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NEW ASTRONAUT CANDIDATES REPORT TO HOUSTON

Thirty-five new astronaut candidates reported to NASA's Johnson Space Center on July 10, 1978, to begin a two-year training and evaluation period. And no time was wasted, as formal training began Tuesday, July 11 with all 35 participating. Activities scheduled included aircraft life support and ejection seat training for the T-38 aircraft, aircraft physiological training and T-38 aircraft systems and operations.

This 35 includes the first six women and three blacks to be given astronaut roles in the American space program. All 35 join the 27 present U. S. astronauts, who will fly the early missions.

The Air Force in 1967 selected a black, Maj. Robert H. Lawrence Jr., as a candidate for its Manned Orbiting Laboratory, which was to have conducted military space research. That operation, which was not connected with NASA's astronaut program, never got off the ground. Later that year, Lawrence was killed when an F 104 Starfighter he was piloting crashed, after a routine training flight in California.

With the reporting of these 35, new dimensions are given to the Shuttle program. Up to now, it has focused primarily on machinery. There was a long engineering effort to design and build the Shuttle itself. Then came the test flights with the Shuttle piggyback on a Boeing 747 and that dramatic moment when the Shuttle was released to glide to a successful landing on its own in the California desert.

These 35 are properly described as diverse. They include the first women, the first blacks, one man of Japanese descent and the first mother. Their backgrounds include test pilot, biochemistry, optical physics, engineering and astronomy, just to name a few.

Two years of hard work are ahead for this group. And we welcome them each and every one.

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SKYLAB IN THE NEWS AGAIN

In the last issue of The Space Log we gave an up-date on the news of Skylab and its reactivation. Those earlier preparations by scientists at the Johnson Space Center in March paved the way for the latest activities.

On June 8, JSC scientists turned on two big gyros which played a key role in the next few days' maneuvers to prevent Skylab from tumbling to Earth. It took about 12 hours for the two gyros to reach their operating speed of 9,000 r.p.m.'s. Three gyros are aboard the craft, but one failed during the final Skylab manned mission in November of 1973.

On June 9, the scientists were successful in maneuvering Skylab so that the solar panels generate electricity to power the craft. Then on June 11 a final maneuver was made. After achieving control at JSC over the orbiting craft, the scientists placed it in a position so that it would move parallel to the surface of the Earth with the craft's small end facing forward. This position minimizes the drag on Skylab as it encounters the thin fringes of the Earth's atmosphere. By doing that, the life of the space station should be extended until astronauts aboard a planned Space Shuttle can reach it in the fall of 1979.

NASA plans for astronauts carried up by Space Shuttle to attach to Skylab by remote control a devise called a "teleoperator", which has a small rocket engine. This engine will be used to boost Skylab up to a safer orbit or to put it into a controlled re-entry so that it will crash into the ocean.

AND THEN IT HAPPENED....On July 9, between 12:09 and 3:14 p.m.. an electrical malfunction occurred and Skylab went into "spin orbit" again. The scientists at JSC spent Sunday and Monday analyzing methods to correct it. It really put the craft back into the position it was in two months before.

Then on July 20, JSC personnel regained control of Skylab and performed laboratory simulation tests, in preparation for a maneuver that would again place the 85-ton satellite into a stable position. On July 25, 1978, JSC scientists won out. Skylab was put into a stable condition and streamlined minimum drag attitude, with its small end facing the direction of flight. Then it responded to 35 separate commands from Skylab Control at JSC.

Now it is a waiting game....to see if a Space Shuttle can reach the orbiting space station and employ one of the two alternatives before it takes the initiative itself and tumbles back to Earth when and where it wants to.

PIONEER VENUS MISSION

Both of the Pioneer Venus spacecraft have been launched and are on their way to the cloud-shrouded planet Venus. Their mission is a detailed scientific study of Venus. These flights are the first ones devoted primarily to a study of the atmosphere and weather of another planet on a global scale. Both flights will employ the largest number of vehicles ever used in such studies and make measurements at the greatest number of locations.

PIONEER VENUS 1....It was launched from Cape Canaveral, Fla. at 9:13 a.m. EDT, May 20, 1978. After a 400-million mile journey this satellite will be put into orbit around Venus December 4, 1978. Pioneer Venus 1 is an Orbiter and upon arrival it will follow a highly-inclined (75-degree) twenty four-hour orbit so that the spacecraft events are timed with those on Earth. It will make daily pictures in ultraviolet light of Venus' clouds for studies of their four-day rotation.

Experimenters will use precise orbit measurements to chart Venus' gravity field for calculation of planetary shape and density variations. The 12 orbiter scientific instruments will make a variety of other remote-sensing and direct measurements of the planet's atmosphere and surrounding environment.

