

carefully ambiguous public attitude. In a delphic speech in Seattle recently, Keyworth hinted that it would be a mistake to plunge into a space station project without spelling out precisely what the next step in space would be. Significantly, he dismissed the argument that Soviet achievements with Soyuz had stolen a march on the United States.

The two most significant deciding factors will be the White House's perception of the military use of the space station and the significance it assigns to private sector interest in space-based ventures. DOD's lukewarm position on the space station will be taken with more than a pinch of salt: the Pentagon learned with the shuttle that by appearing to be unimpressed it could gain access to an attractive space asset without having to pay for its development out of its own budget.

As for the private sector, NASA has spared no effort to persuade industry that a space station could lead to real manufacturing possibilities. The private management consultants, Booz, Allen and Hamilton, said last week that under a contract from NASA they had determined that there was enough economic potential in space to persuade a significant number of companies to invest in the space station. The most promising opportunities were in biological processing, production of high-performance catalysts, a fee-for-service laboratory in orbit and the production of high purity iridium crucibles for making gallium arsenide.

Peter Wright Wood, Booz Allen's senior vice president, warned, however, that several important obstacles had to be surmounted before many companies would invest in the project. Most companies complained that NASA's commercial procedures were too cumbersome and insisted that some way must be found to protect intellectual property that would be acquired by an investment in space.

NASA has also begun extensive talks with foreign governments interested in becoming users of a space station. Canada, France, Germany and Japan, as well as the European Space Agency, have carried out their own studies of missions that could be mounted from NASA's space station. Until the project is formally approved, however, NASA will not talk to foreign governments about collaboration in the station's planning and construction.

Even if the White House agrees to approve the space station, NASA will still have to deal with the sceptics in Congress. Some committees have already indicated that an unmanned space station using refinements of existing hardware offers a cheap way to achieve many of NASA's goals. But most congressmen are enthusiastic. In a recent survey by the Political Action Committee for space 26 senators and representatives favoured a space station, 3 expressed opposition and 13 were undecided.

Peter David

Cell astrobiology

Shuttle separation of islet cells

St Louis

ON the eighth space shuttle flight, due to be launched on 30 August, the McDonnell Douglas Corporation will be using continuous-flow electrophoresis to try to separate insulin-producing beta cells from the other cells of the pancreas. The procedure could have potential as a way of obtaining cells for transplantation into human diabetics. On board the shuttle *Challenger* will be dog pancreatic cells provided by Drs David Scharp and Paul Lacy,



researchers at Washington University Medical School, St Louis. They are interested in separating pure beta cells for transplantation experiments from the 98 per cent of other cells in the pancreas.

Whether they will need zero gravity in space to get the purity at which they aim is not yet known, but the absence of gravity allows electrophoresis to be done without the usual Earth-bound constraints. In space, high voltages can be used without setting up convection currents that disrupt the separation, and the concentration of the sample is limited only by the solubility

of the sample, not by the density of the buffer used.

Many questions remain to be answered about how to handle the cells before, during and after the flight — such as what kind of buffers to use and whether to use fresh or frozen tissue. This first attempt at separating beta cells in space will be used to work out the handling and separation procedures. The cells harvested from the continuous-flow electrophoresis will be tested for viability on their return.

McDonnell Douglas started working in 1977 on continuous-flow electrophoresis for separating materials in space. It has joined with the Ortho Pharmaceutical Corporation to use the procedure for drug purification.

The company plans three phases of work in space. First, it will perform separations on board the shuttle. Then it plans to launch free-flying satellites that contain automatic equipment for the separations. These satellites will be serviced by the shuttle, which will be used to load raw materials and recover finished products. By the turn of the century, McDonnell Douglas hopes to use the facilities of an orbiting space station for the work.

Much remains to be done before purified human pancreatic beta cells could be transplanted into diabetics. Even if purifying the required number of cells turns out to be feasible, the details of transplantation remain to be worked out. In any case, a procedure that works for purifying beta cells could probably be adapted to other cell types that are difficult to purify.

Karen Freeman

Yellow rain

More toxin victims claimed

Washington

MORE evidence in support of the US State Department's contention that toxin weapons are being used in South-East Asia was forwarded to the United Nations last week, bringing to 20 the number of supposed victims found to have fungal toxins in their blood. The trichothecene mycotoxins T-2 (which the State Department says is the major toxin used in "yellow rain") and HT-2 (a metabolite of T-2) were detected in the blood of four subjects, 5 days to 2½ months after allegedly being attacked on different occasions between November 1981 and March 1983 in Laos and Kampuchea. By contrast, no toxins were detected in five control subjects of similar background who did not claim to have been attacked. While the use of control samples in this latest set of data appears to buttress the State Department's claims, no explanation is offered for the failure to detect toxins in at least seven other subjects who reported

being victims of three of the four attacks.

At a briefing last week for reporters, Robert Dean of the State Department dismissed criticism that focuses on the scientific data, saying that sceptics such as Matthew Meselson of Harvard are "working from a very limited body of data" that does not include intelligence information which "has really convinced us beyond a shadow of a doubt" of the Soviet use of toxin weapons in the region. The State Department, citing security reasons, has refused to make public any of this intelligence information.

One bizarre note was interjected into the latest scientific data by the State Department's assertion that the 6 November 1981 victim, described as a Lao resistance fighter, had been attacked with a "toxic agent grenade". The victim was the only witness to the incident. Previous reports have referred to aircraft-delivered sprays or artillery shells.

Stephen Budiansky