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LANDSAT 3 before its flawless launch on March 5

Flawless Delta Launch

Landsat 3 Eases into Orbit

On March 5 Landsat 3 rocketed into orbit aboard a two-stage Delta Launch Vehicle. Observers called the space shot from the Western Test Range in California "flawless."

The Delta rocket also carried into orbit an amateur radio communications satellite—OSCAR-D. The second stage of the rocket became an orbiting space lab for a Plasma Interaction Experiment (PIX) designed to study detrimental interactions between high voltage systems and the electrically charged plasma fields in space.

The new Landsat joined its sister ship Landsat 2 (1975) in orbit 917 kilometers (570 miles) above the Earth. The satellites are taking inventory of the Earth's natural resources and studying the effects of man's activities on the planet. Every 18 days each satellite completes a scan of the entire globe. Using them in conjunction allows observation of any given locale once every nine days.

With the addition of Landsat 3 to the Earth-watch program, scientists are able to detect temperature changes in vegetation, bodies of water and urban areas—day or night. Improvements in Landsat 3 sensors increase the resolution of selected recorded images by 50 percent, allowing areas as small as half an acre to be identified.

Utilizing temperature data from the new satellite, observers will gain new understanding of the effects of urban heat on local climates. They can alert farmers to crop stress (plant "fever"), and lead fishermen to upwellings of cold water where ocean fish gather to feed on surfacing nutrients.

Application of the new Landsat 3 sensor data also will result in better cartographic mapping, help track ocean currents and enable scientists to monitor the effects of nuclear power plants on nearby rivers and bays.

In addition to its two major remote sensing systems, the Landsat-3 carries a Data Collection System (DCS). This versatile experiment collects radioed data directly from as many as 1,000 remote ground platforms and relays it to a Landsat data acquisition station.

The ground platforms are often placed at locations where actual measurements will aid in the interpretation of the sensor data of the same area. Volcano activity, stream flow, water and snow depth, water temperature, and sediment density are some of the measurements collected with the DCS.

Ground control for the Landsat-3 is maintained by Goddard and data collected by the satellite is processed initially at Goddard before dissemination to users.

The OSCAR-D radio communication satellite was placed into orbit for a variety of uses by amateur radio buffs around the globe, particularly with small fixed and mobile stations. Primary emphasis will be placed on its application as a teaching aid in secondary schools.

Morrison Is Named European Representative

James R. Morrison has been appointed NASA's European representative in Paris. He will succeed Walter P. Murphy who will be returning to a new NASA assignment in the United States in March.

For the past three and one half years, Morrison has been manager of the Earth Resources Survey Program in NASA's Office of Applications. Prior to that assignment, Morrison served for 12 years in NASA's Office of International Affairs.

As NASA European representative Morrison will serve in a liaison capacity between NASA and European space agencies on matters of mutual interest. He will report to the Director of International Affairs, NASA Headquarters, Washington, D.C.



First LANDSAT 3 photo shows southeastern coast of Massachusetts.

Humboldt Award Recipient

Dr. Behannon Goes to Germany

Dr. Kenneth W. Behannon left Goddard on March 1 for a year's study in Germany under the Senior U.S. Scientist (Humboldt) Award.

He is the second Goddard scientist to receive this honor from the German government.

By the award Behannon may choose the place and subject of his study in Germany, and receives research funds of \$25,000.

Behannon has chosen to do research at the Institute for Geophysics and Meteorology at the Technical University of Braunschweig, where he will collaborate with Professor Fritz Neubauer of the institute in studying plasma physics and the geometry, structure and source of electromagnetic waves in the solar wind.

Behannon said he and Neubauer have independently studied interplanetary magnetic sector boundaries in the solar wind. Behannon used data from Mariner 10 and IMP 8. Neubauer used HELIOS 1 and 2. The scientists plan to combine their efforts and add to them with data from the Voyager missions.

They will also "prepare for the encounters of Voyagers 1 and 2 with the Jovian magnetosphere and satellites in March and July 1979," Behannon said. He added that he is eager to review the theoretical models Neubauer has been developing of the Jovian radiation belts.

