



SL-4 COMMANDER AND FAMILY—Astronaut Gerald P. Carr poses for a picture with his wife JoAnn and their six children. Among the children are two sets of twins—James Adele (top right) and Jeffrey Ernest, (bottom left), 15; and (bottom center) Jessica Louise and Joshua Lee, 9. Jennifer Anne, 18 is at top left. John Christian, 11 is at bottom right.

Launching Of Skylab-4 Was Spectacular Event

The crowd in the viewing sites at Cape Kennedy, Florida waited with mounting anticipation. Meanwhile, JSC's Mission Controllers were just a bit tense, yet confident that all would go well. The final count began.

"9, 8, 7, 6, 5, 4, 3, 2, 1, we have a liftoff! The engine's building up to 1.6 million pounds of thrust. Skylab is moving slowly off the pad. It's cleared the tower." "Roger, tower clear, we're getting a roll program." "Thrust looks good on all engines. "Roger, smooth ride."

And so it began—the Saturn 1B rocket lifted off from Cape Kennedy on November 16 at 8:01 a.m. in what has been described as one of the most spectacular sights ever witnessed by man. Skylab 4 was "Go!"

Skylab 4 crewmembers Gerald Carr, Edward Gibson and William Pogue docked their com-

mand module with the workshop at 3:41 P.M. CST last Friday. They began activating the workshop early last Saturday.

The SL-4 command module, the heaviest ever launched at 13,456 pounds, carried with it a lengthy list of items required for crew activities, experiments, and repair and maintenance of the workshop systems. Included in the items transferred from the command module are 159 pounds of new food, 75 pounds of new EREP magnetic tape, more than 30 separate line items, including a 54 pound far UV camera for observing Kohoutek, and an 81-pound kit to repair the coolant loop.

The crew has been undergoing certain medical tests to assure that they remain in top physical health. Thus far, they have adapted well to their new weightless environment.

ROUNDUP

NASA LYNDON B JOHNSON SPACE CENTER

HOUSTON, TEXAS



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Special Camera to Snap Kohoutek

As the Comet Kohoutek approaches, passes by, and recedes from the Sun, streams through space at speeds exceeding 100,000 miles per hour, astronauts aboard the Skylab space station will use a special Far Ultraviolet Electrographic camera to photograph features not visible from Earth's surface.

The complex camera records light wavelengths too short to be seen by the human eye. It will record the presence of hydrogen, oxygen, carbon monoxide and perhaps other substances in Kohoutek's cloudlike head and tail.

The SL-4 crew will use the special camera more than a dozen times as the Comet

approaches, passes by, and recedes from the Sun.

While the Comet is at some distance from the Sun, the camera will be pointed through a scientific airlock in the wall of the orbiting laboratory.

By using a moveable mirror system and rotating the space station, Skylab's new camera will be able to photograph the comet around the side of the 100-ton vehicle.

On space walks scheduled for December 25 and 29, just before and just after the comet passes closest to the Sun, the camera will be taken outside and fastened to one of the trusses that

[Continued on Page 4]



POGUE AND FAMILY—Astronaut Pogue stands with his wife Helen and their three children in the Pogue home near JSC. The children left to right are Thomas R. 16, Layna, 18; and William, 20.

SL-4 Crew Undertakes Gypsy Moth Research Project

One thousand gypsy moth eggs in two special vials were launched aboard the third and final Skylab mission.

The first moths in space are part of a research project sponsored by the U. S. Department of Agriculture's Agricultural Research (APHIS) in cooperation with NASA.

Agriculture scientists are trying to find out if the state of weightlessness might be the key to altering the gypsy moth's life cycle. If weightlessness does prove to be the factor, the key point may be found in rearing insects by the millions and thus controlling a whole class of insect pests with similar life cycles.

USDA researchers have long known that rearing millions of insects, sterilizing and releasing them to mate native insect populations could eventually eliminate the pest.

Because of the nature of the insect, the gypsy moth may be a possible candidate for this type of biological control called "ster-

ile male technique".

Although gypsy moths are active for about four months, their spontaneous hibernation period or "diapause" stage lasts 150-180 days -- considerably dragging out the period they must be held and processed in the laboratory. If weightlessness were found to be a key to reducing the diapause time, large numbers of insects could be reared at will and be available for release of sterile males in infested areas.

