

Did Earth have Saturn ring-34 million years ago?

A ring similar to the rings surrounding Saturn today may have existed around Earth 34 million years ago.

Dr. John A. O'Keefe, a scientist at NASA's Goddard Space Flight Center, Laboratory for Astronomy and Solar Physics, calculates that the ring, composed of tektites (glass meteorites), lasted one to several million years. The shadow of the rings on Earth's surface caused dramatic climatic changes in the temperate zones.

The sudden climatic change 34 million years ago has been known to geologists for many years as the terminal Eocene event.

This change is considered to be the most profound climatic event to have occurred during the entire Tertiary period

between 65 million and 2 million years ago. (The Eocene era represents the earliest part of the Tertiary period in the Earth's geological history.)

Through botanical studies, geologists already had found that the temperature changes occurred at the end of the Eocene, but until now, there has been no acceptable explanation for the occurrence, according to O'Keefe.

During the terminal Eocene event, he explained, winter temperatures in the northern hemisphere dropped approximately 20 degrees Celsius (35 degrees Fahrenheit).

The basis for O'Keefe's belief lies in the fact that the biological changes coincide quite accurately with a massive fall of tektites from outer space. While the

precise origin of the tektites has not been established, O'Keefe thinks that they might have come from an eruption on the Moon.

Studies of the tektites, he said, show that some of them have similarities with rocks brought back from the Moon by American astronauts in the NASA Apollo program. Whatever their source, these tektites crashed into the Earth, leaving a path, or strewn field, extending at least half way around the Earth, from the eastern United States westward across the Pacific to the Philippines.

O'Keefe suggests that the tektites that missed Earth went into orbit around our planet and organized themselves into a ring like the rings around Saturn. Once formed, the ring blocked out the rays of

the Sun in the northern hemisphere in the winter; due to the Sun's location below the plane of the equator. The shadow cast by the ring resulted in the lowering of winter temperatures.

The ring disappeared, O'Keefe believes, when forces in space, such as the pressure of sunlight or the drag of the atmosphere, pulled the particles out of the ring. They were pulled either downward into the atmosphere, where some burned up and others fell to Earth, or upward into space away from the Earth.

O'Keefe reports his findings in the May 29 issue of the British journal, *Nature*.

Until recently, Saturn was believed to be the only ringed planet in the solar system. However, rings have been discovered around both Uranus and Jupiter.

Voyager probes mysterious moons of planet Saturn

by KAY EBELING
ROUNDUP Editor

There are crater-like features on Dione. Titan has a polar cap which may be a seasonal feature caused by radiation. Rhea resembles Jupiter's Ganymede, and the planet Saturn resembles Jupiter.

As the Voyager One spacecraft closes in on Saturn, 8.14 million miles from Earth, details of the ringed planet are coming into focus. Ground-based observations of Saturn show a pale, featureless body; but as the Voyager images sweep down the videoscreens at Jet Propulsion Laboratory in California, turbulent windstorms and colorful bands are showing up as predominant features on the distant planet.

At Roundup press time, the spacecraft was sending increasingly clear images of the moon, Titan, and project scientists are becoming skeptical that the photos from its closest approach at a distance of 2,500 miles will find any breaks in the clouds to allow a view of Titan's surface.

However, Voyager's radio signals and other instruments will measure the diameter of Titan; the thickness, density, and composition of its atmosphere, and perhaps surface temperatures.

(Although Roundup goes to press just hours before closest approach to Titan, Saturn, and other moons in the Saturnian system, more results from the mission will be available in future next issues.)

The Voyager spacecraft is sending reams of data into the control centers at JPL and the 11 science teams are gearing up for months, perhaps years, of analysis from the onboard experiments.

Initial results of the mission are revealing new mysteries about the planet and its moons. At least 95 distinct bands, or ringlets, have been seen in the planet's ring system. The moon Iapetus is distinctly brighter on the far side from the sun, probably an effect of the moon's reflectivity, but still a puzzle.

Images come to Earth in black and white from the spacecraft's two video cameras—one with wide angle and one with narrow angle lens. Members of the Voyager Imaging Science Team then process the photos through three filters—orange, green, and blue—to create color-enhanced views which are near exact to what would be seen with the naked eye from the spacecraft.