The Orbiter's primary mission of eight months in Venus orbit will cover one complete rotation of Venus on its axis---243 Earth days. It circles the Sun in 225 days.

PIONEER VENUS 2....Riding atop an Atlas Centaur rocket, Pioneer Venus 2 was launched at 3:30 a.m. EDT from Cape Canaveral, Fla. on August 8, 1978. Its journey to the Planet Venus will be two hundred and twenty million miles and will arrive at its destination on December 9, 1978.

This second of two Pioneer spacecraft is a Multiprobe and designed to measure directly Venus' dense, searing atmosphere from top to bottom. Venus' atmosphere at the surface is 100 times as dense as Earth's and hotter than the melting points of lead and zinc (900 degrees Fahrenheit).

Pioneer Venus 2 is made up of a transporter bus, a large probe craft (The Sounder Probe) and three identical small probe spacecraft (the North, Day and Night Probes). The 8-foot diameter structure cylindrical bus, contains most of the spacecraft support systems. The four probes are launched from the bus toward Venus. Within the bus cylinder, a thermally-controlled equipment compartment houses instruments, communications and data-handling systems, as well as navigation, orientation thruster and power systems. The exterior of the bus cylinder is covered with power-generating solar cells.

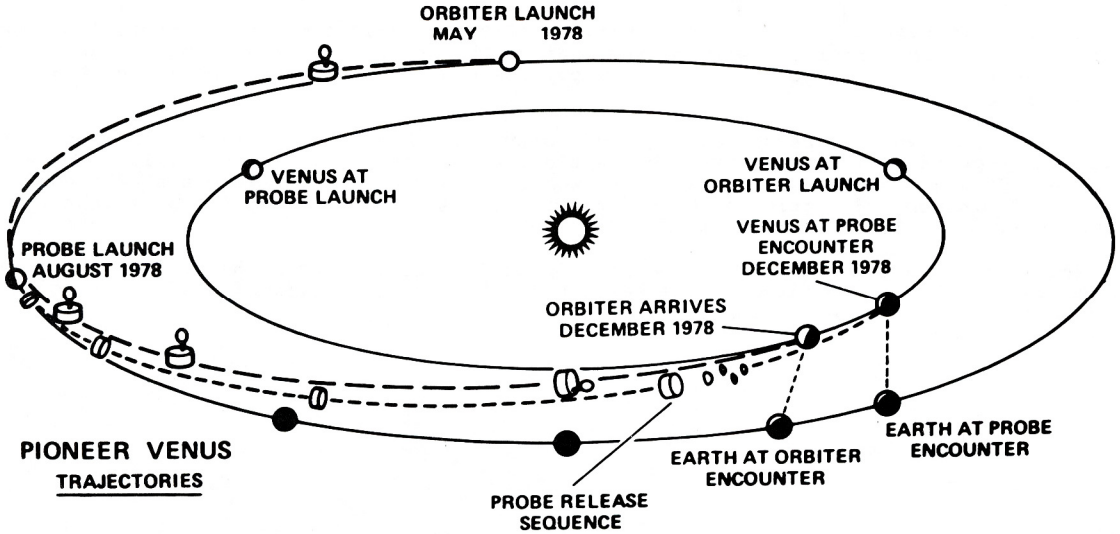
Eight million miles and 20 days out from Venus, Pioneer Venus 2 will separate into five atmospheric entry craft. Four of these probes will enter Venus' atmosphere at points spread over the planet's Earth-facing hemisphere, two on the day side and two on the night side. The fifth entry probe, the transporter bus, will also enter on the day side.

MISSION OPERATIONS....For Pioneer Venus, mission controllers will be operating simultaneously two different spacecraft on two different missions. During the Venus encounter period, launch of the four probes from the transporter bus to their atmospheric entry points will be accomplished; the bus will be retargeted for its entry; the Orbiter will be placed on its 24-hour, high inclination, highly elliptical orbit. Five days after Orbiter encounter, probe entry will be monitored, and the critical probe data received and stored for later analysis.

With completion of the Multiprobe mission, after impact of the probes on the surface and burn-up of the Bus, controllers will continue to operate the Orbiter for the eight months of its primary mission. Controllers may make significant changes in the orbit during this extended mission period.

Since all Pioneers are relatively unautomated spacecraft, mission operations often require 24-hour-a-day control and careful analysis and planning in short time spans. Ground-controlled spacecraft provide flexibility for changing plans and objectives. They also offer economies in spacecraft design and construction.

Pioneer Venus control and spacecraft operations will be at the Pioneer Mission Operations Center (PMOC), Ames Research Center, Mountain View, Cal., from the time both spacecraft separate from their launch vehicles through the end of the Orbiter mission. The PMOC is the central mission control center. It is under operational direction of the Flight Director. This area will originate all command information and receive and display telemetry data required for mission control. Although all commands are originated in the PMOC, emergency procedures include backup command generation at the Deep Space Network (DSN) stations, if necessary.