The gypsy moth eggs were sent aboard Skylab are enclosed in a special container and separated into two lots -- part laboratory reared and part wild insects collected in naturally infested areas. A control group for gypsy moths eggs will be monitored on the ground and should hatch normally next spring. For weightlessness to be the sought-after answer, the eggs in space would have to hatch appreciably earlier than the control eggs on Earth.

Insect researchers of ARS and

APHIS have tried many experiments in terminating diapause but so far have been unsuccessful. And for a number of years scientists have been interested in weightlessness as a possible factor to activate growth in hibernating insects.

The gypsy moth is a serious

threat to the nation's forest resources. While the insect is in its caterpillar stage (May-June), it eats the leaves of trees, sometimes killing them.

The insect presently infests the northeastern United States-- Maine, New Hampshire, Vermont, Pennsylvania, New Jer-

sey, Maryland and Delaware. In 1973, it defoliated approximately 1.75 million acres of trees. USDA and the cooperating states are trying to suppress the gypsy moth before it becomes destructive in the valuable hardwood forests of the southern and central regions.



GIBSON AND FAMILY—Scientist-Astronaut Edward Gibson sits with his wife Julia and their children, left to right, Julie Ann, 5; Janet Lynn, 13; Joseph Michael, 2; and John Edward, 9.

Nurses Finish Weeks Of Medical Testing

Twelve women recently completed five weeks of medical tests at NASA's Ames Research Center in Mountain View, California, in which they were spun, examined and studied in a research project to help set medical standards for candidates for flight on the Space Shuttle scheduled for operation at the end of this decade.

The current study is one in a series which have been conducted over the past few years—investigating responses to space flight conditions, looking forward to the time when persons other than pilot-astronauts will be making these flights.

As part of this experiment, eight of the 12 Air Force flight nurses had two weeks of total bedrest in the weightlessness simulation, with the remaining four acting as ambulatory control subjects.

The relatively low acceleration forces, which will be experienced during long duration Shuttle reentry into the atmosphere, were simulated in tests on the centrifuge. In line with findings from earlier tests with other subjects, the period of total bedrest decreased tolerance to acceleration on the centrifuge.

For the first two weeks of the program, the nurses underwent orientation and preliminary medical testing to establish baselines against which to compare their performance after two weeks of total bedrest.

In addition to testing on the centrifuge, the subjects also underwent cardiovascular and endocrine testing with close

check kept on biorhythms, body chemistry and circadian changes in body temperature.

During the bedrest period, the subjects had to remain horizontal at all times, except during meals when they were permitted to raise themselves on one elbow. The ambulatory controls helped to chart data from the study during this time.

Television, stereo, books, other entertainment and a lot of needlework by the participants helped make non-testing periods less wearing.

The horizontal position was enforced even when the subjects were taken to the University of California at Berkeley where they were placed in a total body counter to have potassium levels measured. They were transported on stretchers in station wagons.

Because of the need for careful biochemical determination, diet was controlled carefully and such items as vanilla, bananas, pineapple, coffee and tea were forbidden.

Among the biomedical measuring devices developed at Ames, which were used in the tests, was a capsule which radiates exact temperatures from inside the body to laboratory recording devices.

In the final week of the study, tests focused on how well and fast the subjects recover from the normal degradation resulting from the total bedrest.

The 12 test participants are all U.S. Air Force flight nurses, 10 from Reserve units in the California area and other Western states.



SHUTTLE CANDIDATES—Pictured above are the 12 nurses who participated in medical tests at Ames Research Center to help set up medical standards for candidates for flight on the Space Shuttle. Left to right (1st row) are Marina Van De Graaff, Bonnie L. Kultgen, and Frances F. Cappa. (2nd row) Jean Parks, Carrol French, Felicia Benton and Lorri Schoen. (back row) Sylvia DeJong, Judith A. Keeton, Marcia Pack, Lucy Zimmer and Kathy Queiser.



PRESSURE EXPERIMENT—One of the volunteers is prepared for the lower-body negative pressure experiment which tests the extent of cardiovascular changes or deviations after a two-week bedrest period.



PRISMATIC GLASSES—These glasses permit a person who has to remain completely horizontal to read without raising the upper portion of the body.

ASTP Crew Visits Soviet Union

The United States flight crew for the Apollo-Soyuz Test Project is visiting the Soviet Union for initial familiarization with Soyuz spacecraft systems. The crew left November 18 and will return December 1.

Discussions of the flight plan, including joint crew activities and onboard documentation are planned also. Most of the activities will be conducted in the Y.A. Gagarin Centre of Cosmonaut Training at Star City, near Moscow.