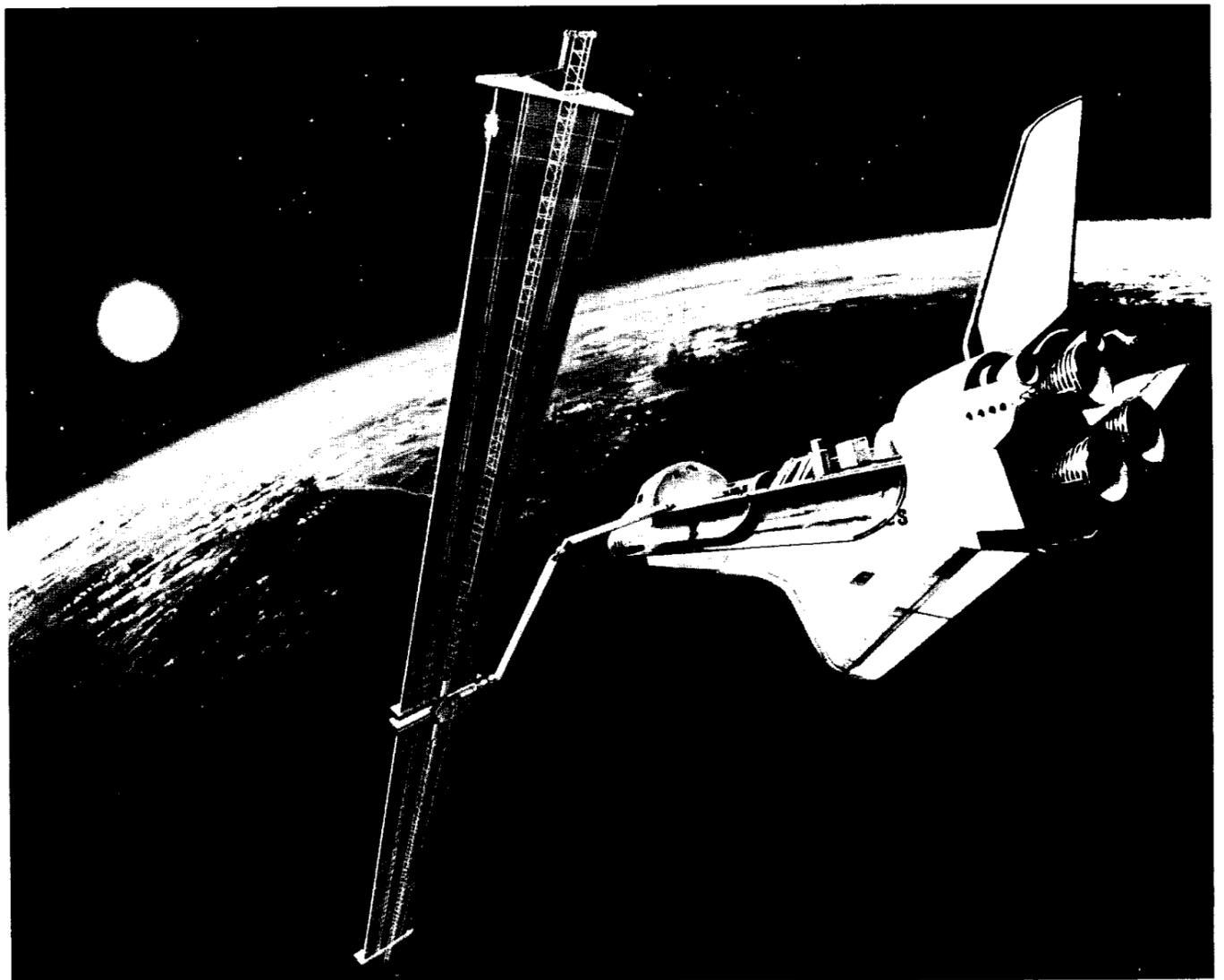
ROUNDUP

Lyndon B. Johnson
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SUN POWER—Solar panels convert sun's rays to additional electric power for Shuttle Orbiter payloads in this artist concept of a functioning Power Extension Package (PEP). The PEP is an orbiter-stored solar array kit deployed by the Remote Manipulator System (a mechanical arm) in space to provide additional power increasing orbital time and experimental data. (See story page 4).

The moon Titan is reading out as a golden, glowing, hazy body. The surface of Saturn consists of colorful bands, much like those on Jupiter, and in the Southern Hemisphere is a small red spot similar to the famous red spot of Jupiter.

Over 800 news representatives have been badged at the JPL media center. TV monitors around the auditorium are providing Voyager images as they are received and reporters gather around to watch as the scan lines come down the screens revealing another view of the distant planetary bodies.

Voyager One will use the momentum of Saturn's rotation to power itself out of the solar system, sending back data on the farthest reaches of solar radiation. Its sister craft, Voyager Two, will fly by Saturn in August 1981, then travel on to Uranus in 1986.

Slayton says Columbia to roll out Nov. 23

The philosophy and objectives of the Orbital Flight Test (OFT) program in general, and STS-1 in particular, were outlined for science reporters during a press conference at JSC last week.

Astronaut Donald K. (Deke) Slayton reviewed post-STS-1 progress and said confidence is high for an on-time rollout of the Columbia, Nov. 23.

Ed Whitaker, STS-4 Mission Staff Engineer, presented an overview of the OFT program, which verifies the flight vehicle, its extensive network of supporting facilities, equipment, procedures and personnel.

Whitaker said OFT is "... the end of a long process of component, subsystem

and system tests initially conducted in ground facilities." But, he added, such testing only provides an incomplete data base.

"The Shuttle represents a complex combination of systems for which there is no way to do ground testing," he said. The OFT will provide a greater understanding of heating, loads, acoustics, environmental and other dynamics which cannot be duplicated in ground tests.

Larry Keyser, STS-1 Mission Staffing engineer, discussed the nominal flight plan and ascent abort contingencies.

The briefing was the fifth in a series of media backgrounders. Another Nov. 19 will cover launch and landing operations at Kennedy Space Center.



CLASS OF '80—Clifford E. Charlesworth, deputy director, presents journeyman certificates to JSC's sixth graduating class of engineering technicians. Ceremony signified completion of four years rigid classroom and on-the-job training. Left to right are Gerald Cortez, Ron Esaac, Charlesworth and Dale Martin.

Driving smart

Drive slow, save dough, and haste makes waste

"Smart driving" can get better mileage than EPA ratings promise. Here's how.