PIONEER VENUS
TRAJECTORIES

BLACK HOLES...JUST WHAT ARE THEY?

First off, it may be best to give the astronomical definition of "black holes"....Believed to be the final stage in the collapse of a dying star which was very massive. The collapsed star's material is so densely packed -- even more so than a neutron star -- and the gravitational force so great that even light waves are unable to escape from the surface of a black hole. All external evidence of its presence disappears. Because black holes emit no light or other radiation, their existence -- predicted by the laws of relativity -- cannot be confirmed by direct observation, but it can be inferred. Astronomers have identified a powerful X-ray source in the constellation Cygnus. Some suspect the source, which has been labeled Cygnus X-1, may be just such a black hole.

Data from an American-British-European satellite, the International Ultraviolet Explorer (IUE) suggest the possibility of a massive black hole at the center of some groups of stars in our galaxy called globular clusters. Six of these clusters, three of them X-ray sources, have been the subject of close examination by a group of scientists headed by Dr. Herbert Gursky and Dr. Andrea Dupree, both of the Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass.

IUE was launched by NASA into a modified synchronous orbit near the equator January 26, 1978 in cooperation with the European Space Agency (ESA) and the British Science Research Council (SRC) to study a wide range of celestial objects in the ultraviolet, one of the most important regions of the electro-magnetic pectrum.

What they see there, according to Dr. Gursky, is probably radiation from a group of 10 to 20 bright blue stars that orbit the core. He says, "These stars may well be orbiting a massive black hole the size or mass of one thousand solar systems." However, Gursky emphasizes that the existence of a black hole is by no means certain; the dynamics of the stars must be studied first to see how they rotate in relation to the center of the million-star cluster. This may give a better indication of what it is that provides the necessary gravitational pull that holds them in orbit. If the stars are indeed orbiting a massive black hole, Dr. Gursky believes they are right on the edge of it. If not, they may be providing their own gravitational equilibrium.

Dr. Gursky says they will continue to observe the six globular clusters, which are like miniature galaxies. However, he feels they won't get a definite answer until NASA's Space Telescope is placed in orbit from the Space Shuttle in 1983. This telescope will be able to use much more powerful instrumentation, including the short wavelength of the ultraviolet spectrum, to study the blue stars in more detail.

THESE INVISIBLE NON-OBJECTS....The catchy phrase "black hole in space" was authored by retired Princeton Physicist John Wheeler. Since even light cannot escape from them, it does make them invisible. Even more astounding, these non-objects are in effect celestial vacuum cleaners that greedily devour everything they meet. They are bottomless pits into which atomic particles, dust and giant suns all disappear without a trace. They are rips in the very fabric of space and time, places where long-cherished laws of nature simply do not apply. So unbelieveable and paradoxical are these notions that they have led to what Wheeler calls "the greatest crisis every faced by physics." Says Wheeler, "Never before did we think that matter could be so ephemearl."

If whole stars can vanish from sight within black holes, literally crushed out of existence, where has their matter gone? To another place and another time? Where did it come from? In searching for answers to the fundamental questions raised by black holes, scientists are infringing on the realm of philosophers and theologians. They are trying to find the meaning of life, of being, of the universe itself.

Whether black holes "are or aren't" we find ourselves in another exciting chapter of space history in the making.

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MISSION SPECIALISTS NAMED FOR SPACELAB 1

Astronauts Dr. Owen K. Garriott and Dr. Robert A. Parker have been selected by NASA to serve as Mission Specialists on the Spacelab 1 mission which is scheduled for the early 1980s. The two were named on August 1, 1978.

This first flight of Spacelab is planned as a seven day flight and is primarily for the verification testing of the Spacelab systems and Spacelab and Orbiter interfaces. In addition, approximately 40 experiments will be on board. Mission Specialists have the overall responsibility for the coordination, with the Commander and Pilot, of Space Shuttle operations in the areas of crew activity planning, consumables usage and Space Transportation Systems/payload interaction.

Spacelab, developed and financed by 10 European nations under agreements concluded with the European Space Agency, will be carried in the cargo bay of the Shuttle Orbiter. The lab will supply investigators with a fully furnished laboratory adapted for the weightless environment of space and pressurized for working without spacesuits.

In addition to the Commander, Pilot and two Mission Spaceialists, Spacelab 1 will include two Payload Specialists, one European and one U. S. citizen who have primary responsibility for operating the science instruments. With six crewmen onboard it will be possible to have two operational shifts of three crewmen each, consisting of a Mission Specialist, Commander/Pilot and Payload Specialist.

Garriott flew on the second manned Skylab mission of 56 days duration. Parker served as Mission Scientist and Spacecraft Communicator during Apollo and Skylab. For the past four years Parker has been involved in reviewing developments of Spacelab for the Astronaut Office.