"I believe that my year's study will contribute substantially to NASA's benefit," said Behannon. He will end his German stay February 28, 1979.



Dr. Kenneth W. Behannon, second Goddard recipient of the Senior U.S. Scientist (Humboldt) Award.

New Massively Parallel Computer to Speed Image Processing

Goddard is asking industry to build a new computer that can process satellite images 10 to 100 times faster than ever before.

The new computer is based on some six years of research at Goddard into "massive parallelism," a new wrinkle in computer technology.

According to Dave Schaefer, Head of the Computer Development, Information Extraction Division, the design for the massively parallel computer is similar to a classroom of students. If a teacher gave thirty problems to just one student, it might take the student thirty minutes to solve the task, he explained, but if she gave one problem to thirty different students, together they might solve the task in one minute.

To speed image processing tasks, Schaefer proposes a massively parallel system of 16,384 "students," or processors, working together. Each processor is a simple computer. They will be arrayed in a 128×128 matrix to form the master computer. Schaefer added that two processors can probably be put on a single chip of silicone.

Previous machines have not gone beyond a web of 64 simple computers, Schaefer reported.

He hopes the new computer will be ready by 1982, and said the first task it will be asked to perform is processing Landsat type images.

The computer will be able to cross correlate images from Earth-watching satellites for landmarks 100 times faster than present machines. It will perform multi-spectral classifications, such as discerning wheatland from cornfields, and make geometric corrections for comparing pictures taken from different vantage points in one tenth the time necessary today.

The specific tasks this machine will perform are nothing new, Schaefer added. "It's like cutting grass; we've been doing it for years. It started with sheep then went to handmowers. The innovation was putting in a motor, in this case the concept of massive parallelism."

Just down the hall from Schaefer's office is the prototype of what he envisions. It utilizes 64 processors.

"We wouldn't ask industry to do anything we aren't pretty sure can be done," said Schaefer. "We have sent them our design of the basic architecture for the system."

Industry showed great interest at the pre-proposal conference held on Feb. 6, Schaefer reported. He credited the in-house design of the system to Lai-wo "Mike" Fung, a resident research associate at Goddard from 1975 to 1977. Other major contributors to the project are Dr. James P. Strong and Jim Fischer, he noted.

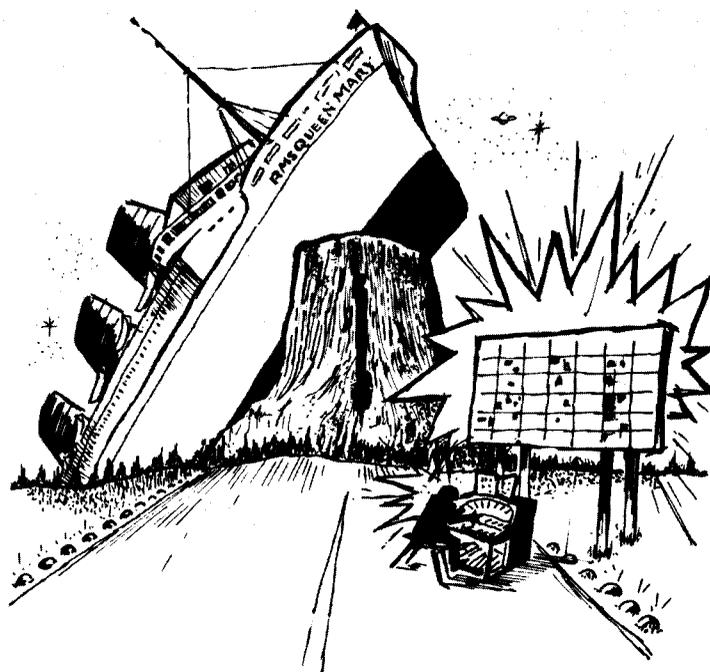
Fairchild Selected for Landsat-D Spacecraft Bus

NASA has selected Fairchild Space and Electronics Co. of Germantown, Md., for negotiation of a fixed-price incentive contract to integrate, test and provide two Multimission Modular Spacecraft (MMS) for Landsat-D. The contractor's target cost is approximately \$10.3 million for the basic requirements.