Astronauts making the trip include the prime crewmen, Brig. Gen. Thomas P. Stafford, commander; Vance D. Brand, command module pilot; and

Donald K. Slayton, docking module pilot; backup crewmen Capt. Alan L. Bean, Capt. Ronald E. Evans and Maj. Jack R. Lousma; support crewmen Lt. Col. Robert F. Overmyer and Lt. Col. Karol J. Bobko; and Capt. Eugene A. Cernan, Special Assistant to the U.S. ASTP Technical Director.

Soviet cosmonauts who will take part in the July, 1975 earth-orbital mission underwent similar familiarization with the Apollo spacecraft at JSC last July. Crewmen from both countries will exchange several visits next year for specific training on joint mission events.

ROUNDUP

NASA LYNDON B. JOHNSON SPACE CENTER

HOUSTON, TEXAS



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HOUSE-HOLD ARTICLES

23" Sylvania color TV, nds wrk, \$50. Sue Jear. HU 3-3431.
 Ampex 8400 w/speakers, include AM/FM MTPX & 8 track player equipped for discrete 2 or 4 channel reproduction. New in factory cartons, \$150. Rowe, 331-3455.
 Antique iron pots, butter churns, hand irons, glass-lid pint & qt. jars, brass plated 40-qt milk cans, 471-6798.
 Queen size mattress and bx springs, 6 mos old, both for only \$100, 944-6988 aft 5:30 pm.
 Packard Bell color tv, 19", table model, prfct cndn, less than 1 year old, \$250, 944-6988.
 Philco stereo cnsl, wooden cabinet, \$125, 944-6988.
 Sewing machine, cnsl model, prfct cndn, used twice, cmplt w/ all attachments, orig pri. \$225, now \$150, 944-6988
 2 hi-fi spkrs, Sensen, 12", 3 element, coaxial, type cx, walnut encl, floor stands, \$32.50 ea, 645-7329 aft 5 pm.
 Ranch Oak/slate top coffee table, \$30, lines off-white custom drapes, 3prs, \$20, 333-3897.
 25" Admiral color tv, full cnsl, contemp styling, \$100, 488-1892.
 125 sq yds. beige/sculptured, used carpet and pad, nds cleaning, not badly worn, \$150, 488-2597.
 10 cu ft Norge refrig, works fine, \$30, 334-2993.
 Pair of matched rust colored armless sofa chairs, \$15 each, 944-8717.

VEHICLES

10 spd bike, xint cndn, 3 mos old, \$50, 334-2419
 72 Westfield tent trailer, Ward, \$325, 485-1486.
 Bike, \$10, 20" boys or girls (switchable), red, training wheels available, Zrubek, 333-2549 aft 5:30, girls' 24" bike, blue, AMF, 333-2549 aft 5:30.
 69 Buick Le Sabre, A-1 cndn, \$925, Forsyth, 534-3113.
 55 T-Bird classic conv, gd drivable cndn, nds work \$2000, Luke, 539-2325 aft 6.
 Boys 20" bike, gd cndn, \$7, Smith, 488-3238.
 64 Chev. Impala, V-8 auto, R&H, 4 nw tires, runs gd, \$150, 534-4173.

70 Honda CB350, 10,600 mi, bkrst, lug rack, crash bar, \$425, 485-1309.
 Honda mini-bike, 50cc, gd cndn, \$150, Cernan, 483-3469.
 71 Honda Cb175, 10,500 mi, \$330, 485-1309.
 65 vw, damaged front end, running gear and motor prfct, gd for hunting or dune buggy, \$175, McElya, 482-1542.
 Penton 100 MX, \$350, Yamaha 90, \$200, both xint cndn, xtras for both, Blackshear, 946-8312 or 946-2311.
 69 Sta Wgn, Dodge Coronet 440, 9-passenger, air, auto, power, radial tires, gd cndn, \$1150.
 Carabella racing motorcycle, 125cc, xint cndn, \$375, Potter, 474-4011.
 69 Corvette, T-top, 427, 4 spd, nw tires, pwr, air, 30.000 mi, \$3300, 944-2777.
 71 Honda 350cc, extended front end, customized, gd mi and xint cndn, \$550, 4 82-2589 aft 5.

