NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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PROJECT: SOUTH AMERICAN SOLAR ECLIPSE EXPERIMENTS (November 12, 1966)

PRESS KIT

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NEWS

NASA

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ECLIPSE WILL BE PHOTOGRAPHED FROM SPACE

Experiments launched on sounding rockets from Argentina and Brazil, by the Gemini 12 astronauts and by 26 scientists aboard a jet aircraft are scheduled to make scientific observations of a total eclipse of the Sun over South American on Nov. 12.

In addition, the orbiting Nimbus II weather satellite will take pictures of Earth in the eclipse zone.

These activities will be conducted by the National Aeronautics and Space Administration in cooperation with scientists of Argentina and Brazil as part of an international program. Many different methods and techniques will be used to observe the eclipse, including about 60 ground, balloon, airborne and rocket-borne experiments. About 300 U.S. scientists will be involved.

The sounding rockets will be launched as agreed in Memoranda of Understanding signed by NASA with the space committees of the two South American countries.

Within a few hours just before, during and after the eclipse, 12 rockets with scientific payloads will be launched from Tartagal, Argentina, and 21 from Cassino, near Rio Grande, Brazil.

Gemini 12 is scheduled for launch Nov. 9 and the crew, James A. Lovell and Edwin E. Aldrin, will be orbiting over the eclipse area.

Unless their flight plans change, Aldrin will have an opportunity to photograph the eclipse from outside the Gemini capsule while standing in the spacecraft seat with the hatch open. The time in total eclipse is expected to be 6-12 seconds.

Aldrin will use a 16mm Maurer camera with black-and-white film, shooting at 16 frames per second. The camera will be mounted on a bracket behind the pilot hatch.

NASA's Convair 990A jet will fly from Porto Alegre, Brazil, along the track of the eclipse over the South Atlantic. The 600-mph transport effectively increases the time of observation. The 23 scientists aboard will use a number of instruments to observe the total eclipse.

This will be the 39th solar eclipse in this century. The zone of total blackout (or path of totality) will form a 55-mile-wide strip across South America beginning in the Pacific Ocean west of Peru, crossing southern Peru, Bolivia, northern Argentina, the southern tip of Brazil and extending into the South Atlantic.

The point of maximum duration of the eclipse -- two minutes -- will be over the Atlantic about 600 miles southeast of Buenos Aires. A partial eclipse will be visible over the extreme southeastern part of the United States, Central America, the West Indies, South America, part of Antarctica, and the southern part of Africa.

Knowledge gained from the experiments will be made available to the world scientific community.

(END OF GENERAL RELEASE; BACKGROUND INFORMATION FOLLOWS)

ARGENTINA-U.S. ECLIPSE STUDY

Twelve rocket-borne experiments are scheduled to be launched Nov. 11-12 from a specially prepared site near Tartagal in the northern part of Argentina. Launching and tracking equipment are being moved to the Tartagal site from Argentina's Chamical Range. Rockets and payloads will be furnished by the United States, and will be launched by the Argentine scientists and technicians.

Three rockets will be used for studies on Nov. 11; the other nine to be fired between 6 a.m. and 4 p.m. Nov. 12, before, during, and after the eclipse.

Purpose of the experiments is to obtain data on the effects of the eclipse on winds, temperatures, and ozone content at altitudes of 25 to 38 statute miles. The booster for each experiment will be the Arcas meteorological rocket. The Arcas is 8 feet long, 4.5 inches in diameter, and weighs about 75 pounds.

Tartagal will be in the path of totality as the eclipse moves southeastward across central South America. The period of totality at the Tartagal site will be about 91 seconds.

The launchings will be conducted under terms of a Memorandum of Understanding between the Argentine Comision Nacional de Investigaciones Espaciales (CNIE), the Argentine Space Commission, and NASA.

Atmospheric Sciences Laboratory, White Sands, N. M., will participate with NASA in the program. The CNIE project representative is Ricardo Valenzuela. The NASA project representative is James F. Bettle of the Aeronomy and Applications Office, Wallops Station, Wallops Island, Va. Harold Ballard, is the senior representative of the Atmospheric Sciences Laboratory, White Sands, N. M. The CNIE Scientific Coordinator is Erich R. Lichtenstein, Argentine Meteorological Service.

BRAZIL-U.S. ECLIPSE STUDY

The Brazil-United States effort will consist of 21 instrumented rockets which will probe the Earth's upper atmosphere and ionosphere to altitudes as high as 175 miles. The rockets will be fired over the Atlantic from a beach site near Rio Grande, Brazil.

The launchings will be conducted by the Brazilian Space Commission in cooperation with U.S. scientists and technicians.

