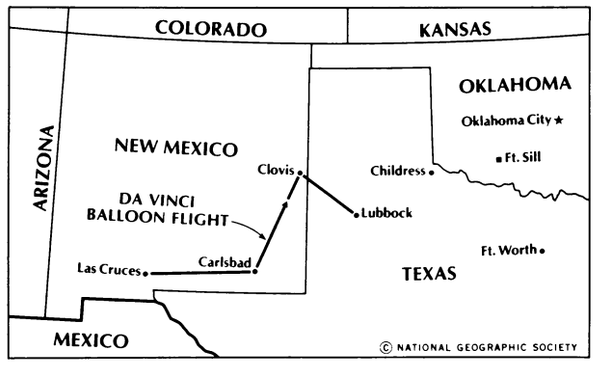
A journey for science by balloon



The route of Project da Vinci—if the winds cooperate. One of the goals of the elaborate atmospheric study is to make future research balloon flights more predictable and controllable.

On the morning of Oct. 12, if all goes well, a 70-foot balloon will rise gracefully from Las Cruces, N.M., Municipal Airport, carrying four people and numerous scientific instruments on one of the most elaborate lighter-than-air research flights ever conducted. Called Project da Vinci, the journey will involve the Atomic Energy Commission, the Army, the National Oceanic and Atmospheric Administration and the National Geographic Society, as well as several other agencies, organizations and universities.

The crew will spend the 36 hours of their mission in a cramped, aluminum and fiberglass gondola, trying to follow an exhaustive work schedule in the limited space not taken up by more than two dozen experiments' worth of instrumentation. Their activities will include releasing as many as 20 smaller balloons, dropping reflective chaff, throwing out strips of paper attached to a wire and blowing loud, periodic "blats" on an atmospheric sounding device. Meanwhile, back on the ground, other groups will be shining laser beams, releasing balloon-borne transmitters and trying to follow the floating crew in a pair of vans and a motor home.

The overall goal of all this, according to project officials, is to obtain a detailed picture of everything that happens to a given "parcel" of air as it travels across differing terrain. The idea was originally conceived a few years ago by balloonist-sculptress Vera Simons, who envisioned the trip as both a scientific and an artistic effort. As more groups began to take interest and provide support, the scientific side began to grow until it finally took over the entire project, with Simons as co-pilot and Jimmie Craig, a civilian employee of the U.S. Naval Weapons Center in California, as pilot. Meteorologist Rudolf Engelmann, deputy manager of environmental programs for the AEC, will be the on-board scientist for the mission, accompanied by a photographer for the National Geographic Society, which is providing part of the funding.

The 25 experiments on the flight are divided into five groups: atmospheric structure and turbulence, atmospheric constituents, electrical fields, radiation, and balloon dynamics and response.

Besides temperature and humidity measurements, the atmospheric structure experiments will include repeated blasts, at 30-second intervals, of a loud, 110-decibel sounder that will seek turbulence layers and inversions much as a depth finder seeks them in water, timing the reflected pulses as indicators of distance. An experimental instrument (one of several being tested on the project) will enable atmospheric density to be measured directly using a sample of promethium 147 as a source of beta rays, which are reflected by air molecules and can be detected with a Geiger counter tube; the conventional technique requires density to be calculated from temperature and pressure data. The ground-released radiosondes, released from three locations while the main balloon is aloft, will gather data for comparison with that obtained from the gondola. Paper strips tossed from the gondola will show small-scale wind-shear patterns, while a group of four-sided, helium-filled "tetroons" will be released from the gondola, ballasted to float at the same altitude, to study larger-scale wind movements. Other experiments will use microphones to record low-frequency sounds made by so-called "gravity waves," which can contribute to clear-air turbulence, and study small-scale turbulences with a group of instruments mounted on a flexible, 100-foot-high framework suspended from the gondola on a 300-foot cable.

Ozone, sulfur dioxide, aerosols, water vapor and other atmospheric constituents will be measured using filters, a ground-based laser beam and chemically reactive sensors.

One of the goals of Project da Vinci's research on electrical fields is to aid in the development of piloting systems for remotely controlled drone aircraft. Electric field sensors will be unreeled on a cable to hang a kilometer below the gondola in an 85-pound "down package" that also carries several other instruments. In addition, chaff consisting of fine, aluminum needles will be released by the crew to see if it can reduce the strength of built-up electric fields; these will be relatively weak fields, however, compared to the lightning-prone ones being studied elsewhere by NOAA aircraft.

A variety of studies will be aimed at measuring the absorption and reflection of various wavelengths of solar radiation, as well as at studying the effects of different types of terrain and man-made features on the ground below. Finally, the researchers will try to find out whether monitoring the air inside and outside the balloon itself, while incorporating wind speed and other data, can enable more accurate design and control of balloons for future flights.

The crew will use oxygen masks during part of the flight, which is designed to remain between 4,000 and 14,000 feet. To condition themselves, they are thus spending the two weeks before taking off living and hiking in the Rocky Mountains west of Boulder, Colo. If the ambitious mission is a success, others are planned, the first one to take place next spring. □

X-ray astronomy: The long and short

The growing field of X-ray astronomy continues to expand. Despite an aggravatingly elliptical orbit, the recently launched Netherlands Astronomy Satellite (SN: 8/24/74, p. 121) is holding out the possibility of more than 26 months of observations, while a U.S.-British team is preparing the 1975 flight of a huge X-ray telescope whose entire working life will be scarcely six minutes.

Next June, climaxing three years of preparation, the 2,000-pound telescope, more than 42 feet long, will poke its nose briefly into space atop a sounding rocket not much bigger than the telescope itself. The sole goal of the mammoth instrument is to take a single, 243-second glance at a single stellar object, the fading remnant of an ancient supernova known as Puppis A (SN: 7/13/74, p. 26).

The target is a particularly fascinating one for astronomers. It is one of the few known objects in the sky that is a source of visible radio and X-ray emissions. Distant even by astronomical standards (it is some 2,000 parsecs