PROPERTY AND RENTALS

Bayfront home single or double family unit, xint view, many xtras, 471-6798.
 One-half acre lots, Roman Forest section III, priced below market, Lake Conroe waterfront townhouse lots in Cape Conroe Section I, 471-6798.
 Lot on 75 sq mi Lake Palestine, looking out ovr 3-mi space, trees, hi, across str from lake front property, Brenton, 483-2634 or 488-4372.
 2 lots on Blanco River above Wimberly water well, 2.07 acres, 370 ft river frontage, Prince, 2171 or 649-7852 aft 5 pm.

PETS

Pointer puppies, beautiful, intelligent pets, superior bird dogs, ready to wrk, reg, futurities, sired by sire of last year's pheasant champ, 332-3671.
 Beautiful AKC Lhasa Apso, \$75 to right home, resembles sm sheepdog, devoted pet, xint watchdog, Polly, 2021, 488-0192, 479-2190.
 5-yr-old male Bordu Collie, free, x-4321.
 AKC blonde Cocker Spaniel puppies, \$75 each, 946-4315 aft 5:30 pm.

BOATS

15 ft fiberglass Lone Star w/ xint 69, 55hp Johnson outboard and xtras, nw trailer wiring and lights, enjoy fall for

\$1100, or bst ofr, Allgeier, 333-4627.
 14' Hobie Cat w/ trailer, xint cndn, stored inside \$1095, Bently, 333-3001.

WANTED

ACE Welder, will trade Acetylene components, Horton, x-5270 or 474-2102.
 Pre-1965 dimes and quarters, will pay \$1.70 per \$1. face value, Lafferty, 2666 or 485-1997 aft 7.
 Used 18-20 hp outboard motor, used childrens water skis, Haines, 4971 or 941-2495.
 Guitar for beginner, Conwav, x-2948.

MISCELLANEOUS

Enlarger, Durst 606, subminiature to 2 1/4 x 2 1/4, xint cndn, \$75, Handly, 4776-482-7041.
 Black/Decker Industrial Router/Planner kit w/ metal case, li nw, \$90, Sears motor, 1 1/2hp, industrial 120.240 v, \$50, Sears Router, industrial, \$35, 471-6798.
 Cornet, li nw, \$100, 334-2993.
 4 Michelin steel radial tires, 185-14, replaces 7.35-14, 12,000 plus miles remaining, \$40, Ron, 5221.
 Erectable umbrella-type aluminum clothesline, gd cndn, \$5, Smith, 488-3238
 Strollee Stroler, gd cndn, \$12, Lewitt, vacuum cleaner, gd cndn, \$15, 946-6658.
 Typewriter, \$15, manual portable, w/ case, Packard model STL, made in Italy, 333-2549 aft 5:30.
 2-man pup tent w/ floor and mosquito net, \$10, Bently, 333-3001.
 Antiques, primitive pine washstand, hand carving, gd cndn, \$55, occasional oak table, carving \$25, Mary, 487-0820 aft 5.
 Baby car seat, Penny's, 2 position, hardly used, \$8, Black, 488-2735.
 Cornet, \$60, 485-1486.
 Ludwig drum set, 8-piece complete, gd cndn, 488-1326.
 Collapsible wheelchair, li nw \$75, Allison, 471-0654.
 Lunar landing training vehicle, LLTV, flight patches, \$3es or 2 for \$5, x-7474 or 333-2952.
 Christmas tree decorations, all red, make offer, 944-8717.
 6 x 36 inch belt sander-bench mount w/ 6" disc sander attachment, \$35, 944-8717.
 2-yr old Yamaha console piano, li nw, Mistrot, 337-2991. 191.

Energy Conservation Stressed At Center

The appearance of the Center at night is evidence of only one part of an extensive program to reduce the consumption of all forms of energy at JSC. The program has been underway for several months now and while the results are very substantial, Dr. Christopher C. Kraft this week announced a major increase in the scope of the program. The measures announced this week were in response to the implementation instructions issued by the Office of Energy Conservation, Department of Interior, based on the President's energy message of November 7, 1973.

Joseph V. Piland, Director of Center Operations, has the central responsibility for defining and implementing the program. In discussing the new measures, he pointed out it was important to keep them in context with actions which had already been taken. These are briefly reviewed as follows:

—The level of street lighting has been reduced by one-half.
 —The level of parking lot lighting has been reduced by one-half.
 —The level of hallway lighting has been reduced by one-third.
 —Parking lot lighting has been discontinued after 10 p.m. on workdays and weekends and holidays.

