

opened in Curitiba in 1975 and now provides 20,000 images a year to 1,100 users, many of them in other South American countries. The next step will be to upgrade the station, at a cost of about \$6 million, to receive Landsat D images.

The meteorology programme involves the building of up to 100 data-collection platforms around the country. A prototype is being tried out in France and the first Brazilian platforms are expected to start operating early this year. Information from them will be relayed by the American TIROS N and GOES satellites. A major objective of the platforms is to provide accurate forecasts of drought in the impoverished north-east region.

According to Dr Jesus Parada, director of the civilian space research institute, INPE, previous cooperative ventures, mainly with America, have given Brazil the necessary expertise to go it alone.

The intention is to launch four satellites a year from 1986–87. INPE would develop the satellites and the launcher would be developed at the nearby military space institute. Total cost of the programme is estimated at more than \$700 million, about two thirds of it for launcher development.

The first two satellites would take over from TIROS N and GOES by relaying information gathered by the meteorological data collection platforms to a national centre. And the number of platforms could be increased to several thousands if the new satellites are launched. A radiation budget experiment is also planned. The first satellite, weighing 150–200 kg, would be launched on the qualification flight of the rocket into an orbit of 25–30° at an altitude of 700 km.

The third and fourth satellites would be more complex, devoted to direct land imaging and weighing 250–300 kg. They would be placed in a near-polar orbit at an altitude of 650 km.

All four satellites would be launched from a site in Brazil, possibly the existing military launch pad near Natal. A major drawback of this site, however, is that large payloads would have to be launched into an unusual trajectory to minimize the threat to the city which is only a few kilometres away.

Ambitious though the new plans are, progress so far has been slow. With a budget of only \$10 million for 1980, feasibility studies have not got as far as Dr Parada would have liked. But if the hoped-for budget of \$40 million is forthcoming for 1981 the project can move on into the design phase.

In a country with grave social problems there are many areas where investment might provide a more obvious and immediate return than a venture into space. And a second space project, for Brazil's first telecommunications satellite, is also competing for funds. So the chances of Brazil's space programme are closely tied to the fate of Brazil's economy over the next few years.

Judy Redfearn

Nuclear waste

US Senate stalls

Washington

Hopes for new legislation establishing a national policy for the disposal of radioactive waste — eagerly sought by both the nuclear industry and the environmental movement — foundered in the Senate last month on disagreement over whether states should be involved in decisions about military waste from nuclear weapons construction.

Main responsibility seems to rest with Senator Henry Jackson, powerful chairman of the Senate Energy committee and a member of its Armed Services Committee.

Senator Jackson had previously supported a proposed nuclear waste bill that was passed in the Senate in July. This bill contained limited provisions for the involvement of states in siting decisions, which the Senator opposes, but it was sweetened by the inclusion of plans for 'away-from-reactor' sites which the owners of nuclear reactors could use for the temporary relief of their own spent-fuel storage tanks.

The House of Representatives, after lengthy negotiations between pro-nuclear and anti-nuclear forces, passed a compromise bill last month. Like the Senate bill, it provided for a state to veto a siting decision, if it obtained support of one of the two congressional bodies.

However, the House bill did not include any mention of away-from-reactor storage, which the industry would like since it would keep spent fuel available for future reprocessing. And Senator Jackson made it clear that he did not support the bill, killing any chance of agreement by offering an amended version unacceptable to the House.

The storage of nuclear waste remains the Achilles' heel of the nuclear power industry, with several states currently refusing permission for further power-plant construction until adequate means for long-term storage are available.

The nuclear industry itself is keen to find more permanent storage for the 80,000 metric tons of spent fuel now lying in storage tanks next to reactors around the country. And the environmental movement wants a nuclear waste policy that is both ecologically acceptable and open as much as possible to local participation in decision-making.

In February, President Carter announced plans for a long-term waste disposal policy. Reiterating his previous opposition to reprocessing, this is based on the permanent storage of waste in deep geological formations — a technique considered both feasible and relatively safe by most of the scientific community.

Carter proposed that long-term studies of possible sites should be initiated, with the goal of having a permanent disposal facility in operation by 1995. But the

Senate, acting under pressure from the nuclear industry, expressed impatience with this schedule, and the bill which it passed in July emphasized short-term waste storage procedures.

Sharp differences also occurred in the House of Representatives. Pro-nuclear forces, led by Congressman Mike McCormack of the Science and Technology Committee, supported a bill which would require the Department of Energy to construct technology demonstration facilities in various parts of the country, to serve as a basis for licensing a full-scale commercial waste facility.

In contrast, the chairman of the House Interior Committee, Congressman Morris Udall, supported a bill more closely modelled on the Administration's proposals, arguing that it was premature to rush into demonstration projects.

In the end a compromise was reached between the two committees and the House passed a joint bill, under which the Department of Energy would pick two possible burial sites by 1982 and two more by 1985; and by 1987, following an elaborate series of public hearings, the President would recommend to Congress the site or sites which he considered safe for the storage of waste.

Despite the faster schedule, this compromise proved unacceptable to the Senate. Stung by the omission of any provision for short-term away-from-reactor storage, Senator Jackson told the Senate that without a specific exemption for atomic defence repositories, the House bill as it stood infringed the jurisdiction of both House and Senate Armed Services Committees, and could conflict with existing clauses in the Atomic Energy Act.

Environmental groups are insistent that military wastes, amounting to up to 90 per cent of the nation's high-level radioactive waste, should also be covered in any national plan.

But the Senate's decision now means that the process of developing legislation must start over again when the new Congress convenes this month. In the Senate at least, recently-elected conservative legislators are likely to be more sympathetic to the nuclear industry.

Meanwhile, in line with the Carter Administration's long-term waste disposal policy, the Department of Energy has issued an environmental impact statement confirming its view that the best method of permanently disposing of radioactive wastes from nuclear power plants is to place them in mined depositories deep in geological formations.

According to the department, a typical repository would require about 2,000 acres underground, and above-ground facilities would occupy 500 to 750 acres. Access roads would take up another 30 acres. A total of 2,000 acres above ground would be needed for each facility, with consequent restrictions of mineral and surface rights.

David Dickson