Hughes Aircraft Co. of El Segundo, Calif., is a major subcontractor, responsible for development and testing of a propulsion module.

The MMS will be the basic spacecraft buses for the Landsat-D flight spacecraft (to be placed in orbit in 1981 aboard a Delta rocket) and a backup.

Under the contract, which will be managed by Goddard, the firm will integrate and test the two spacecraft buses.



By Maceo Leatherwood

STRANGE ENCOUNTERS OF THE FOURTH KIND

If You're Looking For UFOs, Try Next Door

After "Star Wars" and "Close Encounters of the Third Kind," what is NASA going to do about UFOs?

According to Dr. Robert A. Frosch, NASA Administrator NASA will analyze any chemical samples of UFOs that it receives from credible sources, but otherwise it is not going to initiate any research programs.

He added that the agency will continue to respond to UFO related mail as it has in the past.

Frosch outlined the NASA position in a letter sent to the White House last year. He was responding to a request for NASA to consider active research into UFOs from the Director of Science and Technology Policy.

Most often, NASA has been asked about purported UFO sightings made by astronauts and President Carter.

NASA has satisfied itself that its astronauts saw nothing that could be termed abnormal in the space environment.

President Carter reported he saw a bright object moving across the sky when he was Governor of Georgia. He said it shone as brightly as the moon for 10 to 12 minutes.

The object was classified as "unidentifiable" by the National Investigations Committee on Aerial Phenomena, but some students of astronomy suggest that what Carter really saw was the Planet Venus, which at times appears much brighter than a star of the first magnitude.

In the past, the U.S. Air Force routinely investigated reports of all UFO sightings. But since 1969, when it terminated its "Project Blue Book," the Air Force has limited its interest to sightings important to defense surveillance.

The Air Force dropped the project when it concluded that never in its almost two decades of experience with UFOs had there ever been "evidence of technological developments . . . beyond the range of present day scientific knowledge."

"Blue Book" is now available to the public at the National Archives.



The late Dr. William Nordberg, in whose honor COSPAR has created an atmospheric science/Earth resources award.

COSPAR to Present First Nordberg Award

COSPAR, the international Committee on Space Research, is scheduled to make its first William Nordberg Memorial Award at its 21st Plenary meeting May 21 in Innsbruck, Austria to "honor deserving individuals who have materially contributed to the application of space techniques to the fields of atmospheric science or Earth resources."

The award, established by COSPAR last year in recognition of Dr. Nordberg's pioneer work in the use of meteorological and Earth resources spacecraft technology, will consist of a citation and, depending on the availability of funds, a check.

Voluntary contributions to finance the fund are being sought from organizations and individuals involved in the field. Alberta Moran, of the Applications Directorate which Dr. Nordberg headed before his death October 3, 1976, is accepting contributions for the fund at Goddard.

NASA Honors James C. Fletcher

Dr. James C. Fletcher, former NASA Administrator, was presented with the NASA Distinguished Service Medal in a ceremony at NASA Headquarters Jan. 30, 1978.

The presentation, made by Dr. Frank Press, President Carter's science advisor, was in recognition of Dr. Fletcher's "distinguished leadership." "His outstanding scientific and administrative abilities," the citation noted, "contributed immeasurably to the nation's significant achievements in the exploration of space and the utilization of space to manage the Earth's resources."

Dr. Fletcher, who served as NASA Administrator from April 27, 1971, until May 1, 1977, is now a consulting engineer and vice president of the National Space Institute in Washington, D.C. He holds the Gulf-Whiteford chair in the School of Engineering at the University of Pittsburgh.

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"The Space Chords"

"We Will Sing to Anybody . . ."

"The Space Chords,' we chose that name when our wives objected to 'The Umbilical Chords,'" says Harold Goldberg, lead singer of Goddard's only barbershop quartet.

"We wanted something that had to do with space," he explains. "We checked that no other quartets had the name and decided to keep it."

Goldberg harmonizes with Joe Deskevich, bass, Gil Mead, baritone and Jack Libby, tenor, to sing "Paddelin' Madelin' Home," "Sweet Adeline" and "Feelings" in barbershop time—just three of some 30 songs in their repertoire.