—Building lighting has been restricted to 10 p.m. and discontinued on weekends and holidays.

—Air conditioning has been restricted to working hours in certain areas.

—A variety of changes have been introduced in the operation of the air-conditioning system.

According to Piland, the full benefit of the measures taken to date should reflect more than 10 percent reduction in the Center's energy budget. More specifically, the expected savings are 17,960,000 kilowatt hours per year of electricity and 180,000 000 cubic feet per year of natural gas. In even more familiar terms, that is enough electricity for 860 homes, enough gas for 1,480 homes, or in combination enough total energy for 1,250 homes of the size and convenience levels generally found in the Bay area.

While the program to date has been effective, it is not enough and has for the most part been accomplished without serious impact on the working conditions, accommodations, or habits of Center personnel. The additional measures which are now necessary will, by contrast, have a direct effect on the work environment.

Dr. Kraft emphasized it is vitally important that all employees understand the steps taken are not designed to constrain or discourage the ambi-

tious and aggressive attitude which is a trademark of the staff of this Center. By the same token, that same virtue lends itself to improving operational efficiency which is the underlying objective of the energy program. With that background, the following additional measures are to be implemented, effective immediately.

—Therostat settings are to be maintained at settings that will maintain temperatures no lower than 78 degrees F. for cooling and no higher than 68 degrees F. for heating.

—All NASA controlled highway vehicles are to be limited to a maximum speed of 50 m.p.h.

—All work area lighting levels will be reduced by approximately one-third.

—All work area lighting will be secured at the end of the workday and is the responsibility of the area occupants.

—All work area cooling will be secured at the end of the working day, critical equipment areas excluded.

—Janitorial services will be accomplished during the regular workday to avoid building lighting solely for this purpose.

—The security force will be authorized to secure building lighting after 8 p.m. unless supervisory notice has been given to the contrary.

—Parking lot lighting will be further restricted and will be secured at 8 p.m.

—Mission critical areas are exempt during mission periods.

Piland stated, "The effectiveness of the measures taken at the site will only partially fulfill the objectives of the Center's emphasis on energy conservation. Encouraging the entire staff as individuals to institute similar practices in their personal circumstances is probably just as important. The beneficial suggestions which are household consumption should be taken seriously. It is a mistake to underestimate the effect of small contribution."

Some Believe There's Life On Jupiter; Others Say No!

As man learns more about his universe, the question of life beyond Earth's thin biosphere becomes of greater concern.

Even though scientists are divided on the subject, all agree a lot more study is needed before anyone can be sure.

Pioneer 10, now about 34 million kilometers (20 million miles) from the great planet, will give man his first close-up look at Jupiter in December. But even the most optimistic scientist doesn't think Pioneer 10 will find life.

What Pioneer 10 will do -- and scientists consider this the first big step -- is give us a clear idea of conditions on Jupiter. It will wipe out a lot of conjecture about Jupiter and its environment, and substitute facts. The answers Pioneer 10 will return as it passes within 81,000 miles of the planet's cloud tops on Dec. 3 may help determine the possibility for life there. It will not settle the argument.

The atmosphere of Jupiter is known to contain methane, ammonia, and hydrogen -- as well as, almost certainly, water, and helium. Add to that the relatively recent conclusions that the original atmosphere on Earth -- when our home planet formed four billion years ago was - methane, ammonia, water, and hydrogen. These facts strengthen the arguments on the side of life.

Until recently, however, opponents of the life-on-Jupiter thesis had a powerful argument. The Jovian atmosphere was believed to be ice-locked in the near-absolute-zero chill of outer space. Solar energy radiation at Jupiter's distance from the Sun (half a billion miles) is only 1/27 that at the Earth. But Jupiter was then discovered to have its own internal heat source and almost certainly vast regions of room-temperature atmosphere favorable to some form of life.

Another argument against life was the extreme alkalinity of Jupiter's environment. Many believed nothing could survive.

Then two scientists at NASA's Ames Research Center found unnamed bacteria living—swimming, growing, and reproducing—in a highly alkaline solution of sodium hydroxide. Biologists Paul Deal and Kenneth A. Souza found the organisms in an alkaline spring in Northern California.

But that was sodium hydroxide. Those same organisms can't survive in high concentrations of ammonia—equally alkaline—that exist on Jupiter. But if they can survive in this alkaline environment, perhaps similar organisms could survive the comparably alkaline ammonia concentrations of Jupiter.

