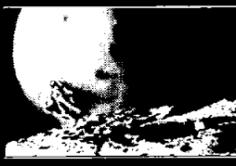


You may be taking time off for the holidays, but some JSC workers will be working Christmas day to keep the center running. Story on Page 3.



NASA's Office of Exploration says modest technology investments today can prepare us for exciting turn-of-the-century missions. Story on Page 4.

Space News Roundup

Vol. 27

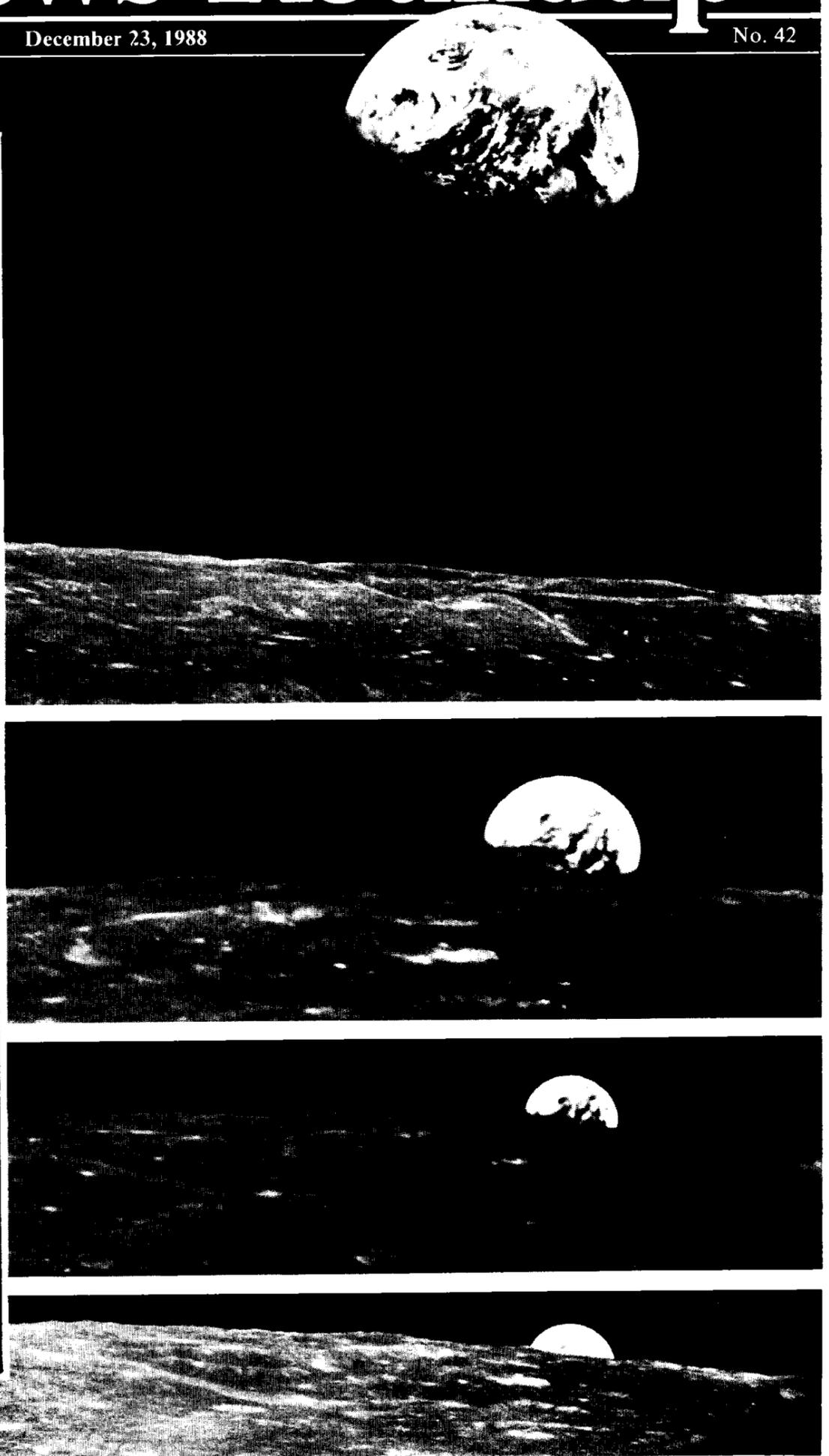
December 23, 1988

No. 42

Season's Greetings

Two decades ago today, three men left the gravitational pull of our planet — the first time humans had ever done so. Twenty years ago tomorrow, they became the first people to witness an Earthrise. These were momentous accomplishments for the crew, for NASA and for this center. But we did not stop to rest on our laurels, we forged ahead and landed men on the Moon, built the space station Skylab from spare parts and began the Shuttle era. This past year, we've made some exciting accomplishments — sending 10 men into orbit aboard Discovery and Atlantis, and returning them safely home to us in Houston. But again, there is no time to rest. We must build on our new beginning and keep our Shuttle flying. We must strengthen our bridge to low-Earth orbit and use it to build a permanent space station. From there we can choose where to go next. This holiday season, we can both rejoice at our successes of the past year, and look forward to the challenges of the next. To all of you and your families from me and mine, have a wonderful holiday and a prosperous new year.

Aaron Cohen
Aaron Cohen



APOLLO 8: Elegantly simple solution reenergizes Apollo program

[Editor's note: This is the conclusion of a two-part article on the events and decisions leading up to the Christmas 1968 flight of Apollo 8.]

By Brian Welch

By July 1968, NASA was facing an ever tighter deadline for reaching the Moon. Fewer than 18 months remained before the end of the decade, and problems with the Lunar Module (LM) program threatened to throw the schedule off track. It began to look as if a lunar landing before 1970 would not be possible.

Despite problems with the LM, however, the Command and Service Modules (CSM) program was going well. It was at this point that George M. Low, the Apollo Spacecraft Program Manager, proposed the Apollo 8

mission, originally intended as an Earth-orbit test of both spacecraft, be altered. Under the plan proposed by Low, NASA could save time and turn adversity to advantage by sending the CSM to the Moon.