Drive below the 55 miles-per-hour speed limit. You'll do best between 35 and 45 miles per hour, since miles-per-gallon decrease drastically below 30 and above 50. Driving at 55 uses 20 percent less gas than driving at 70 in the average car. It's 20 percent cheaper.

Avoid idling. Tests show that one minute of idling uses as much gas as one minute of driving at 30 miles an hour. You use enough gas to drive half a mile during every minute you idle.

Also, a minute of idling uses twice as much gas as restarting the engine. So, if you're likely to wait in line for more than 30 seconds, turn it off.

The 30-second rule applies to warm-up time, too.

True, your car gets fewer mpgs when the engine is cold, but it gets zero mpgs when idling. After the 30-second start-up idle, drive under 35 miles-per-hour for the first couple of minutes and your car will warm up more efficiently than when idling.



One of the gas-saving surprises for careful drivers is the "move on out" rule. Contrary to popular belief, slow acceleration actually wastes gas. "Brisk but smooth" is the best acceleration technique. The quicker your car shifts out of low gear, the more gas you save. But don't employ jack-rabbit starts. They waste the most!

An overweight car, like an overweight jogger, burns up fuel at a faster rate. There's not much you can do to reduce the weight of

your present vehicle, but you can avoid carrying around any extra baggage. For example, if you leave those two 50-pound bags of fertilizer in the trunk for a week before applying them to the lawn, you cheat yourself out of four-tenths of a mile extra you could have traveled on each gallon of gas.

Most of the fuel penalty for air conditioning comes from carrying that extra weight around, and running the unit in city traffic. Some tests indicate that shutting windows and turning on the air actually uses less gas at highway speeds!

In the next article, we'll tell you a high-pressure way to increase your miles-per-gallon three to six percent at no cost, with no inconvenience, and with practically no effort.

(The savings figures used in these articles are averages. In many cases, the test results showed a wide range above and below average for individual cars.)

Cookin' in the cafeteria

Week of November 17 - 21

Week of November 24 - 28, 1980

Monday: Cream of Chicken Soup; Beef Burgundy over Noodles; Fried Chicken; BBQ Sausage Link; Hamburger Steak (Special); Buttered Corn; Carrots; Green Beans. Standard Daily Items: Roast Beef; Baked Ham; Fried Chicken; Fried Fish; Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday: Beef Noodle Soup; Baked Meatloaf; Liver w/Onions; BBQ Spare Ribs; Turkey & Dressing (Special); Spanish Rice; Broccoli; Buttered Squash.

Wednesday: Seafood Gumbo; Broiled Fish; Tamales w/Chili; Spanish Macaroni (Special); Ranch Beans; Beets; Parsley Potatoes.

Thursday: Navy Bean Soup; Beef Pot Roast; Shrimp Chop Suey; Pork Chops; Chicken Fried Steak (Special); Carrots; Cabbage; Green Beans.

Friday: Seafood Gumbo; Broiled Halibut; Fried Shrimp; Baked Ham; Tuna & Noodle Casserole (Special); Corn; Turnip Greens; Stewed Tomatoes.

Monday: Chicken Noodle Soup; Weiners & Beans; Round Steak w/Hash Browns; Meatballs & Spaghetti (Special); Okra & Tomatoes; Carrots; Whipped Potatoes. Standard Daily Items: Roast Beef; Baked Ham; Fried Chicken; Fried Fish; Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday: Beef & Barley Soup; Beef Stew; Shrimp Creole; Fried Chicken (Special); Stewed Tomatoes; Mixed Vegetables; Broccoli.

Wednesday: Seafood Gumbo; Fried Perch; New England Dinner; Swiss Steak (Special); Italian Green Beans; Cabbage; Carrots.

Thursday: HOLIDAY

Friday: Seafood Gumbo; Baked Flounder; 1/4 Broiled Chicken w/Peach half; Salisbury Steak (Special); Cauliflower au Gratin; Mixed Vegetables; Whipped Potatoes; Buttered Cabbage.

Schmitt, Apollo pilot

To talk next week at Microcircuit meeting

More than 400 are expected at the Government Microcircuits Conference Nov. 19-21 at the Shamrock Hilton Hotel in Houston.

Sponsored by the Department of Defense, the meeting will feature discussions on Digital and Analog Signal Processing and

Radiation Hardening (their effects on circuitry).

Opening address will be by Sen. Harrison Schmitt, NASA Scientist-Astronaut who served as Apollo 17 Lunar Module pilot during the 1972 moon landing in the Valley of Taurus-Littrow.

Dr. Schmitt also is guest speaker Tuesday (Nov. 18) in the Gilruth Recreation Center during the AIAA Houston Section dinner meetings which begin at 6 p.m. His topic is "Today's Outlook For Space."

Credit union seeks nominations for 5 for 3 year terms

Nominations are being accepted for three Federal Credit Union positions on the board of directors and two on the credit committee. Terms are for three years.

Election is scheduled for 7:30 p.m. March 6 during the 19th annual meeting of the credit union membership in the Gilruth Recreation Center.

Those who wish to be considered for nomination should send a brief, signed personal resume to Roy C. Stokes, nominating committee chairman, c/o JSC-FCU, P. O. Box 58346, Houston, 77058.

Roundup deadline is the first Wednesday after publication.



