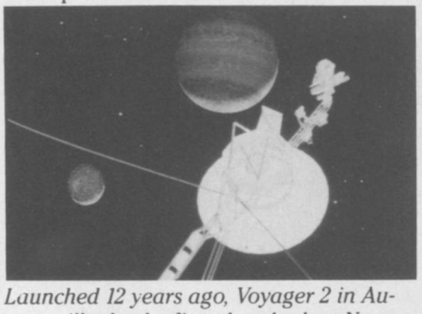
# NASA 1989: Suddenly It's 1986

## Readying some postponed science missions for launch

By JONATHAN EBERHART

Well in advance, NASA dubbed 1986 "A Year for Space Science." Galileo would head for Jupiter (to arrive in December 1988), the far-seeing Hubble Space Telescope would orbit Earth at last, and Magellan was being groomed to go to Venus in two years. All of those plans vanished in the Challenger explosion, but this year the agency is setting out to recoup them and more.



JPL

*Launched 12 years ago, Voyager 2 in August will take the first close look at Neptune and its moon Triton, the only such visit yet in any country's plans.*

Galileo, now set for launch from the shuttle on Oct. 8, 1989, will follow a different and far longer path to Jupiter than planned in 1986, not reaching there until 1995. On the way, it will swing past Venus and Earth in 1990 for gravitational "assists" to increase its speed, take the first close look at an asteroid (Gaspra) the following year, pass Earth again in 1992 for another boost, fly by a second asteroid (Ida) in 1993, and finally get to Jupiter more than two years after that. There, a probe will descend into Jupiter's atmosphere and the Galileo orbiter will spend 22 months photographing the planet and the Galilean satellites, its four largest moons.

NASA's ambitious 1989 science agenda begins, however, with the first launch of a U.S. spacecraft to another planet since the Pioneer Venus mission took off in 1978. Like that Pioneer, Magellan is to map the cloud-shrouded surface of Venus by radar. Formerly planned for liftoff in 1988, it is now scheduled to depart from the shuttle on April 28. Planetary scientists often remark that a given mission will "keep researchers busy for years," but Magellan officials maintain the new craft will supply data for decades of study. It should reach Venus in August of 1990.

Late December 1989 will see shuttle astronauts deploy the huge Hubble telescope. Astronomers will first spend six months checking it out in orbit from the ground, then as long as 20 years looking at planets, at stars and out almost to the edges of the universe with its 2.4-meter mirror, which will give an unparalleled view because of its position above Earth's distorting atmosphere.

Astronauts will periodically repair and replace the telescope's instruments. NASA, in fact, recently approved a study of what may be the first of the telescope's "second-generation" instruments. A combination of a near-infrared camera and multi-object spectrometer, it will equip Hubble to study the faint heat emissions from objects such as possible planetary systems now forming elsewhere in the galaxy, some of them first spotted in 1983 by the Infrared Astronomy Satellite. The proposed $80-million instrument's operation will depend on keeping its detectors cold, so they will be mounted within what one official describes as "a block of solid nitrogen the size of a refrigerator, which is inside a dewar cooled by a block of dry ice [solid carbon dioxide] inside another dewar."

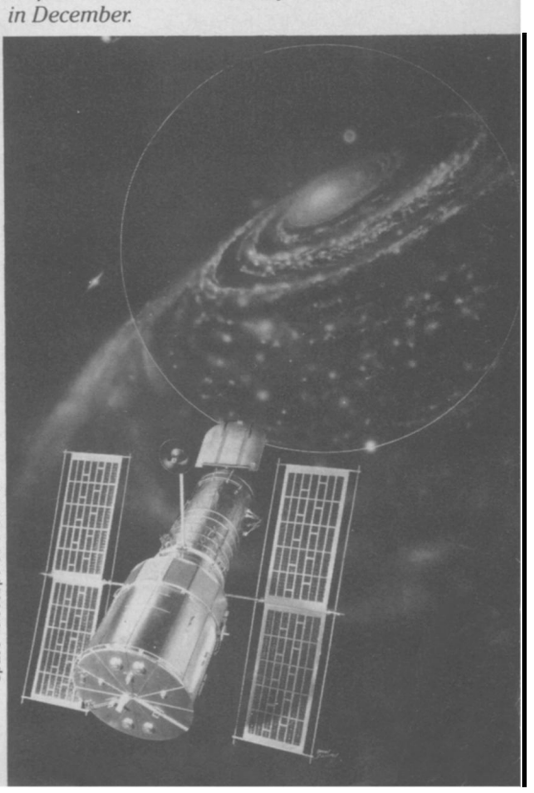
Pointedly not going up by shuttle is the Cosmic Background Explorer, or COBE, designed to sense emissions dating almost from the Big Bang. NASA originally intended to launch COBE from the shuttle, but modified the satellite in the aftermath of the Challenger explosion to ride a conventional Delta rocket—making it the first NASA spacecraft deliberately redesigned to get into space the old-fashioned way.

Shuttle astronauts this year should make the long-overdue pickup of a device called the Long Duration Exposure Facility (LDEF), which has been waiting passively in orbit since astronauts put it there in 1984. Equipped with no electronics, no moving parts, it consists merely of a rack to expose various material and biological samples to the space environment. The original plan was to leave LDEF there for a year, but it stayed longer because of the busy shuttle schedule; then Challenger blew up, leaving LDEF still in space, from which NASA expects to retrieve it on Nov. 13.

Scientists most interested in LDEF's results include those concerned with life aboard NASA's planned space station. The seeds, dormant shrimp eggs and other life forms in LDEF will have experienced a half decade's exposure to cosmic rays, gamma rays and other Earth-orbit influences. When planted, will the seeds have mutated? Will they grow at all?

The materials tests range from paints and glasses to computer chips, some of them from the Defense Department. Will, for example, the ceramics — essentially "fired" in their extended but presumably low-level radiation environment — hold a key to harder materials with greater breaking strengths, for such applications as high-temperature turbine blades? The other major space event of the year, due late in August, was really triggered by the launch of Voyager 2 in 1977. The last planned feat on that mission's agenda, after visiting and returning enormous amounts of data from Jupiter, Saturn and Uranus: the first close look at Neptune. □

*Envisioned as operating in orbit for as long as 20 years, the Hubble Space Telescope is to be carried aloft by the shuttle in December.*



Space Telescope Science Inst.