In early July, Low and Center Director Robert Gilruth presented the idea to the men responsible for flight operations and flight crews: Chris Kraft and Deke Slayton.

"We were taken aback," Kraft remembers. Kraft and Slayton consulted their experts, Low consulted his. Kraft met with a small cadre of his operational troops—Arnold Aldrich, now director of the Space Shuttle program, Eugene

F. Kranz, now Director of Mission Operations at JSC, Clifford Charlesworth, recently retired from JSC after serving as the director of Space Operations, and Jerry Bostick, now an executive with the Grumman Corp. Kraft gave his team two days to respond to the idea.

The plan was surprising, but not shocking for Kranz and JSC Director Aaron Cohen, then working on CSM development.

"I got a call from Kenny Kleinknecht, who was the Apollo Command and Service Modules project manager, saying I needed to meet with George Low," Cohen remembered.

"George Low explained the mission to me and asked me to verify that the Command and Service Modules could do that mission. My role at the time was to validate the hardware. Was it certified? Was it of the integrity that would allow us to do that part of the lunar mission?"

Cohen ended up writing the memo for Low's signature that stated the vehicle was indeed ready to make the voyage.

"It wasn't a tremendous shock, but it was a very bold maneuver, a bold step from where we were. I don't think I was really shocked—more enthusiastic and excited. That was the mood of the center. Everyone thought it was great; they thought it was exciting, they took on the challenge."

Please see LUNAR, Page 4





MFA HONORS—Twelve civil service and 16 contractor employees from JSC received an all-expenses paid trip to Kennedy Space Center in November, compliments of the Manned Flight Awareness Program. Back row, from left, Bob Farney, Lockheed; Jack Holcomb, Lockheed; Ron Bartosh, SR&QA Business Management Office; Leo Waltz, Systems Development Division; Glen Iwai, NSTS Program Assessment Office; John Henderson, Propulsion and Power Division; Jack Thrift, Link Flight Simulation Corp.; Ed Lawson, Ford Aerospace; David Pitts, Solar System Exploration Division; Bill Peters, Calspan Inc.; and Bill Lilly, Boeing. Front row, from left: Richard Lopez, White Sands Test Facility; Paul Svejkovsky, Lockheed; Kevin Hart, Boeing; Luis Vega, Anchor Inc.; Jackie Henry, Mason & Hanger; Sherri Garner, IBM; Janie Olivas, DMS; Mavis Lancen, Aircraft Operations Division; Susan Bonner, Systems Engineering Office; Kit Michels, NSTS Administrative Office; Judy Parnell, Orbiter Avionics Systems Office; Yolanda Guillen-Burris, Reconfiguration Management Office; Mike McCulloch, McDonnell Douglas; Don Morris, Quality Assurance; Ken Bleam, Ford Aerospace; and Harold Reimers, Lockheed.

JSC

People

Lewis is AIAA woman of month

Dr. Marian L. Lewis has been named the December recipient of the AIAA Houston Section's Professional Woman of the Month award. Lewis, an AIAA associate fellow, is former chairman of the Houston Section's Life Sciences committee.

Lewis is senior research scientist and supervisor of the Cell Science Research Laboratory operated by

Krug International in support of JSC's Medical Science Division. She performed investigations during the Apollo, Apollo-Soyuz, and STS-3 missions, and was one of the principal investigators for cell attachment studies on STS-7 and STS-8, and cell separation experiments on STS-8.



Lewis

JSC

Swap Shop

Swap Shop ads are accepted from current and retired NASA civil service employees and on-site contractor employees. Each ad must be submitted on a separate full-sized, revised JSC Form 1452. Deadline is 5 p.m. every Friday, two weeks before the desired date of publication. Send ads to Roundup Swap Shop, Code AP3, or deliver them to the deposit box outside RM. 147 in Bldg. 2.

Property

Sale/Lease: Unique home in Seabrook w/ view of Taylor Lake, separate apartment can be sub-leased. 333-5821.

Rent: Lake Livingston waterfront, 3-2, fully furnished, covered decks, pier, new cond., FPL, ex. fishing, week or weekend. 482-1582.

Sale: Alvin, brick, 3-2-2-2D, FPL, 2/3 acre, oversize detached garage, large closets, new loan or assum., no city taxes, \$59,900. x38456 or 388-1090.

Sale: Middlebrook, 3-2-2, study, FPL, wet bar, covered patio, large lot, ex. cond., FHA assumable 10%. 480-9363.

Sale: Friendswood, 3-2-1, near Westwood Elem., lots of trees, covered deck, assumable at 10%, \$56,900. Sam, x35602 or 482-9601.

Sale: Friendswood retiree's well-kept home, 3-2-2, large LR w/cathedral ceiling, covered patio, good neighborhood. 482-3697.

Rent: University Trace condo, 2-2-2PS-1 carport, W/D, dishwasher, icemaker, FPL, wet bar, sec. sys., \$450/mo. plus dep. Jerry, x38173 or 480-8220.

Sale: University Green executive bachelor residence, 2-2-2D, study, all of the most desirable amenities, \$98,700. 488-0397.

Sale: Friendswood/Sun Meadow Estates, wooded lot in established neighborhood, cul-de-sac, bordered by stream & golf course on 2 sides, approx. 245' deep & up to 86' wide, approx. 1.3 acre, util. on site, \$31,500. Doug, x32860 or 486-7412.

Sale: Alvin area, 3-1-1 brown brick house, 25 min. from NASA, well estab. neighborhood, 2 bks. from high school, \$45,000. Kay, x32251 or 331-3379.

Lease: La Porte, 3-2-2, ex. schools, near NASA, \$600/mo., OBO, x39676 or 471-8742.

Sale: Pasadena/Deer Park, 1980 14' x 60' Redman mobile home, 2-1, covered patio deck, shed, skirting, \$14,000 principle or VA, OBO, Jim, 280-2226 or Faye, 998-0719.

Sale: League City waterfront lot, size 134' on private canal and 125' on W. NASA Rd. 1, \$23,000. 332-4644 or 338-2733.

Sale/Lease: Brookforest, CLC, 4-2-5-2, 2,500 sq. ft., lovely contemporary, all formals, beautifully landscaped, near schools, \$1,100/mo. or \$129,900. x37016 or 488-7224.

