. C. Forrest Malone, 877-2339.

Two Electro-Voice 3-way speakers in Jensen enclosures. Jim Martin, 946-5404.

61 Chevrolet Engine disassembled and ready for rebuilding, power pack heads and four-barrel, intake and exhaust manifolds. \$65. N. Corbett, Ext. 5961 (no home phone).

1960 Glaspar Citation, 6 individual seats, 75 hp Evinrude, tilt trailer, top and stern cover, extras, excellent condition, \$1250. N. Corbett, Ext. 5961 (no home phone).

18 ft. Lone Star El Dorado alum cabin cruiser, new trailer, Mark 75 Mercury, 18 hp Johnson for offshore backup, head, builtin ice chest, 2 bunks, lots of storage, \$1250 or trade for car. R. L. Carlton, GR 1-4539.

3-cushion walnut Danish couch, new avocado covering, impeccable condition, \$50. Kenmore washing machine, good mechanical shape, \$25. Tom Grubbs, HU 8-3872.

Eight-drawer metal desk and chair, \$60. Good condition. Hatpoint portable TV, still works but needs working on, \$15. G. B. Foster, HU 7-0155.

18 ft. wooden canoe hull. Requires wood work and recovering. Best offer. Frank Boyle 534-5695.

Winter spinet piano. Very good condition. \$400. Jean Hess. 944-0966 after 5 and weekends.

Miniature Schnauzer dog. Female, sprayed, 5 years old. Jean Hess. 944-0966 after 5 and weekends.

WANTED

Roommate to share 2-bedroom apt. at the Balboa apts. Phil Maceli, HU 8-0850 ext. 3616.

Old car for a few weeks for local transport in December. Hooper, Ext. 5126 (no home phone).

Need ride daily from 1500 block of 18th Street, Galveston, to Bldg. 8. Camille D. Lackey, Galveston, SO 2-5406.

Want to lease house with the following: 3-2-2, built-ins, carpeting, dishwasher and disposal, central air conditioning and heat. Prefer location in MSC area. A. Sanchez, HU 3-3995.

PERSONAL

Anyone having knowledge of a witness or actually witnessed an accident on the south end of Red Bluff Road about 5:30 to 5:40 pm November 20, 1967, (Monday) or who may have traveled the south end of Red Bluff going north after 5 pm and can describe the appearance of a barrier across Red Bluff Road about 1/4 mile south of Bayport Boulevard are asked to contact Don Haulbrook, ext. 2841.

Season's Greetings to all from Pi Mathews, ITT/FEC, Building 13, High Bay Area.

Lighting Ceremony



LIGHTING UP—Mrs. Martha Chaffee speaks at the December 10 rainy lighting ceremony of the Roger B. Chaffee memorial tree in the parkway of Nassau Bay office building complex. Caroling was provided by girl scout troops as a backdrop to plugging in the lights and decorations draped on the tree the day before.

New Report Covers Fuel Cell Research

Nearly 800 technical reports on fuel cell research by Government agencies and their contractors are reviewed in a new NASA publication.

The reports cover work by 44 industrial firms, 31 universities and research institutes, and 11 Government laboratories during

1950 through 1964. They were assembled and summarized by L. G. Austin, professor of chemical engineering at North Carolina State University, under a NASA contract with John I. Thompson & Co.

Government-sponsored research on fuel cells, which convert chemical energy directly into electrical energy, was started by the Navy in the early 1950s to save weight in submarines. Later work was done for the Army, Air Force, the Advanced Research Projects Agency of the Department of Defense, the Atomic Energy Commission, and NASA. More recently NASA has used fuel cells as a source of onboard power in spacecraft. Industry is working to improve their efficiency for possible use to drive golf carts, tractors, forklift trucks, and smog-free automobiles.

Many of the early reports covered by the NASA review are now difficult to obtain, and the information was in danger of being lost. Reports on later work are more readily available in technical journals and document collections.

