US space station

Japan reassured on military uses

Tokyo

A MAJOR obstacle to Japanese participation in the US space station project seems to have been overcome this week with assurances from Mr James Beggs, administrator of the US National Aeronautics and Space Administration (NASA), that the station would not be put to military use.

Mr Beggs arrived in Tokyo on Sunday to offer the Japanese Government a chance to join in the project to put a station, permanently manned by a crew of seven or eight, into orbit by the early 1990s. Discussions with Prime Minister Nakasone and the Space Activities Commission — the highest space policy body in Japan — took place on Monday. Because the Japanese constitution specifically forbids the maintenance of armed forces, it would be almost impossible for the government to make a commitment to a space station that might be used for military purposes. But Beggs stated that the US military has no desire at all to participate in the development of the station. It would, he said, be launched into a low-inclination orbit (28.5 degrees, 300 km elevation) that would not take it over any of the high-latitude areas which might be of interest to the military. Should the military later want to use space station technology for their own high inclination orbit station, they would not have an automatic right to use technology developed by Japan for the station. Rather, Japan's "intellectual property" would be protected in a way satisfactory to Japan. But Beggs hoped that all work done on the project would "in the NASA tradition" eventually be published and made common property.

With the Japanese Government apparently satisfied on that score, the pressure is on the Japanese to decide quickly to what extent they are willing to participate financially.

Although an official of the Science and Technology Agency said before Beggs' arrival that it was unlikely that a decision could be made before the end of the year, Beggs made it clear that the project will be starting to move rapidly by the last quarter of this year. NASA would like to see the station operational by 1992 and is preparing to invest \$8,000 million in the initial development period. By the spring of 1985, some \$30 million will have been spent and a decision made on the basic form of the station. Expenditure will then rise rapidly to \$150 million by 1985-86 and \$400-\$500 million by 1986-87.

If Japan is "not well on board by the end of this year", Beggs said, "then doors will start to close". This deadline is particularly important because Japanese engineers hope to design totally one of the modules that would be clustered together to make the station. For this, Japan must join in early so that the module interface requirements can be decided.

The United States would like Japan to contribute an amount equal to 10-15 per cent of the US investment, to be added to the 20-25 per cent asked of Europe and Canada. If all countries participate as asked, the development budget will be near the \$11,500 million dollar mark, allowing a far more sophisticated programme than the United States could accomplish on its own. Beggs stressed that the money spent should be viewed as an investment: space projects, he said, can return substantial sums both in direct returns on satellite launches and in high technology spin-offs, and the aim is to make the space station a commercial and industrial success.

But with the Japanese Government already struggling to find funds for its own ambitious space programme (*Nature* 1 March, p.3), it is hard to see where the money will come from. Beggs said that the United States is not insisting on a 10-15 per cent investment from Japan — each nation will have to decide for itself how much it wants to invest. All Michiyuki Isurugi, director-general of the Science and Technology Agency, is prepared to say so far is that the meeting with Beggs has "deepened interest in the project", but discussions of more concrete plans have not yet begun.

Alun Anderson

Phaenomenal colours

THE early history of the spectroscope since 1666 when Isaac Newton "...procured me a Triangular glass-Prisme, to try therewith the celebrated Phaenomena of Colours" is covered in a new exhibition which opened last week in Cambridge, England, and runs until 7 December. The exhibition is at the Whipple Museum of the History of Science, part of the University of Cambridge. A catalogue and illustrated history of the spectroscope are published to accompany the exhibition. The engraving below shows a two-prism spectroscope fitted to an 11-inch refractor at Potsdam Observatory.

Commercial space

Poor outlook for Landsat sale

Washington

COMPANIES interested in buying all or part of the United States' Landsat satellite remote sensing system have until 19 March to submit their bids to the Department of Commerce. The Communications Satellite Corporation (Comsat), the Radio Corporation of America (RCA), Fairchild, General Electric and a new company called Space America have already expressed interest. But the proposed sale is regarded by many outsiders as an unpropitious start to the commercialization of space.

Part of the problem is financial. What little market exists for remote-sensing data consists mainly of government departments. As the proposal to commercialize the system has creaked through Congress, even enthusiasts for private sector investment in space have questioned the wisdom of the government selling a system and buying back its products. A proposal by the Reagan Administration to include government meteorological satellites in the sale was rejected outright.

But many in Congress, prompted by the Office of Technology Assessment (OTA), fear that sale of the Landsat system will also jeopardize the diplomatic interests of the United States. An OTA technical memorandum published this month says that Landsat has been used over the years to advance important foreign policy objectives — notably preserving the principle of the free international flow of information and helping developing countries see the American use of space as an opportunity rather than a threat.

The commercial interests of a private buyer may well conflict with such objectives, OTA warns. On the other hand, any constraints the Commerce Department intends to place on a sale to ensure that Landsat data remain available to developing countries at an affordable price threaten to make the enterprise unprofitable.

The OTA memorandum points to several other problems raised by the sale. For one thing, the defence and intelligence communities are the biggest users of Landsat data within the federal government. Unless there were safeguards on a privately-owned system, these communities might find it necessary to build and operate their own systems, a course that would probably cost the government more than it would save by selling Landsat.