Rent: League City, Glen Cove, 4-2-2A trilevel, family room/FPL, fans, Jen Aire, W/D, ref., fenced, sec. lights, CA/H, comm. park and boat ramp, \$650/mo., \$600 dep., no pets. 337-4051.

Rent: Lake Travis cabin, private boat dock, central A/C and heat, fully equipped, fall and winter rentals, weekly/weekends. 326-5652.

Cars & Trucks

'83 Olds Cutlass Supreme, 6-cyl., auto, A/C, AM/FM/cass., factory mags w/new 225 GT

tires, 78K mi., \$2,900. 532-1793.
'80 Plymouth Champ, 4 spd., 87K mi., no frills, \$500. 282-3233.

'81 Pontiac T1000, 4 cyl., new tires and starter, A/C, AM/FM/cass., orig. owner, \$800, OBO. Kim, x30223 or 481-6792.

'81 Citation, white, 4 cyl., 4 spd. manual, 2-dr. hatchback w/luggage rack, A/C, AM/FM, new stl. belted radials, 73K mi., \$1,500. 486-7831.

'87 Mustang, 289 V-8, 3 spd., new paint, AM/FM stereo, A/C, lots of new parts, runs and looks great, \$2,995, OBO, x38169 or 482-8496.

'79 Dodge 3/4 ton van, customized, captains chairs, bed, table, storage, ex. mech. cond., tires, low mi., \$3,000, OBO. Dean Thompson, 332-2229.

'87 Jaguar XJS V-12, 2-dr. coupe, red with biscuit int., w/side molding and hood ornament, 19K mi., \$32,000. x34194 or 280-0993.

'74 MGB-GT, A/C, AM/FM/cass., wire wheels, 94K mi., dove grey, \$3,100. 488-0549.

'87 BMW convt., red, beige leather int., 19K mi., \$24,500; '83 Camaro, 6 cyl., auto., clean, sound, 61K mi., \$3,600; '82 Pontiac Bonneville sta. wgn., 6 cyl., \$2,850; '63 Corvette classic, spit window, coupe, A/C, red, frame VP restoration, \$25,000. x36315 or 482-8660.

'85 35' Mallard motor home, loaded, low mi., \$34,000, OBO. 337-4051.

Cycles

'85 Honda "Spree" scooter, very good cond., \$350. 333-7472 or 337-3032.

'80 Honda CB 750F, good Dunlops, S.S. Super trapp, K&N air filter, ultrareliable, \$1,000. Bruce, x34925 or 923-4571.

'79 Yamaha XS 750 Special, 1 owner, windjammer, AM/FM/cass., new tires, lots of extras, \$1,250, OBO. Rich, x34818 or 480-8335.

'86 Honda ATC 250R 3-wheeler, ex. cond., many extras, \$1,000; '85 Honda 200X ATC, ex. cond., some extras, \$800. 280-8855.

'79 Yamaha Enduro 500, good cond., new brakes, battery, \$600. Wayne, 488-9005, x272 or 538-1221.

'82 Honda Nighthawk, runs great, looks good, new rubber, chain and sprockets, \$800, OBO. Randy, 282-4857.

'83 Honda XL600R Enduro, \$300. Reid, x31699 or 488-8500.

Boats & Planes

'76 27' Catalina, VHF, depth, knot, new cushions both int. and cockpit, ex. cond. inside and out, \$13,900, OBO, x36249 or 280-8644.

TRI-Q experimental aircraft, 2 place, 140mph, 75mp, 300 T.T., cost 20K plus, will take \$12,500 or trade for fishing boat, lake property, motor home, etc. Wood, x37007.

'19' Flying Scot sailboat, mainsail, jib, spinnaker, sails in good shape, great bay boat, centerboard allows for shallow lake sailing, w/ Shoreline tilt galv. trailer, incl. is a British Seagull engine, \$3,000; new in box Rotec Rally ultralight airplane, was \$5,000, now \$3,000, plane and boat together, \$5,000. Phil Peterson, 471-1471 or 282-3544.

'77 17' monarch MCFast bass boat, w/115 Evinrude, trolling motor, custom trailer and LCR 3004, good cond. x37022 or 941-7133.

JSC

Today

Correction—The Roundup incorrectly reported the date that Federal Employee Health Benefits Program enrollment changes would become effective if submitted by today, the last day for open season changes. The effective date for such changes will be Jan. 1, 1989. For more information, call x32681.

Cafeteria menu—Entrees: fried shrimp, broiled halibut with lemon butter sauce, chopped sirloin, fried chicken (special). Soup: seafood gumbo. Vegetables: breaded okra, buttered broccoli, carrots in cream sauce.

Monday

Exercise class—Class meets 5:15-6:15 p.m. Mondays and Wednesdays at the Gilruth Recreation Center for eight weeks. Cost is \$24. Participants may sign up anytime. For more information, call x30303.

Cafeteria menu—Entrees: weiners and sauerkraut, stuffed pork chop, potato baked chicken, chopped sirloin, meat sauce and spaghetti (special). Soup: cream of potato. Vegetables: French cut beans, breaded squash, whipped potatoes, buttered beans, French fries.

Tuesday

BAPCO meets—The Bay Area PC Organization will meet at 7:30 p.m. Dec. 27 at the League City Bank & Trust. For more information, call Earl Rubenstein, x34807, or Ron Waldbillig, 337-5074.

Cafeteria menu—Entrees: beef stew, grilled liver with onions, shrimp creole, chopped sirloin, smothered steak and dressing (special). Soup: Navy bean. Vegetables: buttered

cabbage, corn O'Brien, buttered rice, green peas, French fries.

Wednesday

EAA badges—Dependents and spouses may apply for a photo identification badge from 6:30-10 p.m. Monday through Friday at the Rec Center.

Cafeteria menu—Entrees: roast beef, baked perch, chicken pan pie, chopped sirloin, salmon croquette (special). Soup: seafood gumbo. Vegetables: mustard greens, Italian green beans, sliced beets, French fries.