"We'll sing to anybody who will listen to us," says Libby. The four men entertain at hospitals, rest homes, on the radio, and once sang at Goddard award ceremonies.

The Goddard quartet also competes in nationwide barbershop contests as members of the Society for the Preservation and Encouragement of Barbershop Singing Quartets of America.

"Barbershop is to men what majorettes are to girls," says Libby.

The barbershoppers' national society includes some 750 chapters of 40,000 enthusiasts in the U.S. and Canada. "The Space Chords" are members of a 70 man chorus that meets in Rockville as "The Montgomery Counts."

The barbershop groups send their profits to the national society headquarters in Wichita, Kan., to fund charities for children with speech problems, says Libby.



"The Space Chords." Left to right are Jack Libby, Harold Goldberg, Joe Deskevich, and Gil Mead.

"The Space Chords" will be vying with other singers in the southern division barbershop championships at Manassas, Va., in May. That is the first step to the international championship of North America.

"We expect to win this year," Libby adds, "last year we placed third and the year before that second."

Meanwhile the group is working on getting away from what Libby calls "cry-type barbershop." They want to put comedy into their songs and their shows.

"We are having a ball," says Libby.

"The Space Chords" expect their next appearance at Goddard will be during the annual Spring Show.

Eighteen Scientists Chosen For Space Telescope Program

Eighteen scientists have been tentatively selected by NASA to participate in the design and early operational phases of the Space Telescope program.

The 10-ton observatory, to be launched into Earth orbit in 1983 by the Space Shuttle, will make astronomical observations deeper into space and in more detail than ever before. It is expected to provide solutions to some of the mysteries related to the structure, origin, evolution and energy processes of the universe.

Goddard Space Flight Center will be responsible for managing the development of the scientific instruments and the operational aspects of the space observatory.

The 2.4 meter (7.8 foot) Space Telescope will be capable of accommodating five different instruments at its focal plane: two cameras, two spectrometers and a photometer.

Wide Fields and Faint Objects

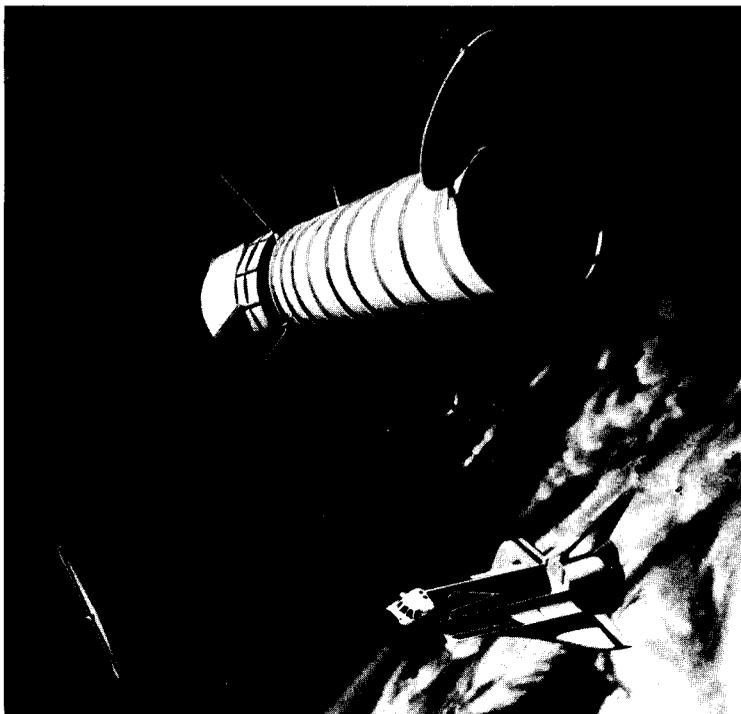
Individual co-investigators for a wide field camera on the telescope have been named as Dr. P. Kenneth Seidelmann, U.S. Naval Observatory, and Dr. James Westphal, Calif. Institute of Technology.

The wide field camera will cover the red and infrared regions of the spectrum as well as the ultraviolet and blue regions. A second camera, for faint objects, has been provided by the ESA to cover only the latter two regions, using the highest resolution that Space Telescope optics can deliver.