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Editor: Kay Ebeling

Bulletin Board

Nasa Foot Race Monday - Saturday At Rec Center

The 10th annual NASA inter-center foot race will be held on Monday (Nov. 17) to Friday (Nov. 21) at 5 p.m. and Saturday (Nov. 22) at 9 a.m. starting at the Recreation Center. Events will be 2 miles and 6.2 miles run simultaneously. Awards will go to all finishers, with medals to the top three in each category. The event is open to runners and joggers of all ages. Additional information from the Rec Center, 3594.

Tickets Now On Sale For Yule Dances Dec. 12 & 13 At Gilruth Rec. Center

Tickets are now on sale for this year's Christmas dances and special celebrations to be held at NASA's Gilruth Recreation Center Friday (Dec. 12) and Saturday (Dec. 13). This year's dinner dances will feature roast beef Friday night and prime rib Saturday, with Jerry Vann's orchestra on the assembly room side and the Bill Nash show in the Gym section.

Tickets, which cost \$13.50 per person for Friday and \$17.50 Saturday, may be purchased at the Bldg. 11 cafeteria Dec. 1 through Dec. 8. Sales will be limited to 600 per night and seating again will be reserved.

JSC Exchange Store Announces New Hours For Tickets, Coupons

JSC Exchange Store hours are 10 to 2 p.m. daily.

Tickets and services available include:

ABC Theatre tickets - \$2.00 each;

General Cinema tickets - \$2.40 each;

Six Flags Over Texas tickets: \$8.00 for one day (Reg. \$10.50)

\$9.95 for two days (Reg. \$14.95)

Postage Stamps (20 - 15¢ stamps) \$3.00

Sea-Arama Marineworld Fun-Time Cards - Free

The new Entertainment '81 coupon books are now here. This two for one coupon book is avail-

able at the Bldg. 11 exchange store. Cost is \$16.00 each.

The JSC exchange store is also offering the Gold "C" Values Book 80-81 for \$5.00. The coupon book is 352 pages of buy-one-get-one-free coupons, and other offers worth over \$1,500. For additional information, come by the exchange store in Bldg. 11.

Former Astronaut Senator Harrison Schmitt To Speak at AIAA Meeting

"Today's Outlook for Space" is the topic of Sen. Harrison H. "Jack" Schmitt's speech, Tuesday at the American Institute of Aeronautics and Astronautics meeting in Gilruth Center. The program, free to the public, begins at 8 p.m., after the social hour and dinner which begin at 6. Schmitt, a Harvard graduate, joined the NASA Apollo program in 1965, and as the Lunar Module pilot and geologist of Apollo 17, landed on the moon in the Valley of Taurus-Littrow in 1972. As a senator from New Mexico, he serves on the Appropriations Committee; the Com-

merce, Science, and Transportation Committee, and the Select Committee on Small Business.

Dinner reservations are due by noon Nov. 14—call Francie at 483-3995.

Celebrate Christmas at Gilruth Rec Center

Christmas is a festive time. The tree is trimmed, the wreaths are hung. The holidays mean getting together with friends for a special celebration at the Gilruth Rec Center. This year's dinner-dance will be held on Friday, Dec. 12, and Saturday, Dec. 13. Tickets are \$13.50 per person for Friday and \$17.50 per person for Saturday which includes everything. Tickets can be purchased at the Building 11 Cafeteria between Dec. 1 and Dec. 8. The dinner will be roast beef Friday night and prime rib on Saturday and it will be served between 8 and 9 p.m. Doors will open at 6:30. The bands will be Jerry Vann's Orchestra on the assembly room side and the Bill Nash Show on the gym side.

Ticket sales will be limited to 600 per night and seating will again be reserved.

Bayou Engineer Group To Hold Talk On Licensing in Texas

The Bayou chapter of the Texas Society of Professional Engineers will hold an engineers' week special event Feb. 25. Topic and purpose are to inform engineers, the technical community and public about licensing in Texas. Speaker will be Woodrow Mize, P.E., acting executive director of the Texas State Board of Registration for Professional Engineers. Subjects to be discussed are the history of registration in Texas, its meaning, how one becomes licensed, and benefits of being acknowledged as a "Professional Engineer." The presentation will be held in the JSC, Bldg. 2 auditorium from 11:45 to 1:00 p.m. Admission is free. For more information contact Robert L. Winkler, president-elect of the Bayou chapter, 488-5660.

JSC Tennis Club singles meet to run Nov. 21-23

The JSC Tennis Club held a Doubles tournament at the Friendswood Racket Club on Oct. 10, 11, and 12. The results of the tournament were Manner and Taft over Dunnage and Durham 6-0, 6-2 in Women's A; Chapman and Feazel over Cassetti and Bridges 6-1, 6-3 in Women's B. Jones and Gisler over Hungerford and Roberts 6-2, 6-3 in Men's A; Jefferson and Williams over Culp and Kyle 6-4, 6-2 in Men's B; and Orgeron and Smith over Nguyen and Nguyen in Men's C.

The next JSC Tennis Tournament will be Nov. 21, 22, and 23 at Bay Area Racket Club. It will be a singles tournament.

JSC golfers end regular tourneys at Atascocita club

The last of the regular golf tournaments was played at Atascocita Country Club by all three flights of the JSC Golf Association on Oct. 13.