Thursday

Cafeteria menu—Entrees: Beef tacos, baked pork steak, diced ham with lima beans, chopped sirloin, stuffed cabbage (special). Soup: beef and barley. Vegetables: ranch style beans, Brussels sprouts, lima beans, French fries, buttered rice.

Dec. 30

Cafeteria menu—Entrees: baked scrod, liver and onions, fried shrimp with french fries, chicken fried steak (special). Vegetables: green beans, buttered broccoli, carrots, whipped potatoes.

Jan. 2

Cafeteria menu—Entrees: beef Burgundy over noodles, one-quarter chicken, barbecue sausage link, chopped sirloin, hamburger steak with onion gravy (special). Soup: cream of chicken. Vegetables: mashed potatoes, buttered corn, Lyonnaise carrots, green beans, French fries.

Jan. 3

Cafeteria menu—Entrees: baked meatloaf creole, braised liver with

onions, barbecue spare ribs, chopped sirloin, turkey and dressing (special). Soup: beef and noodle. Vegetables: Spanish rice, broccoli, buttered squash, French fries.

Jan. 4

Cafeteria menu—Entrees: breaded baked redfish, tamales with chili, chopped sirloin, Spanish macaroni (special). Soup: seafood gumbo. Vegetables: parsley potato, Harvard beets, ranch beans, buttered spinach, French fries.

Jan. 5

Ballroom dancing—Ballroom dancing lessons, from the foxtrot to the samba, will be taught Jan. 5 through Feb. 23 at the Rec Center. Separate advanced and beginner classes will be conducted from 7-8:15 p.m. Thursdays. Separate intermediate and beginner-intermediate classes will be taught from 8:15-9 p.m. Thursdays. Cost of the 8-week sessions are \$60 a couple. For more information, call x35789.

Cafeteria menu—Entrees: beef pot roast with dressing, shrimp chop suey, grilled pork chop, chopped sirloin, chicken fried steak (special). Soup: Navy bean. Vegetables: buttered carrots, green cut beans, steamed rice, buttered cabbage, French fries.

Jan. 6

Cafeteria menu—Entrees: broiled flounder, fried shrimp, baked ham with cherry glaze, chopped sirloin, tuna and noodles (special). Soup: seafood gumbo. Vegetables: cream style corn, macaroni and cheese, diced turnip greens, stewed tomatoes, French fries.

TRAC 16' catamaran, one yr. old., extras incl., \$3,200. Randy, x35459 or 335-1577.

'12' Sears Gamefisher fiberglass boat w/live bait well, new cond., never used, rated for 10hp, \$295. Tom, x39775.

'22' Ranger sailboat, 7 sails, stereo, depth sounder, knot meter, sleeps 4, good cond., great family boat or class racer, trailer and/or motor optional, \$5,000, OBO. Mike B., x32667 or 334-3615.

Audiovisual & Computers

Cardco numeric keypad w/2 analog paddles for the Commodore 64, \$25. Samouce, x35053 or 482-0702.

Casio FX-7000G graphics calculator, all manuals, \$35; printer, cassette interface and interconnect cable for Casio FX-795P or Tandy PC-6 pocket computers, \$65. Tom Clark, x39842.

MonoChrome Display Adapter (MDA) card with a parallel port for IBM XT/AT computers, \$85; a single programmable serial card for IBM XT/AT computers, \$50; Samsung MonoChrome Display Adapter (MDA) card and Amber monitor for the IBM XT/AT computer systems, \$140 together. Brad, 282-3570.

Household

Large white metal eight-light chandelier w/ shades over lights, \$70; multicolor floral metal chandelier, \$40; white 2' x 3' bulletin board, \$5. 326-3370.

Electric stove top, yellow, \$70. Jerry, x38173 or 480-8220.

GE portable 5" color TV, AC/DC, w/stereo AM/FM/removable cassette, like new, in box, was \$300, now \$159. 280-8796.

Mirrors, gold-veined, 45" x 91 1/2", two each, like new, \$200 for two or \$125 each, OBO. Doug, x32860 or 486-7412.

Stereo console w/AKAI cass., turntable, Teac reel-reel recorder, Sansui AM/FM tuner, \$275, OBO; GE Hotpoint washer and dryer, like new, used only seven mos., large capacity, \$500/pair. 486-0157.

2 twin sets, incl. box spring, \$150, ex. cond., only a year old, will sell separate. Tammy, 282-4455.

Antique school desk w/chair, \$50; pair of large carved chairs, new upholstery, \$250/each; tall wood fern stand, \$20; old school house light fixtures, \$15/each; portable sewing machine, \$50. 488-5564.

Bernhardt dining room suite, 37" x 63" plus 12" leaf, buffet and six high back chairs, looks like new, was \$1,695, now, \$575. 996-9690.

Ash rocking chair, \$60; 4 Thomasville dining chairs, \$350; 1 sofa chair, new, \$120; 1 gas grill and cover, \$50; 2 Sears prof. tool chests, \$380. x37192 or 996-9724.

Kenmore upright vacuum cleaner, extra bags, \$30. 944-5624 or 487-9283.

Wanted

Want camper top for small pick-up. 486-7831.

Want two roommates, nonsmokers, to live in my 2-3 home in Friendswood, cable, W/D, microwave, VCR and all household privileges incl., no deposit or lease to sign, \$225/mo., all bills paid. Mike, x38169 or 482-8496.

Want ping pong table, pool table or bumper pool table. Gary, 480-8357.

Want original, full-size, space shuttle mission stickers for mission STS-1 and mission 51-D (Discovery). Patrick, 282-3544.

Want roommate, female nonsmoker desires same, 2-2 apartment at Green Oaks, W/D, fans, microwave, partially furnished, \$240 plus 1/2 util. Jonette, x36624 or 486-5798.

Want to buy elec. trains. Don, x37832 or 996-1425.

Want drum set, good quality, for adult. C.W., 282-1871 or 280-8796.

Want trombone, preferably with F-attachment. Lonnie, 488-8927.

Photographic

Antique camera, Graflex 2 1/4 x 3 1/4 revolving back, Series B, 1930 Vintage, w/case and orig. operating manual, ex. cond. John, 326-2461.

35mm Mamiya-Sekor TL1000 camera w/two lenses. Rita, x36161 after 3 p.m.