BOWLING

MSC Men's League

Standings as of December 4

Team	Won	Lost
Rompers	30	18
Jokers	27	21
Humbugs	26	22
Croakers	24	24
High Hopes	20	28
Wheels	17	31

High Series: J.W. McWhorter 610, H.F. Erickson 587, S.S. Esparza 584.

High Games: R.F. Fletcher 246, J.W. McWhorter 235, H.F. Erickson, H.L. Bell and A.K. Spivey—all 232.

The MSC Men's League meets at 5:30 pm Mondays at Ellington AFB Bowling Alley, and is a handicap league open to MSC and contractor employees when vacancies exist. For membership call Roy White at Ext 7741.

Ideas Pay Off at RASPO-Downey



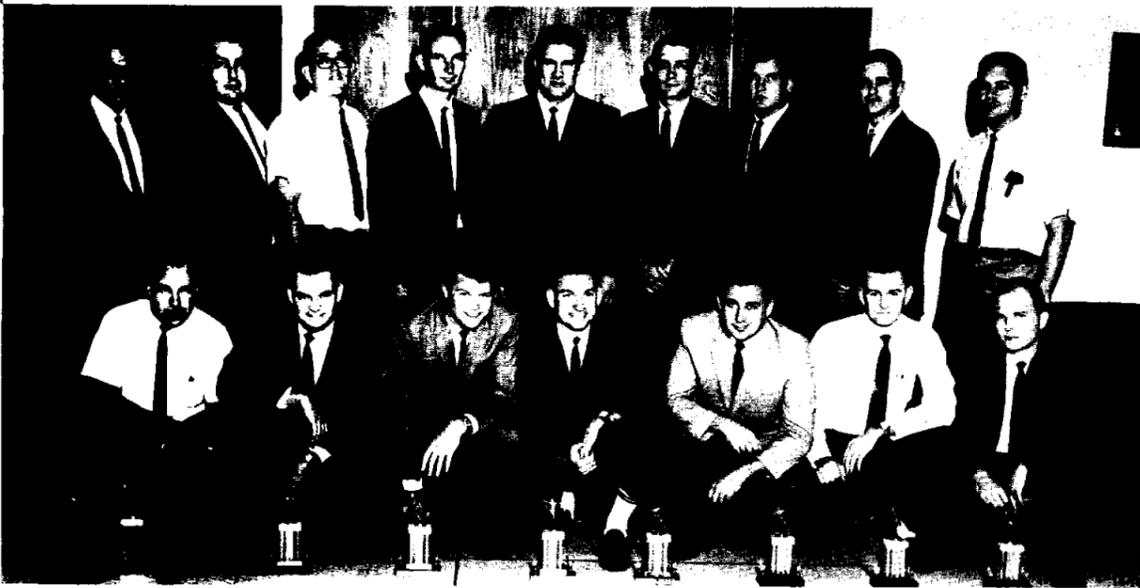
EXTRA CASH—Five employees at RASPO-Downey recently received cash awards for suggestions. Left to right, they are: Richard E. McGrath, \$100, "modification of Command Module work floor;" Larry L. Brumley, \$35, "eliminate duplication of NASA-O inspection requirement;" William J. Fitzgerald, \$35, "electrical assembly wire bend radius gauge;" and Raymond C. Heiskala and Anthony J. Retrosi split \$35, "improved failure reporting system."

JIM THRIFT SAYS...



Merry Christmas
and a
Happy New Year

Gridiron Champs



HABITUAL WINNERS—For the second year in a row the Computation and Analysis Division team has nailed down first place in the MSC Flag Football League by winning 11 games and losing none. Gloating over their trophies are, kneeling, left to right: Manager Bill Whatley, Ray Southers, L. Norbratten, O. McCafferty, D. Scheffman, R. Kruse and K. Westerfeld. Standing: W. Blackmon, J. Long, Don Holkan, G. Weber, Larry Armstrong, L. Ratcliff, G. Ricks, E. Svrcek and J. Vyner. Not in photo: R. Becker, R. Parten, D. Beck and J. Stanley.