Dr. Cyril Ponnamparuma of the University of Maryland has performed experiments that

shed light on the Jovian environment and the possibility of life. While leading Ames Research Center's Chemical Evolution Laboratory, Dr. Ponnamparuma mixed a chemical soup identical to Jupiter's atmosphere, and exposed it to electric discharge, much like the Miller-Urey experiments. Dr. Ponnamparuma's studies indicate that Jupiter's Great Red Spot could be a giant cauldron, brewing the precursor elements of life.

Contrary evidence has been spelled out by Dr. Gerard P. Kuiper of the University of Arizona's Lunar and Planetary Laboratory. Dr. Kuiper says the Jovian Red Spot's color is caused by chains of inorganic (non-living) chemical compounds.

Dr. Kuiper has spent his long career studying the planets in great detail and believes wholeheartedly that, "While there may be some chance of finding life on Mars, it is a chemical impossibility on Jupiter."

As with any major question, the discovery of life on Jupiter—or that it does not exist—must await further evidence from spacecraft. Some future projects include Jupiter orbiters and atmospheric entry probes.

Pioneer 10 will fly within 81,000 miles of Jupiter's cloud tops on Dec. 3. Pioneer 11, a near-twin, will arrive at Jupiter a year later, on Dec. 5, 1974.



QUIT BUMMING AROUND...
 ...SUGGEST SOMETHING!!!

SL-4 Crew To Expand Knowledge of Earth's Resources

Astronauts Gerald Carr, Edward Gibson and William Pogue are well equipped to survey the Earth during a final Skylab mission that could last nearly three months.

Their training included 20 hours of special lectures on Earth observations and they took along a detailed handbook for viewing Earth from space and the largest store of film and computer tapes ever supplied for a Skylab mission.

Meanwhile, the 20,000 Earth photographs and 25 miles of computer tapes obtained during the two previous Skylab flights will be undergoing extensive analysis by 137 Principal Investigators and their staffs in the United States and 18 foreign sophisticated techniques to use photographic and electronic data provided by Skylab's remote-sensing experiments.

The third Skylab astronaut crew took about 50 vertical-looking passes using the Earth Resources Experiment Package (EREP), a battery of six remote-sensing devices carried aboard the space station. Plans called for only 30 EREP passes, but a longer mission -- up to 85 days -- would permit the additional survey time.

To support the longer mission, the crew carried 6 rolls of film for the large Earth Terrain Camera, enough for 2,400 detailed 5-inch photographs of the planet's surface. The command module that ferries the new crew up to the space station is also stocked with 42 cassettes of 70mm film for the six-camera array of the Multispectral Photography Facility-- enough to make nearly 17,000 pictures with filtered, black-and-white, infrared, and color film.

Although 25 reels of magnetic computer tape were stored on the Skylab space station before its launch May 14, only seven remain. The second crew used 13 reels -- about 18 miles -- of the 28-track computer tapes as they completed a total of 39 EREP passes, 13 more than originally planned. The final command module carried 7 additional reels to the space station, for a total of 14.

During the two Skylab missions completed so far, some data has been acquired for all 48 continental U. S. states and 34 foreign countries. The Skylab flights also collected data on the Atlantic and Pacific Oceans, the Gulf of Mexico, the Caribbean and Mediterranean Seas, the Sea of Japan, the Gulf of Aden, and the South China Sea.

During the first Skylab flight, data was collected for Principal Investigators in Bolivia, Brazil, Canada, Mexico and Nicaragua. Photographic and electronic data from the second flight will be forwarded to Principal Investigators in 13 additional countries: Argentina, Australia, Chile

France, Germany, Israel, Italy, Japan, Mali, Malaysia, Switzerland, Thailand, and Venezuela.

Earth Resources aircraft from JSC and Ames Research Center, the National Oceanic and Atmosphere Administration, the University of Michigan, and Colorado State University gathered supplementary remote-sensor data during 136 flights in support of U. S. investigations.

In addition, principal investigators on the ground recorded information on weather conditions, soil moisture, water turbidity, vegetation, geology, and related disciplines to correlate to the photographic and electronic sensor data returned by Skylab.

Data has been gathered for more than 90 per cent of the Earth Resources investigations, with more than 75 per cent of the specified test sites already surveyed to minimum require-

ments.

During the first and second Skylab manned missions, photography and electronic data for a tremendous variety of studies were accumulated aboard the space station and returned by the crew for extensive processing and cataloging by personnel at JSC.