Pets & Livestock

Free cat to good home, male, gray, long hair, 1 yr. old. Desiree, x30211.

Cocker Spaniel pups, AKC, born 10/19. \$150 each. Tameia, x36159 or 480-8980 after 3 p.m.

Chow-Chow puppies, pick now for Christmas, full-blood, wrinkled faces, M&F, black & reddish brown, \$125. x37815 or 475-2357.

Free to good home, 2 female neutered cats, all shots, declawed, 1 white w/black ear and tail, 1 grey. Linda, x34802 or 488-6638.

Musical Instruments

Kimball Spinnet piano, 15 yrs. old., ex. cond., \$900, OBO. Rich, x34818 or 480-8335.

Fender Mustang guitar and Peavey amp, \$350; trumpet, \$125. Ross, x38411.

Casio MT-200 electronic keyboard, case, music, used less than 9 hours, \$125; portable AM/FM/8 track, \$15. 944-5624 or 487-9283.

Sale/Trade: Prof. bass guitar amp., Cerwin/Vega BG250, 250 watt head w/1 large speaker cabinet, 1-18" speaker and 1-12" speaker in folded horn enclosure, \$450 or trade for 4-track, etc. Mike, 559-2450.

Miscellaneous

Pistol, 9mm automatic, ex. cond., \$250. 482-1582.

Pop-up travel trailer, sleeps 6, \$300; '82 boat, motor and trailer, motor needs work, BO; Farberware oven convection, \$95; Graco baby playpen, \$30; playpen, umbrella-like fold-up, \$25; Graco walker, \$5; port-a-crib, \$10; stroller, \$7, all 1 yr. old. 333-7472 or 326-2794.

Tennis rackets, various wood, \$15 each. Samouce, x35053 or 482-0702.

Schwinn Super Sport bicycle, was \$550, rarely used, now, \$275; new aircooled 50hp, two-cylinder engine, was \$1,300, now \$400; 106' of 6' chain link fence with poles, \$100. Phil Peterson, 471-1471 or 282-3544.

Custom 22 Rem. Shillen barrel, 11" target crown, Kanjar trigger, Fagen AAA stock (European style), 12x Weaver scope, fully glass bedded, less than 1" group at 200 yds., \$995. 332-5057; Smith & Wesson Mod. 10, 2" pinned

barrel, hard-carved holster, \$200. 332-5057.

3-4 Stratavarius copy violin, \$250; mini-14 rifle w/extras, \$300; 2 4OR 3-pc. suits, \$80; new 15" spare wheel and tire for Chevy, \$20. Jim, 280-2226 or 487-4552.

Kirby vacuum cleaner and all attach., recently reconditioned and works perfect, \$75. Dean Thompson, 332-2229.

Large heavy glass table w/4 chairs, \$140; '79 Honda motorcycle, good cond., 3,000 actual mi., does not run, \$200. Kay, x32251 or 331-3379.

BMW owners, rim w spare tire for a 318 or 325 (3 left), \$90 each compared to \$200 at the dealer. Scott, x36244.

'81 Audi 5000S cast aluminum rim, \$30. Scott, x36244.

Graco playpen, \$30; Graco battery-operated baby swing, was \$67, now \$45; baby walker w/music box, \$35, all in good cond. 474-7583.

'73 Ford shop manual set (volumes 1-6) and 1964 Ford and Mercury shop manual, BO, each. Norman, 326-5652.

Baby dresses size 24 mos., 2T, some worn once, some not at all, ex. cond., \$5 per dress. 474-7583.

4 BBS alloy rims, 4 bolt w/ 4.25 inch bolt circle, 2-6x13 w 20x6.0 Goodyear Racing Eagle tires and 2-9x13 w 21.5x8.5 tires. Merrill, x34925.

Utility trailers, 5'x8' and 4'x6 1/2', either \$375, less than 1 yr. old., alum. wheels, ex. cond. Wayne, 488-9005, x272 or 538-1221.

Universal gym, all chrome, multi-station, 400 lbs. of weight, \$695, OBO. x36249 or 280-8644.

Boys Schwinn, 10 spd. 18" bike, good cond., new rubber, \$35. 649-8332.

Huey drafting table, Mod. 2011B, adjustable metal base and tilting drawing surface, K&E horizontal/vertical drafting arm, table size 38" x 60", \$300. Emery, x39419 or 353-9449.