RUNNERS-UP—The Mission Planning and Analysis Division team took second place in the football league. Kneeling, left to right, are: John Vogel, Jason Kostelic, Johnny Cools, Al Jackson, Cliff Bean and Mason Lancaster. Standing: Martin Alexander, Harry Kolkhorst, Richard Swalin, Melvin Rother (coach), Mike Conway, Ivan Johnson, Scott McKay, Frank Boyle, Harold Kingsbury, John Parker, Leroy McHenry and Bob Arndt.

Closed-System Cabin To Get 60-Day Test

Four California college students will spend 60 days in a simulated space cabin early next year, living in a closed system using re-circulated water and oxygen.

The test, longest attempted with a crew subsisting in conditions like those of a space flight lasting a year or more, is part of an extensive NASA life support research program.

The test is part of a project under a NASA \$200,000 contract with the McDonnell Douglas Corp., Santa Monica, Calif. The company has been performing research for several years in biotechnology and human factors. The test will be made at the Douglas plant for NASA's Office of Advanced Research and Technology.

The crew members chosen, all students at the University of the City of Los Angeles, are majoring in varied fields including pre-medicine and philosophy.

Throughout the two-month period the four men will use re-

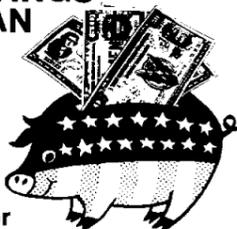
claimed water and oxygen from their own metabolic wastes. The test is believed the longest attempted in flight conditions using a closed water-oxygen loop.

The crew members are now in training to operate and maintain the oxygen and water reclamation systems, and to understand other technical and mechanical factors.

The closed loop water purification system consists of an evaporation unit, a charcoal filter and a condenser which reclaims moisture directly from the crewmen and from air in the cabin.

Oxygen will be reclaimed through a process of mixing hydrogen and carbon dioxide, converting them to water and methane gas. Oxygen is recovered from the water by electrolysis and the methane gas is expelled from the cabin. The atmosphere for the crew will be at seven pounds per square inch (or half the sea level pressure), consisting of 3.1 psi oxygen and 3.9 psi nitrogen.

STAR-SPANGLED SAVINGS PLAN



Sign up for U. S. Savings Bonds, New Freedom Shares

On-Board Deer Strength Stays at Present Ceiling

It all started with a photo on page one of the November 10 *Roundup* of a herd of whitetail deer wandering about the area between Bldg 5 and the HL&P cooling canal. Alan D. Johnson, director of the NASA Lewis Research Center Plum Brook Station, having a surplus of deer at Plum Brook, offered to replenish MSC's herd—no Form 52s required. (See November 24 *Roundup*)

In the latest development, MSC Director Dr. Robert R. Gilruth memored Johnson declining the offer, to wit:

Thank you for your offer to augment the Manned Spacecraft Center herd of white-tailed deer. We are unable to take advantage of the offer, however. We have had our doe allocation established already for FY 68, and a few bucks more or less would be of little use to us, unless, of course, you can spare bucks that are applicable to the AO budget.

Incidentally, how are you fixed for ducks?

Cordially,
Robert R. Gilruth

Last Lunar Trainers Delivered to Center

Delivery of the second and third of three Lunar Landing Training Vehicles to the NASA Manned Spacecraft Center for space pilot training was made last week by Bell Aerosystems Co. of Buffalo, New York.

The two vehicles were accepted by an MSC LLTV Customer Acceptance Readiness Review Board at the Buffalo plant on December 1.

The first LLTV was delivered to MSC on October 9, 1967, and is now in a ground and flight test program. The two newest LLTV's will be put through a similar test program of about 30 weeks duration. Bell Aerosystems will support the ground and flight test program before pilots begin using the vehicles for training.