The winners in the Championship Flight all shot net 69's. Using the 15th hole score to break the ties, the first three places were Bob Ross, Bill Fullbright, and Bob Allen, respectively. The First Flight winners were Reuben Taylor (net 72), Marc Broussard (73), and Joe DeAtkine (74). Second Flight winners were Bill Zuber (73), Larry Magers (74), and Tom Dennis (78).

The Ed Mitros Memorial Championship Tournament at the Chambers County Golf Course was the next event taking place Oct. 25. This is played by the top eight finishers from each flight and determines the JSCGA champion for the year. The final event of the year, a fun tournament at Chigger Creek, will be played Nov. 11.

Two buildings close public tour areas for security repairs

The Skylab exhibit and "sim" observation sections of Building Five closed to the public for six weeks Nov. 10 to allow for construction of two separate entrances and exits. One passage will go through the Skylab exhibit and a separate passage will take visitors to the flight simulator viewing area.

The modifications, part of NASA's preparation for the Department of Defense Shuttle operation, will separate JSC visitors from the lobby and hallways leading to simulator working areas.

On completion, visitors will be able to view the exhibits and activity, while JSC will have provided more security for Building Five.

Building 30 modifications begin next year, and should be completed by the end of spring, before the summer arrival of tourists.

Visitors to the Mission Control Center (Building 30) will use a separate lobby, stairway and elevator, which lead to the second floor viewing area, tunneling over the second floor hallway, with no access to other areas.

Construction in Building 30 will require cancellation of Mission Control tours for approximately one week.

Kraft to deliver keynote speech at telecom conference

Christopher C. Kraft, Jr., Director of JSC, will be keynote luncheon speaker Dec. 1 during the five-day National Telecommunications Conference at the Shamrock Hilton in Houston. His topic is, "Telecommunications: The Revolution Is Coming".

1980-1981 CAMPAIGN



OVER THE TOP—Wally Grimes, coordinator for the JSC Combined Federal Campaign, announced a grand total of \$197,000 contributed this year, exceeding the goal by \$2,000. Grimes said JSC completed its drive while United Way was approaching 65 percent of its total, receiving

the "memory-maker" weekend award for two at the Hyatt Regency Hotel. In a drawing Nov. 20, George Abbey, Director of Flight Operations, will pick the winning name of employee, to be announced in the next issue of Roundup.

The conference, which starts Nov. 30 and runs through Dec. 4, will bring together world telecommunications experts—those who create the techniques, know-how, and equipment to process and transmit information.

Talks and teaching sessions will include topics on "Cryptographic Techniques" (the art of writing in secret letters or words), "Microwave Power Transmission - An Energy Alternative for the Year 2000", "Electronic Mail - Technology and Application", "Optical Communication Systems", "Fiber Optic Transmission Systems", and "Communications Satellites for the 1980's".

Shuttle tool kit to help astronauts on Columbia

A Space Shuttle tool kit will be aboard the Orbiter, *Columbia*, next year.

The kit includes a tube cutter, winch, three-point latch tool and a center-line latch tool, all designed to help shut and lock the high payload bay doors.

Although the tools remotely resemble those used by handymen on Earth, they are far more sophisticated and must perform in

the gloved hand of an astronaut in a bulky spacesuit and in the weightlessness of space. The crewman will steady himself with one hand and operate the tools with the other.

Strong, durable, and lightweight as possible, each must withstand temperatures ranging from -190° to 267° F.

The cutter, which resembles an oversized wrench, will snip obstructions that prevent the doors from shutting.

The winch actually "reels" them in and latch tools (resembling giant vise grips) secure and lock.

Roundup Swap Shop

Ads must be under 20 words total per person, double spaced, and typed or printed. Deadline for submitting or cancelling ads is 5 p.m. the first Wednesday after publication. Send ads to AP3 Roundup, or deliver them to the Newsroom, Building 2 annex. No phone-in ads will be taken. Swap Shop is open to JSC federal and on-site contractor employees for non-commercial personal ads.

Boats & Planes

Airboat, ready to hunt, 16' aluminum, 110 h.p. corvair, full prop guard, big wheel trailer, \$2,700. 944-3560.

LIDO-14 sailboats: new/used, family sailing/racing, popular boat/big fleet, exc. invest. 334-2392 or 482-7305.

14' Alum boat, motor, trailer, perfect for bass fishing/duck hunting, extras. Parker X-4241 or 481-7372 after 5:30.

Carpools

Need additional member. Alvin (Bayou Bend) to JSC, 7:30 to 4. Pletcher X-4065 or Mansur X-4581.

Need a ride from Bldg. 31 and return, 7:30 to 4 from Texas City, near Dike, with same. Jeanette X-3274.

Lost

Gold w/white gold wedding band. Lost in or around bldg. 45. Please call Shirley X-6353.

Cars & Trucks

1975 Granada (white), 4 dr, 6 cyl, ac, 3-speed, am/fm stereo, 1 owner, good cond, \$1,450. J. Kemp 481-6427.

1969 Olds, very good condition, luxury car, low miles, cash-trade-terms. 482-7698.

1978 Camaro, good condition. 482-8425 after 5.

1977 Chev. Van, black, ac, power am/fm cassette, new radials and more, best offer over \$3,000. 8:30 - 4:30 474-4219.

1969 Mustang convertible, 302-2V, p/s, air, guaranteed electrical, cooling, exhaust, braking and transmission systems, all rebuilt, needs minor body repair, sacrifice \$2,500. Mike D. X-4326.