NEW LUNAR LABORATORY AT JSC

Upon return of crews of the Apollo Moon Landing missions, NASA had obtained 860 pounds of rock during the Moon landings. It has since obtained about one-quarter ounce, from Russia and in return sent 18 grams, about one-half ounce to Soviet scientists. Most of those samples are now stored in several buildings at the Johnson Space Center. The rest are in a vault in San Antonio.

Next spring they will be moved to a new two-story building at the space center that will protect them and provide laboratory facilities for their study. Mike Duke, chief of NASA's Lunar and Planetary Science Division, says the laboratory will permit scientists to study samples that cannot be loaned out for fear of contamination. They will also be able to study whole samples rather than tiny fractions. The $2.2 million building will have a special vault on the second floor to protect the rocks from storm-generated high water, Duke says.

"Out of 54 core samples, we have 18 which have never been opened," he says. This is mostly because the core samples under study "are being taken apart layer by layer." Methods of studying the rocks are continuing to improve. "What took a gram (about the weight of a paper clip) a few years ago can now be done with a few thousandths of a gram," Duke added. Duke, who was the second curator of the Lunar Receiving Laboratory, says the most important thing learned from the samples is the timing of the moon's early development. Scientists have also found evidence of how the planets developed during their first 200 million years. Such evidence was lost regarding Earth because of its continuing evolution, Duke said.

Presently, about 100 groups around the world are studying samples on loan. In addition, two other NASA programs allow students from junior high school through college to examine moon specimens. The college-level program permits professors to borrow sets of prepared microscope sections for study in special courses in lunar geology. High schools and junior highs may borrow sets of six samples encased in clear plastic. Although the agency has 100 sets, there is a backlog of several hundred requests. In addition, the agency has prepared two permanent displays for the Smithsonian Insitution in Washington, D. C. Additional long-term displays are being considered.

When the lunar samples are moved next spring the old receiving laboratory may be turned over to the preservation of meteorites, particularly those recently collected in Antarctica. These objects from space have been preserved without contamination by the extreme cold and dryness of the South Pole region. " There may be enough new things learned that there will be a renewed effort to collect them," Duke said.

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PIONEER 11 FINAL COURSE SET FOR SATURN

Pioneer 11 was launched on April 6, 1973 and so much has happened since that time, that we thought this would be a good time to bring things up to date on the mission. In late July 1978, mission controllers completed final course adjustments for the Pioneer 11 spacecraft's encounter with Saturn on September 1, 1979, man's first visit to the giant ringed planet.

Spacecraft controllers at NASA's Ames Research Center, Mountain View, Calif., report that Pioneer 11 is now locked onto a trajectory that will bring it to within 18,000 miles of the edge of Saturn's outer ring. The spacecraft will then swing under the plane of the rings to 15,000 miles from the planet's surface. Pioneer 11 will take the first close-up color pictures of Saturn and its rings and make other first-time measurements of the planet's magnetic field, atmosphere and other features.

Without the course correction, Pioneer 11 would have flown by Saturn at a much greater distance (60,000 miles) from the planet's surface. "We're going as close as we dare," said Jack Dyer, chief of mission analysis at Ames. Getting any closer to the ring edge would risk impact with orbiting fragments in the planet's ring plane.

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CHANGES IN URANUS ATMOSPHERE

Major changes occurring deep in the atmosphere of Uranus have been discovered by two radio astronomers at NASA's Jet Propulsion Laboratory in Pasadena, Calif. Dr. M. J. Klein of JPL's Planetary Atmospheres Research Section and Dr. J. S. Turegano, a visiting research associate at JPL from the University of Zaragosa, Spain, find that radio emissions from deep in the Uranian atmosphere have become 30 percent stronger in 10 years.

They believe their results can be explained if Uranus' atmosphere is either warming up or becoming clearer to the passage of radio waves. It is hard to believe that the temperature so deep in a planet's atmosphere could become 30 percent warmer in only 10 years. A similar change on Earth would raise our average air temperature above 250 degrees Fahrenheit. It is more likely they explain, that the change is related to the planet's unique orientation. Unlike any other planet, Uranus spins on its side as it orbits the Sun. Every 84 years (the length of one year on Uranus), the Sun shines directly on the north pole; 42 years later the northern hemisphere is dark and the south pole points sunward. The north pole is now turning toward the Sun after 42 years' darkness. It will point directly at Earth (and the Sun) in 1987.

Current studies of the radio temperatures of Uranus are important to understanding the origin of the solar system because recent results suggest that Uranus, unlike Jupiter and Saturn has more than its expected share of the elements that are heavier than helium. This conclusion suggests that a chemical imbalance occurred in the outer regions of the solar system billions of years ago when it was forming.