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Teams of scientists from the two countries will measure changes in the ionosphere and disturbances near the surface of the Sun as the Moon temporarily blocks out radiation from the Sun. They hope to gain a better understanding of Earth-Sun relationships by observing the effects of more rapid changes of illumination than can be seen near sunrise and sunset.

A solar eclipse presents an opportune time to study the disturbances that occur near the Sun's surface and their effects on the Earth's environment, especially on our weather and communications. The Sun is now beginning the upward swing of its 11-year cycle of solar flare and sunspot activity.

The program is based on an agreement, dated July 18, 1966, between the Comissao Nacional de Ativadades Espaciais (CNAE), the Brazilian Space Commission, and NASA.

The Rio Grande launch site is located near the path of totality, whose period will be slightly less than two minutes. Most of the launchings will be conducted during a four-hour period centered around the time of totality at about 11:10 a.m. local time (9:10 a.m. EST).

Experiments

The scientific payloads will be flown on sounding rockets capable of probing altitudes of 50-175 miles. Four types of rockets will be used, Nike-Apache, Nike-Mydac, Nike-Javelin, and Nike-Tomahawk. All are two-stage vehicles with solid propellant motors. They are 25 to 30 feet long. The first stage Nike booster is 16.5 inches in diameter. The rockets will be furnished by the U.S. participating agencies. The experiments will be provided by both U.S. and Brazilian scientists.

The 21 payloads in this program will carry experiments to measure characteristics and properties of the upper atmosphere and ionosphere before, during, and after the eclipse. Various techniques and devices will be used to measure electron density and temperature, ion density, atmospheric density and high altitude winds. Measurements will be made of variations occurring in time and at different altitudes.

Participants in addition to NASA in the sounding rocket program are the University of Illinois, Urbana; Defense Atomic Support Agency (DASA), Washington, D.C.; the GCA Corp., Bedford, Mass.; and the Sandia Corp., Albuquerque, N.M.

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Launch Site

The launch site is located on the Atlantic Coast about 15 miles south of Rio Grande, near Cassino, in the State of Rio Grande Do Sul. It is very near the path of totality. The rockets will be fired over the ocean.

Management

Management of the U.S. Brazil Eclipse Rocket Program is being shared by the Brazilian Space Commission (CNAE), headed by Dr. Fernando de Mendonca, and NASA.

The eclipse manager for CNAE is C. E. Sobral Vieira. Cary F. Milliner, head of the program management and liaison branch, Wallops Station, Wallops Island, Va., is the NASA eclipse manager. Project manager for Wallops Station is Robert T. Long, Milliner's assistant. Warren W. Berning of BRL, Aberdeen, Md., is project manager for DASA. W. E. Walker is project manager for the Sandia Corp.

NASA JET TRANSPORT TO TRACK SOLAR ECLIPSE

NASA's Convair 990A transport, a four-jet flying research laboratory, "Galileo", will carry a team of 26 scientists to observe and record the eclipse.

One hundred and ninety seconds of eclipse totality will be available to the eleven experiments during their photographing and measuring of the turbulent processes of the solar atmosphere. The speed of the aircraft, while flying in the same direction of the eclipse path, serves to increase observation time over the maximum of 116 seconds available to ground observers.

Flying about 575 miles per hour 38-40,000 feet altitude, the Galileo will intercept the eclipse path at 34 degrees 14' south latitude, and 50 degrees 07' west longitude, or about 200 miles east of the most southern point of the Brazilian coast.

At 38,000 feet, the Galileo would be above five-sixths of the Earth's atmosphere and free of nearly all cloud and weather interference.

Departing from Porto Alegre, Brazil, the aircraft will make weather and navigation runs prior to interception with the eclipse path. The eclipse run will be in a southeasterly direction. The Convair will then return to Porto Alegre, for a total time of about seven hours on the flight.

The airborne expedition is being conducted by NASA's Ames Research Center, Mountain View, Calif. Dr. Michel Bader, chief of the airborne science office, is expedition manager. Louis C. Haughney is assistant manager.

Flight crew of the Galileo consists of Fred J. Drinkwater, command pilot, and Glen W. Stinnett, pilot, both of Ames; Frank J. Brasmer, flight engineer and John W. Kroupa, navigator, both of Northrop Norair, Hawthorne, Calif., and Patrick R. J. Reynolds, chief navigator of Pan American Airways, navigator.

Experiments and Investigators

1. Infrared Chromospheric and Coronal Spectroscopy -- Investigators are Kenneth E. Kissell of the U.S. Air Force Aerospace Research Laboratory and Paul L. Byard of Ohio State University, Columbus. Their purpose is to obtain additional spectra of the chromosphere from 9000 to 12000A, and to reexamine the corona in this same wave-length interval to confirm the coronal line at 9910A found in 1965, and examine the region from 10,000 to 12,000A with increased sensitivity.