1967 Chevelle, ac, ps, exc cond, am/fm 8-track stereo, custom rims & tires, \$1,500. Mark X-6134 or 483-5393.

1970 Lincoln Continental, big & smooth, runs OK, needs work. Dave 488-8862 after 6.

Property & Rentals

Beautiful 2500-ft 4-2-1/2-2A, formals, blockpaneled den, wet bar, custom drapes, new carpet and kitchen appliances, wooded lot, 7-1/2% loan. 482-3809.

Non-escalating 9-1/2%, low equity, Countryside 3-2-2, fireplace, formal D/R, fenced lawn, 2 yrs old, very nice. Terry X-3035.

League City, 706 Reynolds, 3-1-1/2-2, \$9,500 equity, assume 10% non-escalating VA loan. Gina X-3377 or 332-6940.

Lease: El Dorado Trace, new condo, 2 br, 2 bath, fireplace, w/d and all appliances, many extras, \$425 plus deposit. 334-4470 evening and weekends.

Lease: LaPorte, Bayshore Condo, 1 bdrm, util. pd., \$200 deposit/\$275 mo. 334-3202 after 5.

Rent: Lake Livingston Retreat, 3 br water front, under the trees, all amenities, by week or weekend. Jerry X-4207 or 554-6093.

League City, Glen Cove addition, 3-2-2A, trees, fenced, under \$50k, financing negotiable. 488-1410 or 488-2432 after 5.

Rent/Sale, League City, Countryside, 3-1-3/4-2, fireplace, large kitchen and master bedroom, near pool, park & courts, \$59,900, 8-1/2% \$462 mo loan. 554-6200.

Needed: Housing for co-op, semester to semester/quarter to quarter. Freda Marks X-5266.

Household Articles

Charming Antique Armoire, light oak, 6 dwrs, beveled mirror, needs knobs on front doors, \$150. 488-2219.

Early American sofa, solid hard rock maple, 6-cushion style w/box pleated flounce, blue herculon, matching platform rocker in red, \$125 for both. Williams X-3338.

Sears A/C, 2 tons, good condition, \$150. Ted X-5285 or 482-8827.

Cycles

1975 Honda 550, extras include Windjammer, Sissy Bar, etc., must see to appreciate, best offer. Lupe X-5473 or 480-4178.

1973 Honda CB450, 17,000 miles, \$450. 482-7042 after 5 p.m.

Stereos & Cameras

19" Zenith Color TV, table model, solid state, AFC and chromatic, \$200. 474-2794 after 4:30.

New audio-technica elliptical cartridge, freq. response 10T030KHZ, tracks 3&4 to 1-3/4 grams, channel separation 2gdB. Roberto X-5841.

Musical Instruments

Clarinet in very good condition, \$100, Yamaha. Nilda Garza X-4776.

Baldwin Accrosonic, excellent cond., \$825.

Gibson Guitar, LGS, black, electric with hard/lined case, make offer. Joe X-6406 or 944-6513 after 6.

Pets

Save a puppy from the pound. AKC Cocker Spaniel, female, 9 mo old, shots, wormed, Must sell. Terry X-3035.

Free, half-miniature Schnauzer puppies, adorable males & females, 8 wks old. Mary X-3296 or 332-2350 after 6 p.m.

AQHA Mare, 18 mo old, FFA project, halter broken, color: bay, breeder: Gene Carver. Williams X-3338.

Miscellaneous

Attention deer hunters. Day leasing in Burnet County. Good dates available. Steve Hawkins X-2201 or 482-1832.

3 hp Briggs & Stratton 4-cycle engine in working condition, \$10. Earl X-3116 or 334-2354.

Live Thanksgiving turkey hens, 6 mo old, will dress out 20 to 25 lbs. \$10 ea. Mary Burck X-4215.

Girls bicycle, Murray 20", banana style, good condition, \$35. Kilbourn X-4402 or 482-7879.

26" 5-speed bicycles, girl's Sears Free Spirit and boy's Western Auto, \$60 ea. Mike Peterson X-4606 or 488-2185 after 4:30.

Beautiful diamond ring, 0.8 ct, lady's solitaire in yellow gold. Paul Richards 337-4748.

Parts for 14" Poulan chain saw, model 25AD, includes bar, 2 chains, case, \$30. 485-6423.

Wanted: Skateboard cones, need 2 dozen. Dave Dun X-4671 or 486-0808.

4 Goodyear steel belted radials (GR70x15), good condition, 12-15,000 miles left, \$50. Blucke X-3533 or 488-4188.

2 girls 24" bicycles, good condition, \$25 ea. Sanders 481-6928 or X-3458.

Home security available: will baby sit your home, vacation or extended leave, for free rent in garage or basement apt or empty condo, Clear Lake or NASA area preferred. 554-6058 after 5 p.m.

Sliding Glass Patio Door, used, curtain and trim included if wanted. R. White X-5031 or 482-7529.

Antique trunk, \$75; Regal china (Coral Rose), 63 pc set, never used, \$75; Realistic amplifier/AM-FM radio/8-track tape, BSR turntable, speakers (needs work), make offer. 944-6457 after 6 p.m.

Radio controlled Corvette Stingray, \$10; 7-ft delux fire retardant, Canadian Pine Christmas tree W/stand, \$15; metal bed frame, twin or double. \$8. John 488-0559 or X-4393.