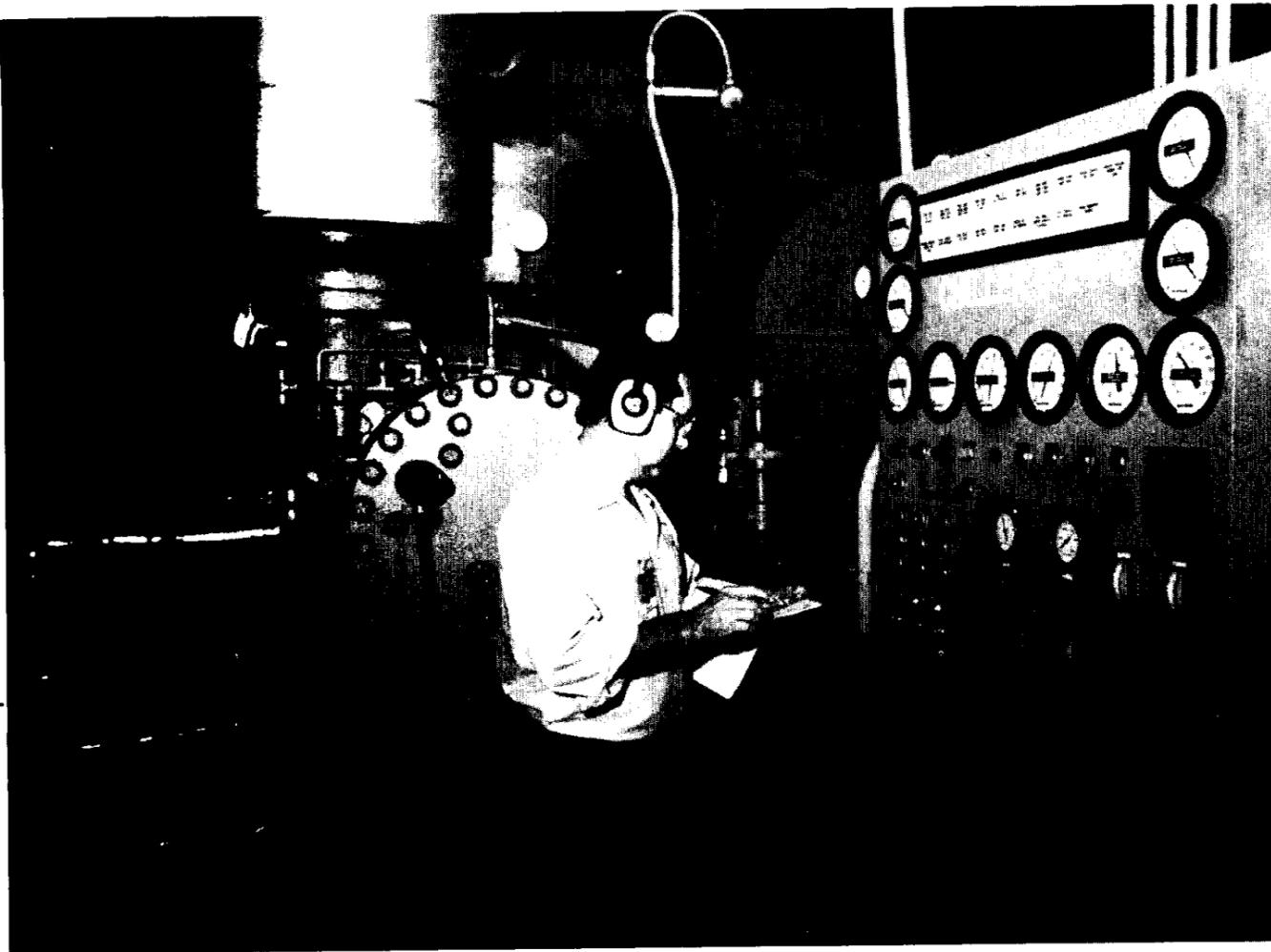
Men's sport jacket, size small, was \$145, now \$50, worn once. Kathy, x36462 or 996-1410.

Bicycles, boys 26", girls 26", and mens 25" racing bike, all like new. Kathy, x36462 or 996-1410.

VW tow bar, \$35; VW trailer hitch, \$35; 1955 Ford pickup, \$1,250. Pigg, x38831 or 944-3044.

Scuba gear and tanks (steel 72s alum. 80, twin 50s); weaving loom; infant clothes; port-a-crib; infant battery-operated Century swing; ladies golf cart, clubs and bag; recliner chair; brass bed head and footboard, queen size; push mower. Xmas tree. 488-7224.

MEC 600 12 ga.



Ralph Riggs, a utility operator for Pan Am World Services, monitors the operation of heating and cooling equipment in Bldg. 24. Riggs will be working the 3-to-11 p.m. shift Christmas day.

For a few, JSC is home for the holidays

Heating and cooling plant workers will spend Christmas here

By James Hartsfield

The heart of JSC is big, but it isn't pretty.

It pumps steam and chilled water, 24 hours a day, day in, day out, through the center's miles of underground arteries. If it stopped, computers would overheat, laboratories would freeze, America's manned spaceflight center would grind to a halt.

And that's why the workers who keep it running are at their posts around the clock. In Bldg. 24, the Central Heating and Cooling Plant, there's no Thanksgiving, no Christmas, no New Year's Day. Amid its five gigantic boilers and its seven huge water coolers, there are nuts and bolts and sweat.

The buildings of JSC contain

some spectacular high technology, graceful wonders that help put men and women into space. But without Bldg. 24, those buildings—and the people in them—couldn't function.

"This is the heart of the space center," says Warren Colar, Pan Am's chief operator of the facility. Colar's worked at JSC for 11 years. And he's worked on 11 Christmases.

"If this building has a problem, then the whole site's got a problem," he says, surveying the noisy, black boilers and yard-thick pipes that surround him, huge machines he knows so well. "Without us, all of the buildings would have to shut down."

Colar will work the graveyard shift this Christmas. But his family's

used to it. "They realize I have to work. Somebody's got to do it," he says. "I'll get off at 7 a.m., and I'll stay awake 'til 1 p.m. Then I'll go to sleep right after Christmas dinner."

He'll have Dec. 27 off, then report back on Dec. 29. "And I'll work on New Year's, too," he adds.

Most JSC employees probably don't know where Bldg. 24 is, much less what it contains or who. In an average month, more than 44 million cubic feet of natural gas warm about 31 million pounds of steam, which, in turn, warm you. Four million one hundred and two thousand ton-hours of cooling is generated each month, on average, in both summer and winter. Most computer rooms on site generate so much heat that they require air conditioning every day of the year.

All of that results from touches on a thousand thermostats.

Unless there's a problem, Bldg. 24 is just another building. And that's the way it's supposed to be; that's the point of shift after shift after shift that clocks in and clocks out there.

Parking's no problem in the center at 3 o'clock on Christmas morning. "We just kind of name our spot," Charlie Pattison says.

Pattison is a Pan Am shift supervisor in operations at Bldg. 24. He'll work the graveyard shift with Colar. "There's nobody else here except for a few from security and the fire department," he says. "Your family adjusts. It's just something you learn to live with—we normally have our Christmas on Christmas morning anyway, and I get off at 7,

so..."

At any given moment during any given year, be it pre-dawn on Christmas or late night on July 4, at least 10 people will be at work to keep the center's temperature just right. At least three work in Bldg. 24, and another person oversees six roving operators who constantly check buildings to make sure their air conditioners are working.

"The utilities are something I think we all take for granted. You only hear from people if the office is too hot or too cold," says Bill Roeh, deputy chief of the Plant Engineering Division. "I consider the people who work there some of the unsung heroes of the site. They're the ones that keep this center up and running."



