Galileo 'will still meet most scientific goals'

Washington. Mission managers handling the National Aeronautics and Space Administration's (NASA's) Galileo spacecraft are optimistic that their two-year tour of the Jupiter system can still meet most of its planned scientific goals — even if the spacecraft's faulty onboard tape recorder is declared a total loss.

Instructions transmitted to Galileo last weekend showed that the recorder, which began experiencing problems on 11 October (see *Nature*, **377**, 563; 1995), is still able to move and read tape normally. But whether it can be trusted with critical images and data during the main mission — which begins on 7 December, when a probe is set to plunge into Jupiter's clouds just as the main spacecraft enters orbit around the planet — could be in doubt.

"We're assuming at the moment that we may well have to live without the tape recorder," says Torrence Johnson, a project scientist at NASA's Jet Propulsion Laboratory (JPL). Galileo managers are already making contingency plans for a 'real-time' mission, with science data either being be relayed to Earth immediately, or stored in the spacecraft's computer memory, rather than on tape. According to this plan, additional computer memory would be made available for storing science data by using sectors that had previously been used to operate the recorder.

Such a strategy will reduce the number of bits of data that can be relayed back to Earth by as much as three-quarters. But Michael Belton of the Kitt Peak National Observatories, who heads Galileo's imaging team, claims that relatively little will be lost. "The science is not linearly proportional to the number of pixels," he says.

Indeed, Johnson estimates that even without the use of a tape recorder, Galileo will still be able to meet more than half its scientific objectives. The loss of the spacecraft's high data-rate antenna in 1991 — the cause of heavier reliance on the tape recorder — had already reduced the mission to 70 per cent of its original output. "The overall mission philosophy is nowhere near as much changed by this as it was by the high-gain antenna failure," he says.

In the revised plan, the mission's top priority, data from the atmospheric probe, would still be retained, as this was already to be stored in computer memory. Data on Jupiter's electromagnetic environment, most of which will be relayed back to Earth in real-time, would be only slightly affected.

Lost in the new plan, however, would be some of the photo opportunities generated by the spacecraft's arrival near Jupiter, including high-resolution pictures of the volcanic moon Io and of the southern hemisphere of Europa. Unless the tape recorder can be made operational — or additional space can be freed in computer memory — the probe data will take up all the available storage room.

IMAGE UNAVAILABLE FOR COPYRIGHT REASONS

Roder Ressmeyer, Starlight/SPL

Getting closer: an impression of Galileo's encounter

Observing sequences for the rapid events surrounding arrival at Jupiter will remain unchanged from the original plan, as it would be too risky to make major changes with only two months left. Any revisions to the tour would begin next July with the satellite fly-by of the moon Ganymede.

During these satellite encounters, says Belton, the imaging team will lower the number of bits of data by reducing the frame size for each image, so that some areas will not be photographed at high resolution. The strategy will still allow areas of scientific priority to be photographed at resolutions of hundreds, and in some cases tens, of metres, about 100 times better than those produced by the Voyager fly-bys of the 1980s. "What [the recorder problem] translates into is a reduction in [the area covered], but the resolution is maintained," says Belton.

He and other mission scientists say they are in better spirits than the dark hours immediately after the tape recorder problem first surfaced. "You should have heard the cheer that went up around our teleconference after we started getting the report [of how much data could still be retrieved]," says Belton. "We thought we were dead in the water."

The Galileo team is no stranger to adversity. The spacecraft, which was built more than a decade ago, was expected to complete its Jupiter mission in 1990. But the explosion of space shuttle Challenger four months before its planned launch in May 1986 threw that schedule out the window. Other shuttle-related problems meant that Galileo had to take a slower, more circuitous route to Jupiter after its launch in 1989, and will now arrive at its destination seven years late.

While most of Galileo's problems are not of its own making, the apparent failure of the mission's single tape recorder — installed despite calls for a back-up — may provide a cautionary tale for today's budget space missions. If hardware failures continue, the best that project managers can do is to cross their fingers and keep devising clever alternatives. **Tony Reichhardt**

NIH radiation incident. A story last week reported that the National Institutes of Health had calculated that 27 researchers involved in an incident at the National Cancer Institute this summer had absorbed doses of radiation of between 300 and 600 microcuries (see *Nature,* **377,** 568; 1995). In fact, NIH measurements showed that, apart from one researcher who had been exposed within this range, none of the others received doses of more than 25 microcuries. The misunderstanding arose from ambiguities in a draft statement inadvertently released by NIH.

SKB backs genome ethics programme

San Francisco. The pharmaceutical company SmithKline Beecham, which entered into a $120-million agreement in 1993 with the gene sequencing company Human Genome Sciences, has donated $950,000 to Stanford University in California to fund a research programme on Genomics, Ethics and Society over three years.

The programme, which also hopes to draw funding from other sources, plans to take a multidisciplinary approach to the issues raised by genetic testing, gene therapy and other technologies resulting from the advance of human genetics.

Initially, a working group made up of representatives from the humanities and the sciences, as well as pharmaceutical companies, patient groups and health insurance providers, will review policy in the area of genetic screening for susceptibility to breast cancer. The working group will prepare a 'white paper' (policy document) leading to an international conference to be held in the autumn of 1996 at Stanford.

Barbara Koenig, the programme's director, says it will take a critical stance on the development of genomics, building on a foundation of scientific expertise. There are no reporting requirements to SmithKline Beecham — which is familiar with controversy surrounding genomics as a result of its funding of HGS — or any restrictions on publication.

But to avoid any apparent conflict of interest, the programme will not consider questions raised by patents or other issues directly related to SmithKline Beecham's product areas, says Koenig. **Sally Lehrman**