Included in the surveys were research projects in geology that could lead to the discovery of potential new sources of coal, oil, and essential minerals. Principal Investigator M.L. Jensen of the University of Utah reported in September that his study of Nevada geology had uncovered a region likely to contain a significant mineral deposit. Partial information on potential geothermal energy resources in the Western United States and Mexico has also been gathered by Skylab.

Volcanoes from Nicaragua to Italy, and earthquake fault zones in California and several other states were test sites for geological investigators, including Troy A. Crites, a student experimenter from Kent, Washington.

James H. Wray of the U.S. Geological Survey will attempt to calculate population growth since the 1970 Census using Skylab data. During the first two manned flights, 13 U.S. urban areas were photographed for this study: Asheville, North Carolina; Aurora and Peoria, Illinois; Cedar Rapids, Iowa; Denver, Colorado; New Orleans, Louisiana; Phoenix and Tucson, Arizona; Pontiac, Michigan; Riverside-San Bernardino and San Francisco, California; Salt Lake City, Utah; and Washington, D.C.

Skylab investigators in Mali will use data from the first

flights to search dry plain regions for new water sources. The photography may provide clues to reversing the southward expansion of the Sahara Desert, which has reduced pastureland and contributed to the famine produced by repeated droughts.

William Hart of the U.S. Department of Agriculture has used photographs brought back by the first Skylab crew to pinpoint areas along the Texas-Mexico border where insect pests including fire ants from the U.S. and fruit flies from Mexico, might cross to infect new areas.

Data for mapping projects in ten nations of the western hemisphere were gathered on a number of EREP passes, including several passes during which the space station remained in solar inertial attitude, with its sensors pointed obliquely at the Earth.

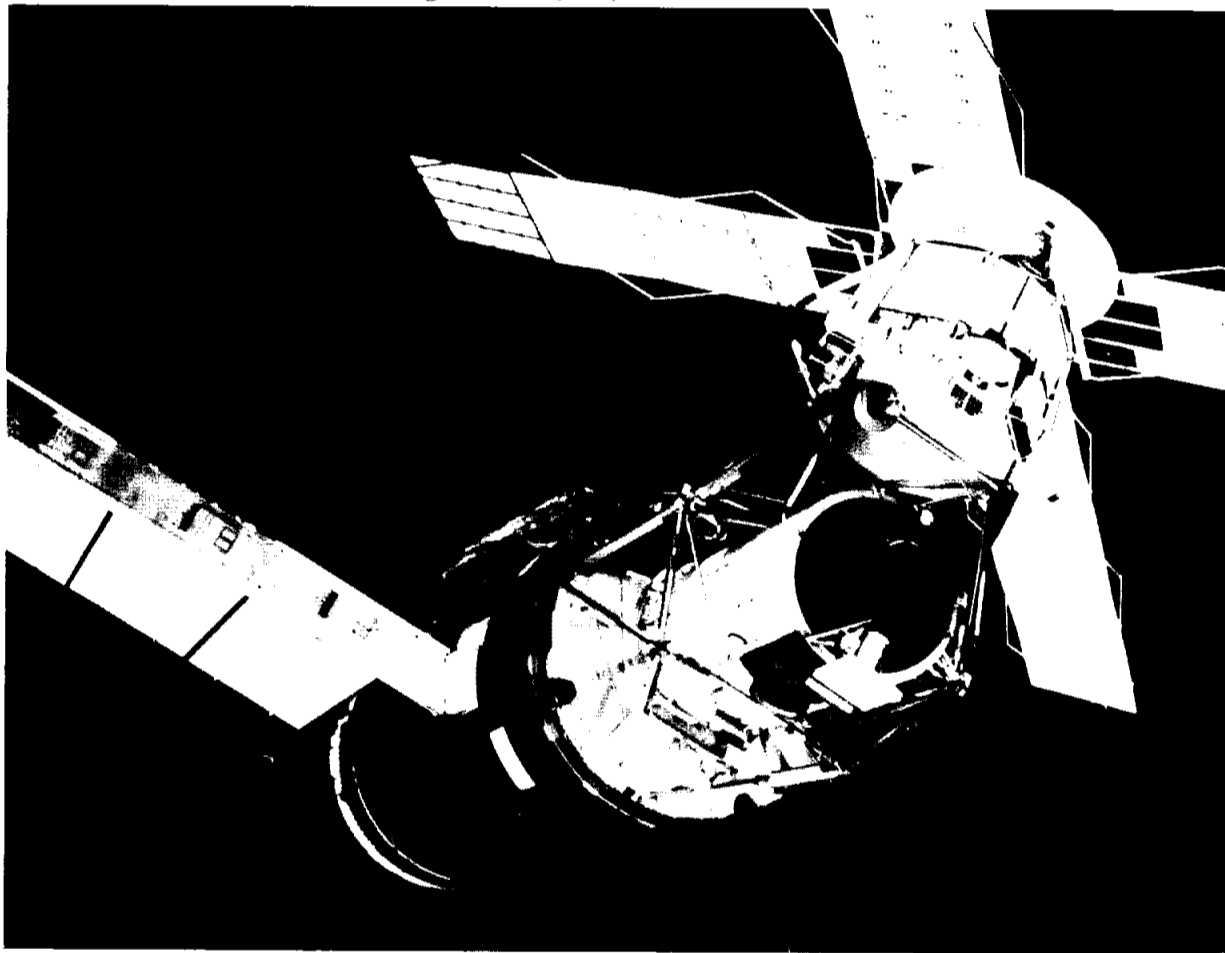
Studies of sea conditions, sedimentation, and marine biology were supplied with information by Skylab's early flights. During the second mission, the millions of tons of seaweed in the Atlantic Ocean's Sargasso Sea were surveyed by the EREP instruments.