Bucket seats (2), exc. cond., blue, fit med size cars/sm pickups, \$55 ea. Mollie X-5393 or 482-8932 after 6.

21" Admiral console TV, \$25; 12" portable TV, \$35; Good working cond.; Outdoor animal cage, \$10. X-6301.

Girl Scout Cadette skirt & tunic top, Size 14, exc. cond., \$7.50 for both. Pat X-2918.

Wanted: Out-of-print record singles/albums by Liz Damon & Orient Express. Statz X-5326.

Assorted mint U. S. commemorative stamps at 1 cent above face value ea., Man old issues, \$10 min purchase, good for Xmas gift. Jeff X-7429 or 482-5393 after 5.

Wanted: lawn tractor with mower deck, 10 hp. or larger. 488-3966.

Columbia gets thumbs up for rollout to VAB Nov. 23

Columbia got a thumbs up from Astronauts John Young and Bob Crippen as Orbiter 102 prepared to "roll out" to the Vehicle Assembly Building (VAB) in Florida. Rollout is only eight days off.

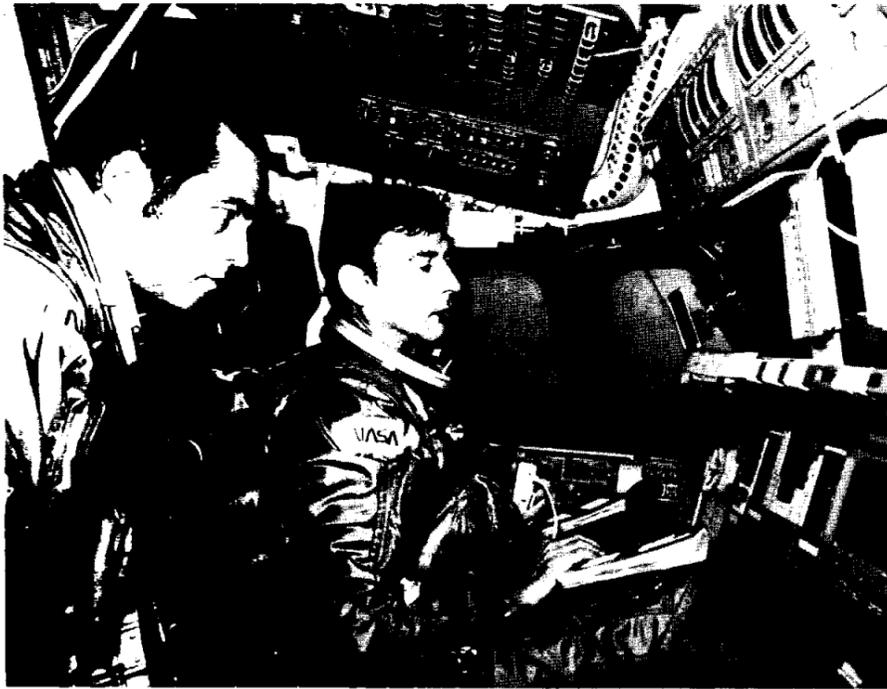
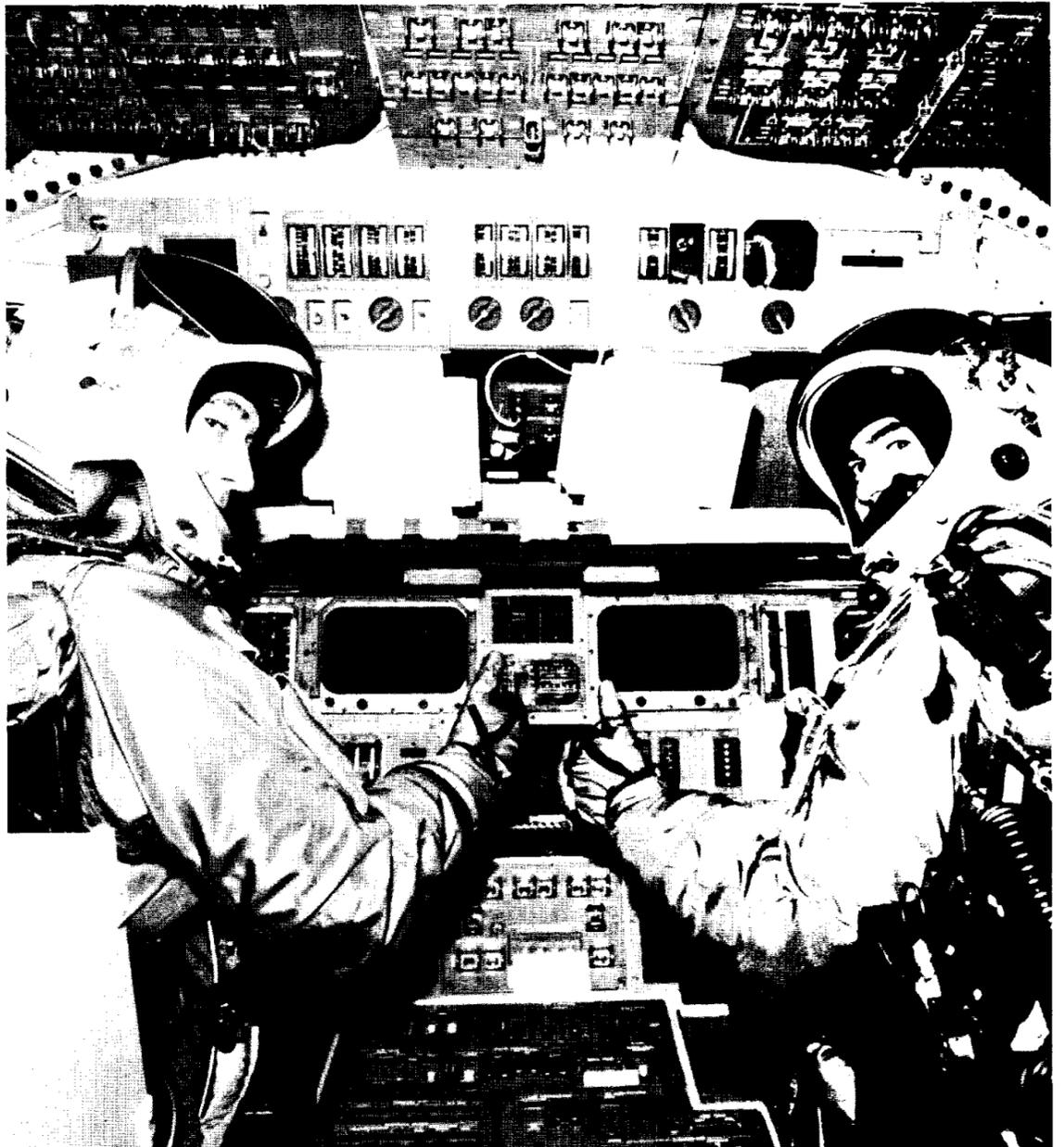
Kenneth S. Kleinknecht, Columbia vehicle manager, said that less than 300 tiles remain to be bonded to the vehicle and "everything looks very good" in meeting the scheduled date. A myriad of paperwork is still to be closed out before the vehicle is moved.