OTA also questions whether a private owner would be far-sighted enough to develop remote sensing technology at the pace necessary to allow the United States to keep ahead of foreign competitors. The European Space Agency (ESA) and several individual countries have well-advanced plans to launch their own systems and to

market the results.

Most worrying for the United States is the French SPOT satellite, due to be launched next year. A remote-sensing satellite capable of high-resolution multispectral stereo-images of the land surface, SPOT is billed by the French as the world's first commercial remote-sensing satellite system. In fact it is heavily subsidized by the French Government.

Competition such as that posed by

SPOT puts the Commerce Department in a cleft stick. The Reagan Administration believes in the power of the private sector to maintain US technological leadership, but in the case of Landsat some form of subsidy, either direct or indirect, may be necessary. What is not clear is whether Congress will go along with plans to sell a public asset if it is going to continue to be a burden on the federal budget.

Peter David

UK higher education

More talk at NEDC

THE British Government seems to have found an unusual forum for developing its strategy for the future of higher education — the National Economic Development Council.

Discussion of a paper on higher education prepared for last week's meeting of the council by the Secretary of State for Education and Science, Sir Keith Joseph, seems to have surprised the minister by its length but to have raised in the minds of others the question whether the British Government still needs the University Grants Committee.

The council is the tripartite talking-shop which normally represents government, the Confederation of British Industry and the Trades Union Council, but whose meeting last week was boycotted by the unions, still smarting from the government's decision to quash the rights of intelligence gatherers to join trades unions.

The striking feature of Sir Keith's paper is the evidence it provides of the government's determination to direct development of education from the centre. Its starting point is a declaration that, apart from the contribution of higher education towards "national well-being and society as a whole", British higher education must make "judgements" of the demand for graduates in different specialities and "contribute directly to mutually beneficial collaboration with employers".

Acknowledging the "case against any detailed or comprehensive planning of graduate supply", Sir Keith nevertheless says that the government thinks it right to "give a broad steer to the system to some extent". Its intervention so far has been the "indication" to the universities that science, technology, engineering and "other vocationally relevant forms of study" should recruit more students, the 15 per cent increase of engineering students and 50 per cent increase of mathematics and computing students planned for next year in polytechnics and the provision of 5,000 places on information technology graduate courses planned for 1985-86.

Further ahead, the government hopes for a 50 per cent increase (to 15,000 a year) in the output of graduate engineers in the decade to 1987-88, and the minister's paper says that he is "actively considering" what should be the target for succeeding

academic years, when the age group from which students are recruited to higher education will be shrinking.

The paper also seeks to stimulate the job market by noting that British industry must make employment for engineers more attractive, saying that "student demand will quickly react against engineering" if jobs do not materialize. Sir Keith says that there will be more jobs for electronic engineers but fewer for civil engineers, and

UK universities

Row about budgets resolved

RECENT trends in financial support for British universities have lately been a matter of public dispute. Mr Peter Brooke, Under Secretary of State with special responsibility for higher education, sent indignant academics diving for their calculators when he claimed in a letter to *The Guardian* newspaper that the universities' recurrent grant had shown a 25 per cent cash increase and "virtually no change in cost terms" between 1980-81 and 1983-84. That view was quickly challenged and, after questions in Parliament, Mr Brooke admitted there had been a real reduction of 8.75 per cent.

Mr Brooke's mistake was that he failed to allow for changed arrangements in 1982-83, when tuition fees were reduced and the recurrent grant channelled through the University Grants Committee was increased to compensate. A better picture of trends as they affect universities is given in the figure above, which covers both sources of income. The deflator is the Treasury-approved Tress-Brown index of universities' recurrent costs.

During the five years since 1979, several additional commitments have been imposed on the universities over which they have no control, thus making comparisons difficult. These include redundancy compensation (£26 million in 1983-84), the upward incremental drift of salary gradings, increased superannuation payments and a shift of funds from capital grant. Together with rates, which the universities never see, these non-academic increases are lumped together in the upper half of the histogram.

The total left over for academic activities compares like with like (although it does include the targeted "new blood" and

that physics in higher education will be squeezed by competition from engineering. Acknowledging that engineering courses cost more than others, Sir Keith offers guarded hope of financial relief for higher education with the remark that "resources are finite and increased expenditure must therefore be clearly justified".

Research is described in the minister's paper as "a further area where higher education and employers must come together productively". Sir Keith says that "fundamental research . . . is vital to our scientific progress, but is not necessarily directed at a specific industrial application". For the future, the minister announced that the government would decide how far the switch in higher education towards science, technology and engineering should go.

Employers, for their part, were asked to say what their expectations are of higher education, to describe their plans for employing the new graduates at attractive salaries and to comment on "the value to the economy of basic research financed by the research councils". □

information technology schemes in 1983-84). The shortfall of £112 million at 1979-80 prices is a drop of 11.5 per cent in income needed to maintain activities at their 1979 level. Full-time student numbers rose from 293,000 in 1979-80 and then fell back to 288,000 in 1983-84: the resulting "unit of resource index" is also shown above. The Committee of Vice-Chancellors and Principals, which supplied the information, points out that these reductions have been achieved despite a shift towards the more expensive science-based subjects. A drop of 1 or 2 per cent a year in the unit of resource has been suggested, and universities' total recurrent grant next year will be 2.5 per cent lower than was announced in November. **Tim Beardsley**