The final Skylab flight will concentrate on seasonal changes, the development of sea and lake ice, snow cover patterns, changes in vegetation in the northern and southern hemispheres, and major storms, particularly below the equator.

In addition, data will be sought for many investigators conducting agricultural, forestry, urban and regional planning, and pollution studies--in which information must be acquired at several separate times during the year.

Skylab's three space rookies are the best trained of all the Skylab crews in the use of hand-held cameras and in visual observations of Earth phenomena. Nearly 2,000 frames of film are available to them for photographing Earth with their 35mm and 70mm cameras. The crew members, trained by more than a dozen Earth scientists and members of previous Skylab and Apollo crew, are expected to substantially increase man's ability to observe Earth processes and to record them from a platform above the atmosphere.

The visual observations of sand dunes, volcanoes, ocean waves, cloud forms, geological features and the like will not only support dozens of scientific projects underway on the ground, it will also pave the way for researchers who may observe Earth in the 1980's.



ANTENNA REPAIR- Before the first EREP pass of the final Skylab mission can be undertaken, the antenna (bottom circular device on space station) for the microwave radiometer- scatterometer- altimeter (S193) must be in good condition. The crew worked on the instrument during their first EVA.

Camera To Photograph The Comet Kohoutek (Continued from Page 1)

support the solar telescopes. The astronauts will also photograph the Comet Kohoutek on a third spacewalk, just a few days before they return to Earth.

Photographs taken outside the space station will provide a broader view than those taken from within the laboratory. Using the scientific airlock and articulated mirror system, the camera's field of view is limited to 7 degrees. Outside, the field of view is expanded to 20 degrees.

Inside the space station, the camera is attached to the articulated mirror system installed in the scientific airlock. One of the astronauts vents the S201 sealed container through a hose for at least 30 minutes, to produce a vacuum inside.

After the space station and mirror system are arranged to

photograph the comet with the S201, the astronaut will push a button to begin the camera's automatic operation.

Light entering the camera must first pass through one of two filters: one admits light wavelengths primarily associated with hydrogen while the other transmits wavelengths associated with oxygen and certain molecules. A sequence of four photographs of hydrogen emission, with exposures from 1 to 15 seconds is followed by four photographs of oxygen emission, with exposures from 3-107 seconds.

A five-inch mirror concentrates the filtered light on a photocathode, which generates electrons and accelerates them toward the 35mm film. Between the cathode and film, a strong magnetic cylinder focuses the

electrons, which pass through a thin, light-proof membrane composed of aluminum and Mylar to expose the film frame.

Two film packs, with a combined total of about 350 frames, have been supplied for photographing the Comet Kohoutek.

Skylab's new electronographic camera is extremely sensitive and must be handled with special care.

The greatest danger is that the instrument may be inadvertently pointed at the Sun. Sunlight could burn a hole in the photocathode, leaving an unexposed dot about the size of a pinhead on every later film frame.

When not installed in the airlock, the sealed container must be filled with dry nitrogen to prevent moisture from degrading the photocathode.

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