Above: L.K. Fuller, a Pan Am supervisor in the Central Heating and Cooling Plant, and Don Sims, a utility operator, stand among the Bldg. 24 chillers that—holiday or no holiday—keep JSC buildings cool. Many buildings need to be cooled even during the winter because of the heat radiated by computers. Right: Electrician Larry Miller, a Pan Am World Services utility operator, works on a circuit breaker in Bldg. 24.



JSC pumps \$860 million into local economy

JSC pumped about \$860 million into the local economy during the past fiscal year, and the total number of workers supported by the center hit an all-time high.

According to the annual JSC economic impact statement released Dec. 12 by the JSC Comptroller's Office, the center supported 10,035 aerospace industry and support contractors in fiscal year 1988 which ended Oct. 1. The number easily eclipses the previous high of 9,896

contractor employees reached in 1969 at the height of the Apollo Program.

Civil service employment at JSC totalled 3,457 last year, a figure that is rising but still below the all-time peak for federal employment at the center of 5,261, reached in 1967. Last year, JSC paid out \$147 million in federal salaries.

Other major portions of the center's total contribution to the local economy included \$3 million paid for air travel

and \$710 million paid for goods and services from 1,200 local firms. Center expenditures last year averaged about \$3.3 million each working day.

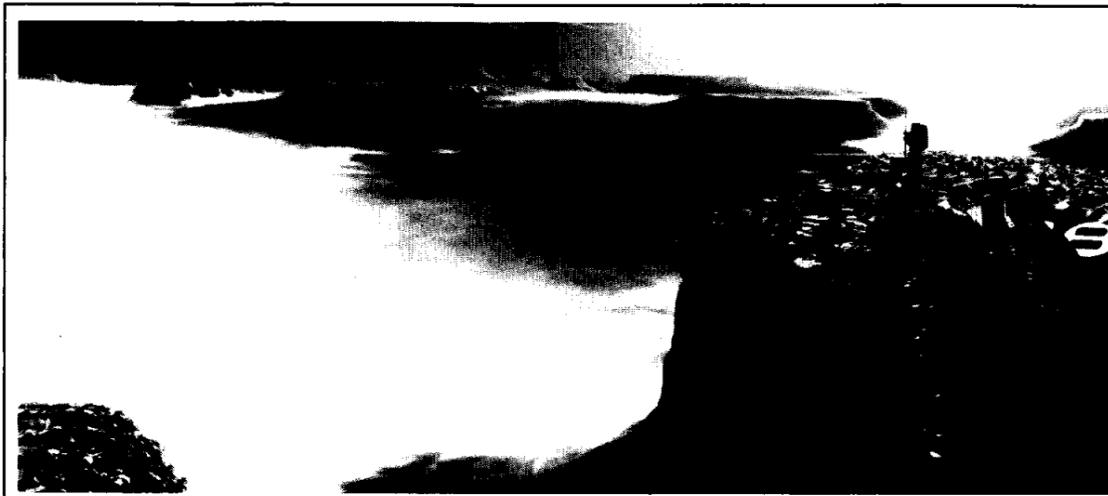
JSC received about \$1.5 billion, or 17 percent, of the total \$9 billion 1988 NASA budget. The majority of that funding, \$1.2 billion, went toward research and development. About \$10 million went for construction of facilities and research and program management, an area that includes salaries, utility bills and maintenance,

among other things, took \$284 million.

With its size, JSC spends a tremendous amount annually on utilities. In 1988, \$1.5 million went for gas, \$6.7 million went for electricity, \$8.2 million went for communications, and \$300,000 went for water and sewer service. Of the total NASA budget in 1988, about \$913 million was spent in Texas, making it the second-ranking state behind California among recipients of agency funds.

Since JSC moved to Houston in 1962, the center has contributed at total of \$35.4 billion to the local economy, including about \$2.5 billion in federal salaries.

Currently, the average civil servant at JSC makes \$42,007 a year, an increase of more than \$1,000 over 1987, and is 43.2 years old. Employees hold bachelor's degrees, 594 have master's degrees and 178 have doctorates or other advanced degrees.



NASA illustration by Pat Rawlings

An illustration from the Office of Exploration's annual report depicts the first two humans to walk on Mars exploring the Noctis Labyrinthus canyon at Valles Marineris.

Exploration office issues report

NASA's Office of Exploration (OEXP) on Monday released the first in what will be a series of annual reports on planning efforts and the nation's current capabilities for future human exploration of the solar system.

The report, entitled "Beyond Earth's Boundaries—Human Exploration of the Solar System in the 21st Century," details OEXP's work during the past year to better understand the efforts required to comply with the National Space Policy directive to "expand human presence and activity beyond Earth orbit into the solar system."

A major conclusion is that the U.S. must now lay the foundation by

pursuing detailed research, technology development, concentrated studies and a strong commitment to ongoing NASA programs. Critical ongoing programs identified are: completion of Space Station Freedom; continuation of Project Pathfinder; pursuit of a critical life sciences research program to be the foundation for long duration space habitation; and continued development of more capable Earth-to-orbit transportation systems.

OEXP examined four possibilities encompassing a broad range of objectives, requirements and capabilities. All addressed the prime directive of expanding human presence and activity beyond Earth orbit,

but each emphasized a different pathway and destination.

They include: "Human Expeditions," studies of a manned mission to Mars or to its moon, Phobos; "Science Outpost," a study of a manned lunar observatory on the far side of the Moon; and "Evolutionary Expansion," a methodical, step-by-step program to open the inner solar system for exploration and permanent human presence, using a lunar outpost as a stepping stone to similar outposts on Mars and its moons.

An in-depth discussion of the OEXP report is contained in a three-volume series entitled "Exploration Studies Technical Report: FY 1988 Status," to be available in early January 1989.

Lunney to manage Rockwell-Houston

Glynn S. Lunney, a former longtime JSC manager, has been appointed vice president and general manager of Houston operations for Rockwell International's Space Transportation System Division and president of that division's subsidiary, Rockwell Shuttle Operations Co. (RSOC).

Lunney replaces Robert Minor as RSOC president, and he will direct the performance of two Space Shuttle contracts at JSC—the Space Transportation System Operations Contract (STSOC), and the System Integration and Shuttle Orbiter Vehicle Development Contract.

