Hubble Space Telescope takes first shaky steps

■ Long-delayed launch is perfect

■ High-strung computers make NASA nervous

Greenbelt, Maryland

AFTER a near-perfect launch last week, the Hubble Space Telescope (HST) has proved unexpectedly difficult to control and may remain partially crippled, National Aeronautics and Space Administration (NASA) officials said. Of greatest concern are the two large high-gain antennas that HST uses to communicate, via relay satellites, to the ground. By early this week, one antenna seemed to be working normally, but the other appears to be obstructed by a misplaced one-inch cable. The antenna is unable to move through its full rotation without triggering sensors that detect excessive force.

Normally, NASA engineers would disable the faulty antenna and rely on the good one, but HST's two antennas are designed to move together; it is impossible to send commands to one and not the other. Although engineers have been able to lock the troublesome antenna, it continued to "dither" when the other was moved. Even if the two antenna can be reprogrammed to operate independently, the body of the telescope would at times block the path between the working antenna and the link satellites, interfering with the transmission of data.

Instead, HST controllers plan to keep both antennas in operation, but limit the rotation of the obstructed one to about 140°, 40° less than planned, to stop it hitting the stray cable. Short of another shuttle mission and a spacewalk, there is no way to remove the cable. The reduced antenna travel is expected to complicate data transmission and increase the time needed for some experiments.

A continuing difficulty is that when the cautiously programmed HST detects serious errors or unexpected motions, it goes into a "safe mode" in which certain systems are shut down until the problem can be sorted out. Bringing HST out of safe mode takes time, even when the malfunction is relatively benign. In the mild safe-mode level, communications links remain open, but the telescope will not move any of its parts. In more severe shutdowns, even communications are reduced.

Last Friday (27 April), as controllers prepared to open the hinged 'lens cap' that protects the 94.5-inch primary mirror, an error signal from the obstructed antenna put HST into its most shallow safe mode. The antenna was turned off and HST was brought back to life to allow the lens door to be opened, but controllers discovered that the process of opening the door jostles the entire telescope, causing motion-sensing gyroscopes to record an unanticipated move. Assuming that the sensors were in error, HST's main computer temporarily turned off two of the four main gyros; without at least three gyros working, HST cannot manoeuvre.

The telescope responded to the loss of the control gyros by dropping into a deeper safe mode. After several tense hours, NASA engineers were able to coax HST back into operation. But a top priority will now be to adjust the sensors or reprogram the main computer to avoid such a painful routine every time the door is opened or closed. Many of HST's components, the door among them, could not be adequately tested on the ground under the force of gravity.

Once the aperture door was open, the shuttle *Discovery*, which had been flying in tandem with the telescope in case of emergency, was free to return to Earth. Astronauts had been on board and prepared to repair the solar panels, the door, or certain other parts that could have malfunctioned. But the rogue cable was not detected until Sunday, when NASA engineers examined the video images taken as HST was released by the shuttle. By that time *Discovery* was already on its way home.

Because of HST's teething pains, the first out-of-focus pictures from the telescope will be delayed by nearly a week. Calibrating and testing the instruments will take another six to eight months. Only then will scientific observations begin, although some detailed pictures should be available within a month.

G. Christopher Anderson

IMAGE UNAVAILABLE FOR COPYRIGHT REASONS

HST floats free of *Discovery*'s robot arm. (AP).

CZECHOSLOVAKIA

Academy law due for welcome reform

Prague

PROFESSOR Armin Delong, the newly appointed chairman of the Czechoslovak State Commission on Science and Technology, seems to have won a concession for which the scientific community has been asking for some time — the promise of early legislation to amend the law that governs the Czechoslovak Academy of Sciences.

At a meeting with the chairman of the federal assembly, Alexandr Dubček, a delegation of scientists led by Delong won agreement that there will soon be *de jure* recognition of the changes in the organization of the academy the federal government has introduced.

The sensitive issue of membership of the academy was also discussed at the meeting. Despite pressure from the scientific community for members appointed for strictly political reasons to resign, only one has so far done so. It was agreed that the membership should now be dissolved, and that new members should be elected on a federal basis. That, acting vice-president Katčtov explains, will cause less pain.

Among other issues raised with Dubček were the problems of the proposed competitive grants system and the general fear that younger badly paid scientists will leave the country. The delegation hopes that Dubček's parting words — "we shall be needing you more than you need us now" — are a sign of the government's goodwill towards science.

Delong's appointment, to replace 52-year-old veterinarian Dr František Reichel, has been widely welcomed. Reichel, who is a prominent member of the Catholic Peoples' Party, was largely unknown before taking office earlier this year. Delong, 65, is both a vice-president of the academy and director of its Institute of Scientific Instruments at Brno. He is widely respected for his work in electron optics and lithography, as an organizer and as a spokesman for reform. As chairman, he is expected to accelerate long-awaited changes at the commission of which he is now the head.

Veronika Maxová

UK CHIEF SCIENTIST

Greener advice?

London

PROFESSOR Bill Stewart, secretary of the Agricultural and Food Research Council, will be the government's next chief scientific adviser, replacing Sir John Fairclough. The appointment will be seen as a sign of prime minister Margaret Thatcher's much-vaunted interest in environmental issues. Stewart serves on the Royal Commission for Environmental Pollution and is a former member of the Natural Environment Research Council. Peter Aldhous