2. Coronal Spectrum -- Investigators are Guido Munch, Gerry Neugebauer and Dan McCammon of the Mount Wilson and Palomar Observatories. Their purpose is to detect and measure the strength of the predicted coronal lines of Si X, Mg VIII, and Si IX at 1.431, 3.032, and 3.859 microns, respectively.

3. Solar Corona Photographic Experiment -- Investigators are Theodore J. Pepin and Homer T. Mantis, University of Minnesota, School of Physics and Astronomy. Their purpose is to look for the presence of the zodiacal dust within 14 solar radii of the Sun.

4. Infra-red Solar Eclipse Interferometer Experiment -- Investigators are Ralph Stockhausen, Charles L. Wolff and John Mangus of NASA's Goddard Space Flight Center, and Raul Curbelo of Block Associates, Cambridge, Mass. Their purpose is to survey the solar corona and chromosphere for emission line structure in the 1 to 3 micron spectral range with a spatial resolution of 10 arc minutes and a spectral resolution of 10 cm^{-1} to 10,000 cm^{-1}.

5. Photographic Survey of the White and Green Coronas -- Investigators are Sheldon M. Smith, Milton E. Henderson and Jack W. Ratcliff of NASA's Ames Research Center.

Their purpose is to study white light structures of the inner and mid corona; measure the inclination and electron density of streamers in the mid and outer corona; measure the spatial variation of the equivalent width of the FeXIV emission line and to compare the gross structure of the green and white coronas; record the structure and spectra of prominences on the east limb; and to cooperate with other observers in the search for material motions in the corona.

6. Fe XIV Temperature -- Investigators are Gordon Henderson and Carl Groom of IIT Research Institute, Chicago. Their purpose is to determine the Fe XIV temperature distribution throughout the solar corona to about three solar radii.

7. Polarization of λ10747 Fe XIII -- Investigators are John A. Eddy, J.W. Firar, J. M. Melville, and Robert H. Lee of the High Altitude Observatory-NCAR. Their purpose is to obtain measurements of the polarization and line to continuum ratio of 10,747 for the purposes of determining the collision cross section of the ion and of studying the effects of coronal magnetic fields upon emission line polarization.

8. Spectroscopy of Middle Corona -- Investigators are Armin J. Deutsch, Mount Wilson and Palomar Observatories; Guglielmo Righini, Arcetri Observatory, Italy; Philip C. Steffey and James D. Gehris, Douglas Aircraft Co., Santa Monica, Calif. Their purpose is to discriminate to F and K cornas from the depths of strong Fraunhofer Lines.

9. Near Infrared Day Airglow Experiment -- Investigators are Donald F. Heath, John S. Fedor and Raymond D. Westcott of NASA's Goddard Space Flight Center. Their purpose is to measure intensity of day airglow in the region from 6,300 to 8,500A.

10. Visible Chromospheric and Coronal Spectroscopy -- Investigator is Richard B. Dunn, Sacramento Peak Observatory, Air Force Cambridge Research Center, Mass. His purpose is to obtain spectra in the chromosphere from 3,000 to 8,800A. The spectra will confirm new coronal lines found on the 1965 expedition. It is also hoped that an active region may be on the limb.

11. Upper Atmosphere Winds and Electron Density -- Investigators are J. F. Bedinger and L. G. Smith, both of Geophysical Corporation of America, Cambridge, Mass.; and James M. Weldon, Office of Space Science and Applications, Headquarters, NASA, Washington, D.C. Their purpose is to measure the wind vector between 80 and 150 km during the daytime; to observe the electron density and electron temperature profile near totality; and to relate structural features of the electron density profile with the wind structure. Note: This experiment consists of a ground-launched Nike-Apache. Weldon will photograph the vapor trail of the rocket from the airplane.

NIMBUS II TO PHOTOGRAPH ECLIPSE AREA

NASA's Nimbus II weather satellite is scheduled to take pictures of the Earth in the area of the solar eclipse. It will take both daytime and nighttime (infrared) pictures.

The eclipse will occur on Nimbus's 2,414th orbit. On the previous orbit, special instructions will be sent from NASA's Gilmore Creek, Alaska, tracking station.

The picture sequence:

The satellite's daytime camera will take two pictures, one just before the total eclipse and one immediately after. These pictures will flash "live" to simple ground stations at the University of Chile in Santiago and the University of Tucuman in Argentina. NASA has requested that copies of these pictures be forwarded to the Goddard Space Flight Center for study.

More than 15 minutes of infrared film will be stored on a tape recorder in Nimbus for later transmission to Goddard. The infrared pictures will reveal how much the temperature decreases in the Atlantic and land masses during the eclipse.

Nimbus is now in its 5th month of operation, having been launched May 15.

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