

## Thermonuclear fusion

# Europe from hand to mouth

THE 1982-86 budget of JET, the Joint European Torus for fusion research at Culham in Oxfordshire, is running out ahead of time. Planned to last 60 months, the budget will last for only 46, until October next year. The reasons are inflation (the 1982-86 programme was fixed at 1982 prices) and high maintenance costs at JET, including £250,000 to rebuild JET shock absorbers after an accident earlier this year.

Despite the economic crisis in the European Communities, which pay 80 per cent of JET's bills, there is little concern at Culham that the extra money will not be found. Community programme budgets never allow for inflation, says JET budget director Peter Kind, and it is always assumed that shortfalls will be made good in the next programme. Even if the 1985-89 programme (overlapping the first by two years), now before the council of ministers, is not agreed until next spring, JET accounts for 1985 could be balanced.

Mr Kind also has a contingency plan. Since operations began a year ago, JET has been short-staffed, so that there has been a squeeze on design time for the JET "extension to full performance" (neutral beam and radiofrequency heating, tritium handling equipment and so on). It has therefore been difficult to keep up the rate at which contracts have been put out to industry. Kind thinks it will be possible to let purchasing slip by a couple of months, particularly on items needed only some years hence.

The high maintenance and operating costs are exactly those predicted by the JET design team, but double what the council of ministers allowed in 1982. So JET can say "we told you so". "We had allowed 5 per cent of the capital equipment costs (excluding buildings) a year for maintenance", says Kind, but the ministers allowed only 2.5 per cent. But since JET began operations, there have been "10-15 requisitions a day for items from £50 to £5,000, from nuts and bolts to vacuum seals", reaching a total of around £10 million over a year, compared with JET equipment costs of £175-£200 million in today's values.

The largest item, the £250,000 for new supports, came after a single unfortunate discovery: that when the oval-cross-sectioned plasma ring was at its maximum elongation, the plasma snaked up and down and escaped control. In this shot, the plasma finally shorted out through the vacuum wall with currents of several megamps, and jolted the vacuum chamber with forces of hundreds of tons-weight. The force shook the floor like an earthquake, and although JET was not seriously damaged (it is now a millimetre longer than before) it has been thought prudent to modify its support structure.

Otherwise, JET has been running well, and made one particularly tantalizing discovery in the last two weeks of its recent closedown (to introduce neutral beam heating). The team has found that a carbide layer a few molecules thick can be deposited on the inconel inner surface of the vacuum chamber by making a glow discharge in a mixture of methane and hydrogen gas, and that this layer dramatically reduces the amounts of metal impurities entering the chamber from the wall. As these high atomic-number impurities efficiently radiate heat from the plasma, it is important to control their number.

Until this work, it had appeared that impurities would be a bigger problem at JET than expected. The carbide layer may bring a striking improvement. And because the layer can be efficiently removed, controlled experiments can be attempted.

## Conservation in Japan

# Modest gain for UK royal

Tokyo

PRINCE Philip, Duke of Edinburgh, has wrung some modest concessions on conservation from the Government of Japan. In his capacity as president of the World Wildlife Fund (see also *Nature* 18 October, p.595), the prince was last week promised that steps would be taken to restrict the import of endangered wildlife species into Japan. But the six-day visit did not yield all the prince had asked for.

In a 20-minute meeting with the prince, Japan's Prime Minister Yasuhiro Nakasone said that he would consider the introduction of domestic legislation to prevent the illegal import of protected species. A task force to study the problem is to be set up immediately. Customs officers are also to receive training in detecting illegal imports — the lists of endangered species are long and complicated and some dealers have skilfully forged documents.

The Minister for International Trade and Industry, Hikosaburo Okonogi, also promised to introduce by next April a system that will require dealers in endangered species to produce export permits from the governments of the nations from which the species are claimed to have come.

Rather less was promised though, in dealing with the vexed question of the 14 endangered species — six species of whale, three species of turtle, three species of monitor lizard, the musk deer and the African saltwater crocodile — which Japan refused to include in a list of endangered plants and animals and their products when it first became a signatory of the Convention of International Trade in Endangered Species, the Washington Con-

The effect was also seen earlier at the TEXTOR torus at Jülich, West Germany, but not followed up. In any case, it should not be over-emphasized, says JET physicist Alan Gibson.

Meanwhile, JET staff are crossing their fingers that Europe will come up with the cash JET needs. "JET is the only really successful example of European co-operation anywhere", claims Kind, "so there is a considerable political will to keep us going." Moreover, the present Irish presidency of the European Commission has put the 1985-89 nuclear fusion programme near the top of its priorities for agreement by the end of this year.

One explanation may be that Ireland sees JET as one of the few problems it can solve. JET officials, however, note uneasily that less senior Irish representatives in Brussels who have been discussing the fusion programme have been, with Greece, among the most negative. Who means what should be clearer at the November and December meetings of the research council.

Robert Walgate

efforts to reduce the number of species on the list, but gave no clue as to how or when this might be done.

Interest was also shown in the prince's desire to have Japan stage a conference on the protection of nature on islands. Among the prince's stops on his six-day tour of Japan was the island of Amami Ōshima, one of a group of remote islands known as the "Galapagos of Japan" and containing many endemic species of mammal, including the Iriomoto wildcat and the Amami rabbit.

Prince Philip had also expressed, in very diplomatic terms, his reservations about Japan's plans to continue sperm whaling in coastal waters, despite the International Whaling Commission's agreement to ban all sperm whale hunting. The Japanese whaling fleet, however, left harbour last Friday to hunt for sperm whales. The Japanese Government is now waiting to see what will happen once a whale is caught — will the US Government carry out its threat to cut Japan's fishing quota in US waters? Japanese officials had earlier expressed confidence that the United States would not retaliate even if whales were caught. Talks on the issue in Washington last week, however, were inconclusive.

Quite separately, the US Department of Commerce also announced last week that it would give Japan only a quarter of the fish quota in US waters it had requested for the rest of this year because of evidence that the Japanese fishing fleet had systematically violated earlier agreements. Whether such action will be extended if sperm whales are caught will depend on the strength of the US conservation lobby.

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