The solar system: A new U.S. flight plan

The National Aeronautics and Space Administration, like any government agency, is the subject of numerous reports, evaluations and recommendations regarding what it has done and what it should be doing. Two years ago, confronted with a planetary research program beset by ever-tightening budgets, a shortage of new spacecraft missions, limitations on the study even of data already in hand and a generally grim future, NASA's then-administrator Robert Frosch established an ad hoc group chartered to produce yet another such analysis. But the group's members, as well as planetary researchers both inside and outside the space agency, hope that the Solar System Exploration Committee will not be seen as merely rewalking the same old ground.

Last weekend, in conference rooms at the National Center for Atmospheric Research in Boulder, Colo., the SSEC met to hammer out the principal sections of its final report, intended as a cost-constrained flight plan of planetary research through the end of the century.

But why should anyone listen? "I think," says SSEC executive director Geoffrey Briggs, who is also deputy chief of NASA's earth and planetary division, "that this is probably the first time in well over a decade ... that a group has really come together and taken into account all of the factors that are really important in putting a mission set together. You know, when COMPLEX [the National Academy of Sciences' Committee on Lunar and Planetary Exploration] looks at the science strategies, that's nice, but it doesn't make a lot of reference to cost constraints. When some group throws up a fascinating mission, it may not have necessarily a lot to do with science. [The SSEC] has brought together all of the considerations in question and done, in my view, a thorough and responsible job of coming to grips with it. And I think people appreciate that this kind of thing doesn't get done too often."

What the committee has done is propose a "core program" — a list of what it feels to be essential planetary missions that will achieve COMPLEX's recommended scientific goals and help maintain U.S. leadership in solar system exploration — with the specter of tight money looking over the list the whole time.

One key is the use of spare hardware from other spacecraft, including that now being designed for the Galileo Jupiter orbiter-and-probe that is the only planetary mission now on NASA's books. At the top of the SSEC priority list, for example, is the Venus Radar Mapper, intended to improve on the radar maps of the Pioneer Venus orbiter by charting the planet's surface with 1-kilometer resolution. It is already part of NASA's fiscal 1984 budget request, but the idea is as young as the SSEC itself, resulting from an attempt to cut half the cost of a formerly considered mission called the Venus Orbiter Imaging Radar. On the proposed VRM, the radar antenna is adapted from the Voyager spacecraft's high-gain communications "dish." Other parts come from Galileo, Viking, Mariner, an earth-orbiting Air Force satellite, the International Solar Polar Mission, the Interim Upper Stage booster rocket, even the space shuttle. In balancing the craft's capabilities against cost, says a draft of the SSEC report, "no requirement has been regarded as inviolate." The scientific potential is still said to be high, but the willingness to stick with existing designs "has proved essential."

Next in line in the SSEC's view, says Briggs, is a Mars Geochemistry and Climatology Orbiter, designed to study the planet's global surface composition (barely touched by the sensors of the Viking orbiters in the late 1970s) and the role of water in its climate. The committee had previously considered these as jobs for two separate spacecraft, but even though their designs together called for a baseline total of only seven sensors, the two craft have been combined into one. The report specifies no set timetable for the MGCO, endorsing it only for "the near term," but implicit in the SSEC's core program idea is progression of missions whose timing will sustain a certain research momentum.

The SSEC's overall proposal is far from the mission-packed "wish lists" that have resulted from some past studies. Surface-landing and sample-return missions, for example, have been omitted from the core as requiring too much expensive development. Atmosphere probes of Uranus and Neptune could be done by probes almost unchanged from the Galileo Jupiter mission, but the report rejects them from the core program because of the large near-term funding necessary to have them ready to take advantage of a Jupiter gravity-assisted flyby on the way in 1990 or 1992. A particularly tempting mission idea that is being "soft-pedaled," in the words of one SSEC member, is a Saturn orbiter-and-probe made largely from spare Galileo parts and timed to take advantage of Galileo's already-assembled flight operations team. It might add as little as 10 percent to the Galileo Jupiter bill, but such "commonality" might have to start in the FY 1985 budget, putting the SSEC in the position of beginning its proposed program with a "must-do-it-now" idea.

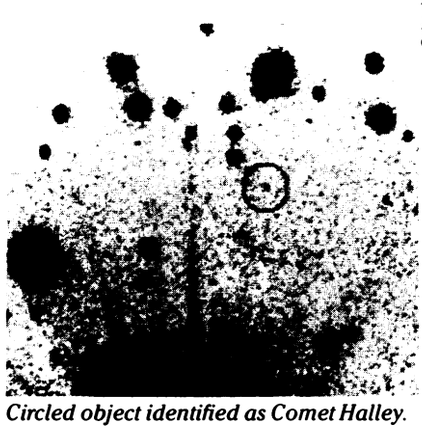
Conspicuously *in* the core, however, are missions to asteroids and comets, sought for studies of the solar system's early history. Other missions (plus expanded study of existing data) are also in the report, but it may be its credibility, rather than its details, that determines its influence.

—J. Eberhart

Recovery of Comet Halley reported

Circling the sun every 76 years, having been traced back through sightings from as long ago as 240 B.C., Comet Halley will surprise no one by simply showing up for its scheduled 1985-86 rendezvous with the earth. Still, it *is* the most famous comet in existence, known to many people who cannot name the solar system's nine recognized major planets, and astronomers around the world have been vying for the distinction of being the first to see it coming. Serious attempts began at least half a decade ago, but last week, a California Institute of Technology team claimed the title.

Led by graduate student David C. Jewitt and G. Edward Danielson, the group used the 200-inch Hale telescope at Palomar Observatory. At the telescope's prime focus was a camera whose sensitive detector was a charge-coupled device (CCD) identifical to the one in the Wide Field Planetary Camera developed for the orbiting Space Telescope, which will be launched in 1986. Looking at a position calculated from past sightings of Halley, the researchers first identified the object in seven plates taken early on Oct. 16. In additional plates made three nights later — desirable to confirm the sighting — the object failed to show up, but the researchers believe the reason to be that it was invisible in front of bright stars occupying



Caltech

Circled object identified as Comet Halley.

the same position in the sky, as determined from the original images. Preliminary measurements indicated that Halley was within 8 arc-seconds of its predicted position, within the 10 arc-second uncertainty of the position calculations. When detected, the object was at a visual magnitude of 24.2—beyond the range of all but the most sensitive of observing instruments—and about 11 billion astronomical units (AU), or about a billion miles, from both the earth and the sun, placing it about 1.5 AU beyond the orbit of Saturn. Comet Halley will pass closest to the earth in February of 1985.

—J. Eberhart