Minor last week was promoted to president of the Space Transportation Systems Division and transferred to division headquarters at Downey, Calif.

As RSOC president, Lunney will lead the 4,000 employees who manage Space Shuttle operations for

NASA under the \$240 million STSOC. The STSOC contract, awarded in 1985, consolidates 22 JSC Shuttle operations functions previously performed by 17 different contractors.

Lunney most recently had been STSD vice president for Business and Advanced Development. Before that, he was executive vice president of Rockwell's Space Station Systems and Satellite Systems Divisions.

The former manager of both the Apollo and National Space Transportation System Programs joined Rockwell in 1985. He had worked for the National Advisory Committee for Aeronautics (NACA) from 1958 to 1959, and served as a member of NASA's Space Task Group, which developed the Mercury Program to put the first Americans in space, from 1959 to 1962. Lunney moved to JSC in 1962, and spent the bulk of his 30-year NASA career in Houston.

Quality award nominations open

Nominations for the second JSC Quality Partnership Award, to be presented by JSC's Safety, Reliability and Quality Assurance Office (SR&QA) will be accepted until Jan. 15.

The award is designed to recognize professionals who do not work in the quality field, but who make significant contributions to quality. The first Partnership Award went to Gordon H. Stauble, a group manager for the Unisys Management and Training

Software Department.

Presentation of the second award in January will begin a quarterly series. Nominations are now open, and must include the name of the nominee and a brief summary of the person's outstanding contributions. Nominees must be employed by NASA, NASA contractors or involved with NASA-related contracts.

Nominations should be sent to T.J. Adams, Chief of the Quality Assurance and Engineering Division, Code ND.

Lunar orbit insertion plan raises stakes

Tension unbearable as Apollo 8 disappears behind Moon

(Continued from Page 1)

According to Kranz, "By the time we got into early Apollo, the space program had moved to a point of confidence in leadership, and confidence that our leaders had a good sense of timing and direction. This meeting was not unlike other meetings we had in the Gemini program, where all of a sudden the managers came in and said, 'Hey, let's do an EVA on Gemini 4.'" It was, Kranz recalls, "good, quality, gutsy decision making."

But there was a catch. From the perspective of the operational community, a great deal of the risk would have already been taken when the CSM struck out for the Moon. Low's original plan had called for looping around the Moon and coming back to Earth. Kraft's men thought they should go into lunar orbit. That maneuver, after all, was integral to the eventual goal of landing men on the surface. But it would also raise the stakes considerably.

"That's a lot different than just going around the Moon, believe me," Kraft said. "I remember when I told Frank Borman that we were pressing for a lunar orbit insertion, he didn't speak to me for two or three minutes. He just stared."

At the time, the U.S. didn't even have a precise gravitational model of the Moon. A NASA probe called Lunar Orbiter was circling the Moon, photographing the surface and mapping potential landing sites. But its path didn't coincide with orbital predictions.

"We were looking at that data and saying, 'We've got the same problem,'" Kraft remembers.

Later, after Apollo 8, researchers realized that objects orbiting the Moon would always encounter minor—yet critical—perturbations in their trajectories due to the presence of large mass concentrations, the result of millions of years of bombardment by rocky objects.

"It was data derived from Apollo 8 which gave us an empirical method—get that, empirical—for calculating trajectories on later flights," Kraft noted.

But neither the knowledge nor the method were in hand in July 1968. By the end of the

month, the teams investigating Low's proposal had all said it was possible. Kraft, Slayton and Low reconvened in Gilruth's office. It was, Kraft would later say, "a very profound day."

"At this point," Kraft remembers, "Gilruth also thought it was a good idea. He picked up the phone and called Wernher von Braun in Huntsville. This was at 11 a.m. 'What are you doing this afternoon?' he asked him. 'Can we see you about 2 o'clock this afternoon?' Of course, the answer was yes, and we got on the Gulfstream and flew to Huntsville. Before we left, Gilruth found out that Sam Phillips was at the Cape. He asked Phillips to meet us that afternoon in Huntsville."

Phillips, the Apollo Program director, later wrote that a quickly scheduled meeting of the Apollo management team was held in Huntsville that afternoon. "The three-hour conference didn't turn up any 'show stoppers.' Quite the opposite; while there were many details to be reexamined, it indeed looked as if we could do it. The gloom that had permeated our previous program review was replaced by excitement."

All was now dependent on the success of Apollo 7. On Oct. 11, 1968, the new Block II CSM, carrying Walter M. Schirra, Donn Eisele and Walter Cunningham, lifted off from the Cape atop a Saturn 1B. "During the 163 orbits of Apollo 7 the ghost of Apollo 204 was effectively exorcised," Phillips wrote.

The stage was set for the next step. Debriefings were held with the Apollo 7 crew. Management teams met in lengthy meetings. Data was reduced, flight plans were put forth, excitement began to grow. Finally, on Nov. 11,

Thomas O. Paine, the new acting administrator of NASA, conducted a go/no-go review of the lunar orbit plan.

"By this time," Phillips wrote, "nearly all the skeptics had become converts. At the end of this climactic meeting Mueller put a recommendation for lunar orbit into writing, and Paine approved it. He telephoned the decision to the White House, and the message was laid on President Johnson's desk while he was conferring with Richard M. Nixon, elected his successor six days earlier."

The decision to go ahead, Kraft says, "was the boldest decision of the space program. But the gains were worth the risks. It was the first manned launch of a Saturn V. It was the first burn of an S-IVB into a lunar trajectory. It was the first time men had left the gravitational influence of the Earth. It was the first time we had tried to navigate with onboard systems to the Moon. It was the first time we went into orbit around another planet. It was the first time men had looked down on the Moon from a distance of 60 miles. It was the first time we came out of orbit around another planet. And it was the first time we did a 36,000 foot-per-second reentry, the same as you would encounter in returning to the Earth from any planet."

Shortly thereafter, elaborate invitations were sent out for the launch with the inscription, "You are cordially invited to attend the departure of the United States Spaceship Apollo VIII on its voyage around the Moon departing from Launch Complex 39A, Kennedy Space Center, with the launch window commencing at 7 a.m. on December 21, 1968."

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