The wide field camera views an area 40 times larger than the faint object camera, but has a resolution degraded by a fraction of two to four.

Dr. Philippe Crane, European Southern Observatory, and Dr. Ivan R. King, University of California, Berkeley, have been chosen to represent the American astronomical community on the ESA's faint object camera team.

Two spectrographs in the Space Telescope will provide a wide range of resolutions which would be impossible to cover in a single instrument. Only the faint object spectrograph will cover the visible and red regions of the spectrum.



The Space Telescope is delivered into orbit (artist's concept).



Applications Explorer Mission-A, the next Goddard launch, is scheduled for April 25 from the Western Test Range, California, on board a Scout rocket. The primary objective of the mission is to measure night and day temperature differences of the Earth.

Dr. Richard Harms, University of Calif., San Diego, heads the faint object spectroscopy team. Individual co-investigators on the faint object spectrograph team will be Dr. Bruce Margon, University of Calif., L.A., and Dr. Arthur F. Davidson, Johns Hopkins. Dr. John Brandt of Goddard is high resolution spectroscopy team leader.

A Multi-purpose Photometer

The fifth instrument on the telescope will be a simple, single-channel photometer that can be used both for calibrating the other instruments and for very high speed photometry. By operating while other instruments are observing, this instrument also can collect generally useful information on the brightness of the galactic background.

High-speed photometry team leader will be Dr. Robert Bless, University of Wisconsin. Individual co-investigator on photometry will be Dr. James L. Elliot, Cornell University.

Interdisciplinary scientists responsible for a broad overview of the space observatory's development have been named as Dr. John N. Bahcall, Institute for Advanced Study; Dr. John Caldwell, State University of New York at Stony Brook; Dr. Malcolm Longair, Cambridge University, and Dr. David L. Lambert, University of Texas.

Responsible for interpreting the scientific performance requirements in terms of telescope design specifications will be Dr. William G. Fastie, Johns Hopkins, and Dr. Daniel P. Schroeder, Beloit College.

Astronomy team leader is Dr. William H. Jeffreys, University of Texas at Austin. Data operations team leader will be Dr. Edward J. Groth, Princeton University.

Magnifying Man's View of Space

The space telescope should permit astronomers to observe some 350 times the volume of space that can be seen now with the largest ground based-telescope.

Once placed in orbit, the telescope will be operated by remote control from the ground, but it will be designed so that a space-suited astronaut can maintain the device and change its instruments if need be. It also will be retrievable by the Space Shuttle for return to Earth for extensive overhaul and subsequent relaunch. These features should allow the Space Telescope to serve as an in-space astronomical observatory for more than a decade.

The observatory will weigh 9,100 kilograms (20,020 pounds) and will orbit the Earth at an altitude of about 500 kilometers (316 miles) above the Earth's atmosphere.

NASA's Marshall Space Flight Center will have management responsibility of the Space Telescope.

Goddard Explorers: Making a Space Shuttle Get Away

Goddard's Explorer Scouts are thinking of "get-away specials" on the space shuttle.

The scouts have already put down \$500 on a \$10,000 ticket, said advisor John Wolfgang. That reserves them a space of 50 cubic feet for 200 lbs.

Now the post is coordinating a national Explorer Scouts' experiment for 1980 or 1981.

"We don't know what it will be yet," said Wolfgang, "the plan is for posts nationwide to submit their proposals to a blue-ribbon panel of NASA officials and engineering professors thru next summer, then four to eight experiments will be selected for orbit."

The experiments may be all quite different, but it will be Goddard Post 1275's task to integrate them into a single package ready for flight, Wolfgang said.

The local scouts will also handle public relations for the flight, document it and process the data.

The Beginning: Serene Process or Chaotic Bang?

Was the explosion that marked the beginning of our universe violent and chaotic—a "big bang?" Many scientists think so. But measurements made recently by a team of researchers using a high flying NASA aircraft suggest that our cosmos may have started more serenely—with a powerful but tightly controlled and completely uniform expansion, more like the blossoming of a plant or a flower.