Construction and delivery of the three LLTV's and associated test hardware is under a \$5,653,063 fixed price contract with the New York firm.

The vehicles were transported by truck from Buffalo to the MSC flight training facility at Ellington AFB.

The LLTV will provide space pilots with an earth-based vehicle capable of simulating a landing on the surface of the moon where gravity is only one-sixth that of earth. During training flights, the single-seat vehicle

will reach altitudes of up to about 800 feet and then in a mode that simulates the pilot handling characteristics of the Lunar Module, it can be maneuvered to a gentle touchdown.

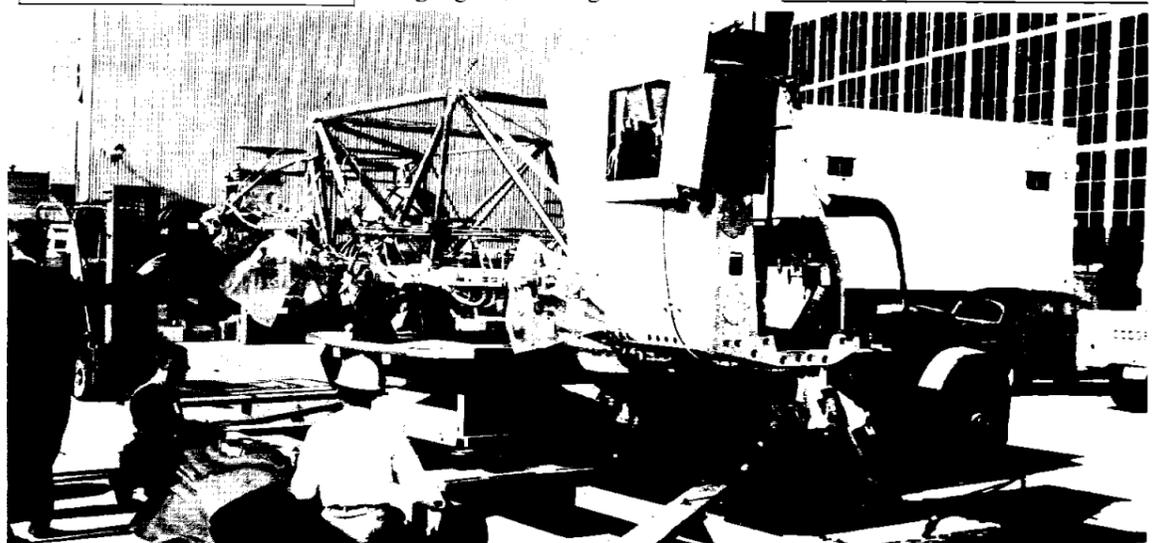
Two earlier research models of the lunar training vehicle are also at the MSC flight training facility and one of these vehicles is currently being readied for pilot training which should begin early in 1968.

New Drogue Fails In El Centro Drop

A new enlarged Apollo drogue parachute failed to open December 8 in a test at the Naval Air Facility, El Centro, Calif. The two drogue chutes were dropped from 37,000 feet with a test weight of 13,000 pounds. At 24,000 feet the drogues deployed and inflated, but a failure of one of the chutes caused the two chutes to become entangled.

The test weight was recovered by a backup parachute system.

The 16.5-foot diameter drogue chute is being tested as a replacement for the 13.7-foot chute—a change brought on by command module weight gain from fireproofing modifications.



LIGHTWEIGHT LUNAR MODULE—One of two final Lunar Landing Training Vehicles is offloaded near Hangar 135 at Ellington AFB after being trucked from Buffalo, N.Y. The LLTVs will be used for training Apollo LM pilots in lunar landing techniques. A turbojet engine subtracts five-sixths of the vehicle's weight to allow realistic simulation of lunar gravity conditions.