Challenger effects: Galileo options

With the Challenger investigation still under way, the full effects of the space-shuttle tragedy on NASA's future plans are so far unknown and unknowable. But it is clear that the length, cost and other consequences of the delay will make themselves felt in numerous ways, notably including the launch plans for many payloads on the shuttle fleet's packed cargo manifests.

One project that already has been strongly rocked by Challenger's ripple effect is the Galileo orbiter and atmosphere-probe of Jupiter. After a decade of development, it has now been postponed indefinitely from a shuttle launching that had been scheduled to take place during a three-week "launch window" that opens on May 20. Linked to Jupiter's orbital position, the window opens only every 13 months. But that is only part of the problem.

Sending Galileo to Jupiter from the earth-circling orbit in which the shuttle deploys it is the job of a powerful upper-stage booster rocket called the Centaur. Not only does the Centaur burn the same powerful liquid oxygen and hydrogen propellants that ignited in the Challenger explosion (a possible additional concern, depending on the investigation results), but only a single shuttlecraft — Atlantis — is now equipped to carry it. And NASA had a second Centaur-boosted mission — Europe's Ulysses flight over the sun's poles — scheduled for just five days earlier, far too short a "turnaround time" for one shuttle to handle both. Formerly assigned to Challenger, Ulysses must first tilt its orbit by swinging around Jupiter, which limits it to about the same launch windows as Galileo.

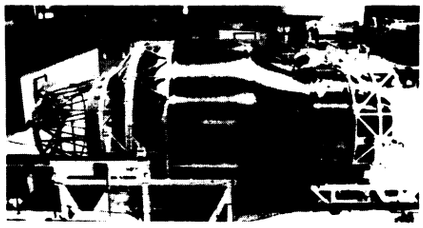
In the immediate aftermath of the accident, Galileo officials at the Jet Propulsion Laboratory (JPL) in Pasedena, Calif., were evaluating a wide range of possible ways around the problem, all of them assuming, of course, that the rest of the shuttle fleet gets back on the job. One, called the Delta-VEGA option, would enable Galileo to be launched this Nov. 1 by heading out past the orbit of Mars, then back to swing around the earth for a gravitational assist before going to Jupiter. This would allow one shuttle to be used for both missions, but the trans-Mars trip en route would get Galileo to Jupiter about a year and a half *later* than would a conventional June 1987 launching. Another possibility considered was not to use the shuttle at all, going instead with an unmanned, military Titan rocket, but the earliest such booster appeared unlikely to be available until 1990.

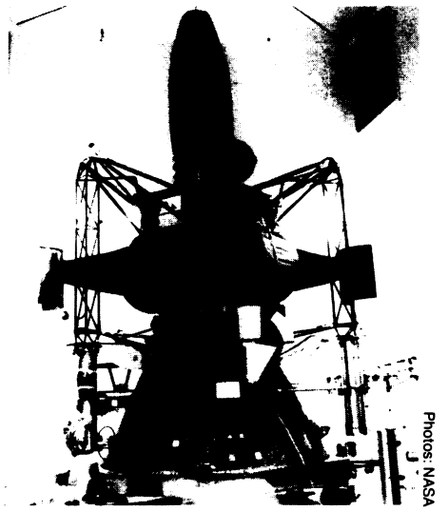
Yet another variation would be to launch either Galileo or Ulysses in June 1987, with the other mission beginning 13 months after that. Galileo might have the inside track in that event, since it would have far more personnel to keep on salary throughout the extra delay. On the other hand, relations with Europe might suffer appreciably from such a choice, in part because NASA had already angered European officials a few years ago by dropping plans for what would have been a similar U.S. spacecraft that would have enabled the study of both solar poles at the same time.

Now, however, NASA has decided to take steps toward equipping one more shuttlecraft, Discovery, to handle the Centaur upper-stage booster, so that both Galileo and Ulysses could be launched in the summer of 1987, says Galileo project manager John Casani of JPL. Hope for this plan, too, depends on the consequences of the Challenger affair, but the time required to procure, install and test the necessary modifications to Discovery require NASA to get an early start even to keep the option open.

Also unknown so far is whether Galileo has already lost the chance for what was to have been the first-ever flyby of an asteroid. The trajectory for the now-postponed launching in May would have carried the craft past the asteroid Amphitrite on the way, a decision NASA made even though it would have delayed arrival at Jupiter by three months. A search will be made for another asteroid that meets the mission's Jupiter-related trajectory criteria, says Casani, but like so much else in NASA's future, its status for the present is a question mark.

— J. Eberhart





The Centaur high-energy upper-stage booster rocket (above), shown last year under development, is to carry the Galileo orbiter and probe (right, with probe hidden beneath the conical structure at bottom) to Jupiter — after the space shuttle has first lifted it into orbit around the earth.

Photos: NASA

Europe plans 5 new science satellites

Plans for five new satellites to study the sun and its interactions with the earth's magnetosphere have been unanimously approved by the European Space Agency (ESA) as the organization's major new scientific project. Envisioned for 1993-95 launchings, the craft are considered to represent the first of four "cornerstones" identified in 1984 as the major items in an ESA plan for European space-science research through the end of the century.

Four of the satellites, collectively known as Cluster, are to be launched aboard a single vehicle — either the space shuttle or Europe's unmanned Ariane 4 — into a complex family of earth-circling orbits that will let them simultaneously monitor different parts of the geomagnetic field. Together, they will study: the "bow shock" formed where the field holds the incoming solar wind at bay; the charged particles of the magnetosphere itself; the polar "cusp regions" where the solar-wind particles find their way in; and the field's extended "tail."

The fifth entry is SOHO, the Solar and Heliospheric Observatory, which will be stationed on the sunward side of earth's magnetosphere to monitor the solar wind in its "raw" form, before it is affected by the presence of the earth. SOHO will be located at a "Lagrangian point," where the gravitational attractions of the earth and sun are balanced. This was the position formerly occupied by a satellite known as International Sun-Earth Explorer 3, which was shifted from that location and which, using the name of ICE, flew through the tail of comet Giacobini-Zinner last Sept. 11.

Together, Cluster and SOHO have been envisioned a Europe's primary entries in a proposed International Solar-Terrestrial Physics program, which would also include participation from the United States and Japan. NASA budgetary limitations have slowed the U.S. role to an uncertain level, though the European plans are designed to go forward whether the United States participates or not. *— J. Eberhart*