Using ultrasensitive radio equipment aboard an Ames Research Center U-2 jet, the research team measured the cosmic microwave background—the radiation left over from the "big bang," the initial, universe-forming event—and surmised that Earth's birth was not explosive but almost serene, with matter and energy uniformly distributed, expanding at an equal rate in all directions.

The findings were made by Drs. Richard Muller and George Smoot, and graduate student Marc Gorenstein of the Lawrence Berkeley Laboratory and the University of California at Berkeley, who also designed and operated the radio equipment.

By measuring the movements of the Earth against the "glow" left from the fireball in which the universe was born, they also found that the Milky Way galaxy, together with the solar system and Earth, appears to be hurtling through space at more than one million miles per hour towards the constellation Hydra.

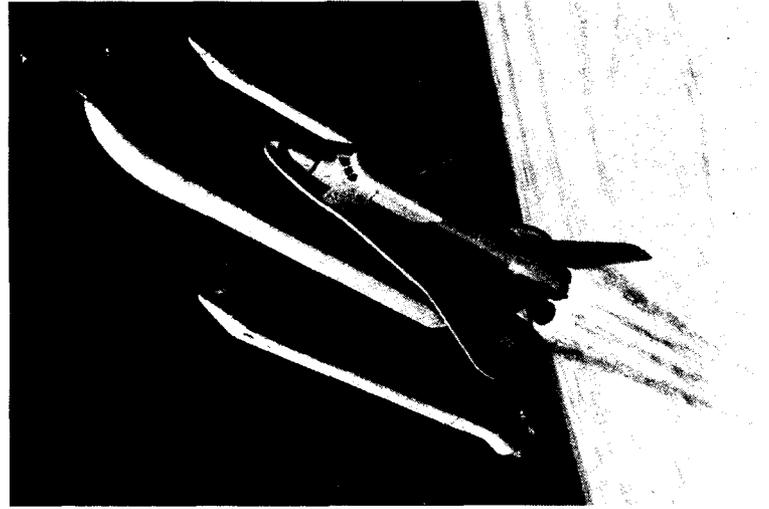
"The radiation left over from the universe-forming event about 15 billion years ago is so uniform that it provides a universal reference for measuring this motion," said Gorenstein.

No Rotation of Universe

"Another major surprise is that the U-2 measurements seem to show that there is no rotation of the universe," said Smoot. "This is surprising because we can see that everything within the universe is rotating—planets, stars, and galaxies. If there is rotation, it has to be less than one hundred millionth of a rotation in the last billion years."

"Our measurements give a picture of an extremely smooth process," the researchers said. "The big bang, the most cataclysmic event we can imagine, on closer inspection appears finely orchestrated. Either conditions before the beginning were very regular, or processes we don't yet know about worked to make the universe extremely uniform."

The uniformity was greater than one part in 1,000 for matter, one part in 3,000 for energy, and one part in 10,000 for expansion.



Space Shuttle blasts into space in this artist's conception. The Explorer Scouts hope to have an experiment aboard by 1980 or '81.



NASA recently graduated 19 students under its Nationalization Program of the Quito STDN Station. By the end of 1978, selected Ecuadorian electronics and administrative personnel will compose 95 percent of the personnel who operate and maintain the facility. Under the training program, Capitol Radio Electronic Institute (CREI), with the coordination of the Network Test and Training Facility at Goddard, awarded diplomas to the following students:

Top row, from left to right are: Mauricio Borja, Eduardo Diaz, Marcelo Cano, Alfredo Roman, Fabian Rojas, Antonio Cruz, Hernan Maldonado and Hernan Tamayo. Bottom row, from left to right: Jorge Nuñez, Gilberto Barrera, Victor Jimenez, Dario Acosta, Fausto Medina and Galo Vallejos. Not shown in the photo are: Cecilia Cordova, Luis Parreño, Rodrigo Vargas, Mario Pulgar and Juan Casals.

According to the currently accepted big bang philosophy, the universe began as a hot, incredibly dense mass containing all the matter in the universe. At a certain "initial" instant, the primeval fireball exploded in the most violent and immense cataclysm imaginable.

NASA Activities, February 1978