The three main engines were installed in Columbia and the external tank was mated to the twin solid rocket boosters.

A new date will be announced later for static firing the engines following the premature shutdown of the main propulsion cluster Nov. 3. Hardware inspection of test data is underway.

The planned 581-second test firing was terminated at 21 seconds when sensors indicated the high pressure fuel turbo pump's turbine discharge temperature had exceeded acceptable limits in the No. 2 engine.

The aborted test is not expected to impact the first flight which is scheduled for next March.



"PEP" kit proposed for extra Shuttle energy

A portable power and light station that would pump converted solar energy into the Space Shuttle Orbiter, doubling electric power and allowing month-long missions at a savings of millions of dollars, has been proposed by JSC engineers.

Named the Power Extension Package (PEP), the Shuttle solar cell array concept was developed at NASA's Johnson Space Center. It could be carried into space aboard the Orbiter, to be unraveled from its accordion fold into a 240-foot gossamer-like double wing.

Early Shuttle flights will receive electric power from three hydrogen-powered fuel cells offering payloads a maximum sustained 7 kilowatts (7,000 watts) for 7-day flights.

Length of early missions will be limited by the amount of fuel cell cryogenics (liquid hydrogen and liquid oxygen) also used for power during Earth orbit eclipse (on the dark side of each orbit).

"A Power Extension Package would increase to 15 kilowatts (15,000 watts) the electricity available to payloads and could lengthen missions to 45 days during maximum sunlight with the addition of crew consumables," said Jerry W. Craig, project manager.

"Compare this to adding fuel cell oxygen and hydrogen tanks weighing about 1,000 pounds a day of added duration, with no increase of power."

The additional available power would allow a 400 percent increase in experiments for seven flights including a German Space Agency payload—the first non-NASA Spacelab flight—Spacelabs 3 and 4 and two Department of Defense payloads. Depending on the number of experiments and their power requirements, it could double or triple the number of experiments flown providing at least four times as much data, said Craig.

The additional power in these missions would reduce fuel cell maintenance costs by about \$5 million and save an ad-

ditional \$15 million in fuel cells. The first five years of operations would save more than \$300 million.

The PEP kit, weighing less than 2,100 pounds, would be stored in an unused area above the Spacelab tunnel. It is a large flexible folded solar-cell array that is deployed from the cargo bay by the Orbiter Remote Manipulator System (RMS), refolded and stowed at the end of each mission.

The PEP kit travels with the Orbiter and operates at any altitude, making it ideal for other sortie operations.

When the orbiting vehicle is in sunlight and PEP is operating, fuel cells idle and conserve fuel.

In operation, the PEP kit is an extension of basic Shuttle Orbiter power system. It provides solar-generated electricity direct to common junctions between electrical circuits (bus-bars) and could provide up to 15 kilowatts to any payload or payload carrier.

The PEP kit includes a tracker that keeps twin solar array "wings" locked onto the Sun in any Orbiter orientation. Raw solar power is converted to regulated voltage.

Ezell Named Space Center Historian

Edward C. Ezell is the new historian at Johnson Space Center.

Ezell is the author of several history articles and papers on the space program including two narrative histories under contract for NASA: *The Partnership: A History of the Apollo-Soyuz Test Project*, and *On Mars: NASA's Explorations of the Red Planet, 1958-1978*.

Ezell replaces James M. Grimwood who retired. Ezell said he will continue the History Office tradition of maintaining the working historical archives, and he is eager to preserve the history of ongoing JSC projects.