

military projects will certainly continue to be limited to getting them up. The chief fear of supporters of the civilian space programme is that with the increased emphasis on these military uses of space, NASA may end up doing little more than running a bus service, and may, as suggested in *Space World* recently, become in effect a "vassal" of the Air Force. The announcement of an 85 per cent rise in the rates charged to civilian users of the shuttle for flights after October 1985 and a scheduled tripling of charges for LANDSAT data this October — not to mention uncertainty over the government's continued support for LANDSAT — have added doubts about the Administration's commitment to the civilian space programme. **Stephen Budiansky**

Franco-Japanese collaboration

Plumbing depths

France is flirting with Japan. Tsukuba, the Japanese "science city" outside Tokyo, is to be named as a twin with Orsay, the complex of scientific institutions and industry south of Paris. At the end of this month, officials from the French ministry of research and technology will be visiting Japan to study Japanese management of science and technology.

M. Jean-Pierre Chevènement, the minister of research and industry has already visited Tokyo twice in his year as a minister. Will he try to model the new ministry of research and industry on its Japanese counterparts?

Philosophical uncertainties apart, one concrete new Franco-Japanese project has been set up — JASP, an oceanographic study of the Japan trench. The objective is scientific, but since the trench involves the subduction zone that causes Japan's frequent earthquakes, there is practical interest in the outcome.

Japan also stands to gain a knowledge of French submersible technology in the form of "SM 97". This new exploration submersible capable of reaching a depth of 6,000 metres is being built at the French oceanographic research institute at Brest, and may be ready by 1985.

The research will take place in two stages, the first in 1984, when the surface research vessel *Jean Charcot* will use a narrow-beam echo sounder (called Sea Beam) to draw a profile of the trench on a scale 1/10,000 to 1/20,000, while Japanese groups make gravimetric, magnetic and seismic measurements. Special study will be made at points where sea-mounts are being subducted and at the point of intersection of the Pacific, Philippine and Eurasian plates.

In the second stage, in 1985 SM97 will be sent down to points reckoned from the first survey to be of particular interest. Three transmitting seismographs and an inclinometer will be left behind.

Robert Walgate

India to expand space technology

Lucknow

India's determination to achieve self-reliance in space technology is evident from the government's recent approval of a space programme for the rest of the decade to build one satellite and two launch vehicles at a cost of 3,963 million rupees (£240 million). An 800-kilogramme remote sensing satellite will be used from 1985 to provide resource information in agriculture, water management, forestry, hydrology, geology and coastal oceanography.

The launch vehicle projects comprise an Augmented Satellite Launch Vehicle (ASLV) and a Polar Satellite Launch Vehicle (PSLV) whose development will rely on the know-how and the sub-systems already developed for the Indian launch vehicle SLV-3, which during its first developmental flight in May 1981 put a 38-kilogramme satellite in near-Earth orbit. It is hoped that ASLV will launch a 150-kilogramme satellite in a similar near-Earth orbit by 1983.

The second launch vehicle, PSLV, would be able to launch a 1,000-kilogramme satellite in polar Sun-synchronous orbit by 1987.

The Indian space programme has been quite successful. The first Indian experimental communications satellite, Apple, although one of the solar panels did not function, could be used for about 14 hours a day and will be used for conducting a course for teachers in institutes of technology on the use of satellite networks in university education. This project, like those based on communications satellites still to be launched will draw on the experience of earlier experiments in broadcasting to Indian villages direct.

The first functional telecommunication multi-purpose satellite, INSAT-1A, launched on 10 April 1982, is now ready for use in telecommunications, television broadcasting and weather monitoring although non-deployment of the C-band antenna and the continued malfunctioning of solar sails may curtail its useful life. But this may not matter if INSAT-1B, to be launched in July 1983 by the American space shuttle, functions well. The two satellites, INSAT-1A and INSAT-1B, have a total operational lifetime of 10 years with an overlapping period of two years.

By 1990, the Department of Space may have launched and tested INSAT-2, an improvement on the present INSAT satellite. It may then be necessary to have one satellite for telecommunications and television and one for meteorology.

Zaka Imam

Permanent space station

Europe cautious

The European Space Agency (ESA) is cautiously considering an invitation from the US National Aeronautics and Space Administration (NASA) to collaborate in building a permanent manned space station. NASA believes that international collaboration will improve the chance that Congress will approve the \$3,000–\$5,000 million project. But the agency, wary of collaboration since NASA withdrew most of its promised participation in the joint international solar polar mission, will be seeking strict assurances that NASA will not renege on the new project.

NASA has been for some time considering two proposals for a manned space station. The Johnson Space Center favours an immediate start on a large manned facility, built piecemeal from components transported by the shuttle, that would serve as an operating base in low Earth orbit. The Marshall Space Flight Center has an initially modest plan for a series of small unmanned platforms that could be built up later into a large manned station.

NASA has invited US industry to submit by the end of this month proposals to define the space station more closely. One eight-month study will define user needs and six smaller studies will draw up specific aspects of space station design. NASA plans more detailed studies in 1983 and 1984, and will next month be putting a request for \$16 million to finance them to the Office of Management and Budget for fiscal year 1984.

Meanwhile, NASA has invited other countries, including Canada and Japan as well as those in Europe, to consider what use they might make of a space station. Last week, ESA decided to support a study of European needs and to call on European industry to participate with US counterparts on the six detailed design studies. European industry will be looking for ways in which it can contribute expertise gained through building Spacelab, the modular laboratory to be carried on the shuttle. So far, ESA has set aside \$6 million for these preliminary studies.

It will not be easy for ESA to decide whether to accept NASA's invitation. Acceptance would almost certainly mean abandoning ESA's independent idea for an advanced transportation system on which those member states that value independence are keen. Largely stimulated by French proposals, ESA is now considering a partly reusable launcher that would build on experience gained during development of Ariane. Several companies, including Aerospatiale, Erno and Marconi, are conducting feasibility studies for a launch system that would be capable of carrying manned payloads. Next year, the agency also plans to place contracts for studies on