should be another review, intended to see how far industrial participation has gone.

OCEANOGRAPHY

New Antarctic Ship

A NEW polar vessel is to be provided for the British Antarctic Survey by the Natural Environment Research Council. It will cost about £1·75 million to build and it is hoped that it will be ready for operations in the Antarctic in October 1970. The new vessel will not be an addition to the polar fleet, because it will replace one of the survey's existing vessels, RRS Shackleton, and it will also replace a ship chartered each year by the survey to supply bases which the Shackleton cannot reach in some ice conditions.

The new research ship will be built by Robb and Caledon at Leith, Scotland. It will be 326 feet long, with a beam of 60 feet, and it will be specially designed for ice breaking. There will be accommodation for 62 survey personnel and the crew, approximately 130,000 cubic feet of space for general cargo, and a laboratory equipped for biological and oceanographic work. There will also be a helicopter deck. Propulsion will be by a diesel-electric system and there will be a service speed of 14 knots. If necessary, the ship will be able to operate for 50 days at full speed—a safety factor when it is operating over long distances in ice-filled waters.

RAILWAYS

Turbines on Rails

BRITISH RAIL now seems to have reached agreement in principle with the Ministry of Transport about the financing of its advanced passenger train. Discussions have been in progress for some time, because British Rail, though enthusiastic about the new train, is in no state to finance its development—likely to cost up to £5 million. But the ministry confirmed this week that agreement over the sharing of costs had been reached, although detailed discussions continue.

The new train, designed by a team at the British Rail research centre at Derby, is designed to be powered by Rolls-Royce Dart engines, de-rated to 1,500 HP. Construction will owe more to aircraft technology than it will to conventional railway engineering; the structure will be stress skin light alloy, producing a weight per passenger very much less than normal trains, lower even than some motor coaches. The maximum speed of the advanced train will be around 150 mph, cutting the time taken to get to Bristol from London to less than an hour, and the time from London to Newcastle to 145 minutes. The train is designed to operate on the existing track, though some improvements will be necessary.

As well as the advanced passenger train, the design for which has been common knowledge for eighteen months or more, British Rail is now talking of a less ambitious plan making use of the new Leyland gas turbine engine introduced at the Commercial Motor Show. This engine, designed for a large truck, produces 400 HP, and could be fitted into conventional rolling stock. In this case, the top speed would be 100 mph, no greater than the existing British Rail Inter-City services, but the gas turbine might offer greater comfort and quietness. Because it has been designed for use with a heat exchanger, it might also be a more economic proposition. A typical train, according to British Rail, would use ten Leyland engines, eight for power and two for auxiliary services.

Despite British Rail's enthusiasm, it is certain that its advanced passenger train will be beaten into service by gas turbine trains in other parts of the world. Before the end of this year, both the United States Department of Transportation and the Canadian National Railways expect to be operating turbine trains built by the United Aircraft Company. These trains are based on the ST 6 gas turbine engine developed by United Aircraft of Canada Ltd, and each engine will develop 550 HP. The trains, designed for Canadian National, should be brought into service between Montreal and Toronto, and each will consist of fourteen cars capable of carrying a total of 600 passengers. Designed like an aircraft, the train will be about one third of the weight of a conventional diesel train, and will travel at speeds of up to 100 mph in Canada.

SAFEGUARDS

Slow Progress

THE achievements and aspirations of the International Atomic Energy Agency in developing safeguards against the secret production of nuclear weapons were outlined by Mr B. W. Sharpe, a member of the Division of Safeguards and Inspections of the IAEA, in a lecture at Imperial College, London, last week. Inevitably most of the talk was devoted to the problems, both political and physical, that must be overcome in order to maintain a viable inspection system. Some observers were left with the feeling that the difficulties involved in trying to carry out inspections on the sort of budget available to the IAEA may well be overwhelming.

Mr Sharpe made no attempt to disguise the difficulties facing his department. About eighty nations have already signed the non-proliferation treaty, and although many of the countries most likely to wish to produce nuclear weapons have not yet ratified the treaty (as distinct from just signing it) an IAEA staff of one or two hundred would spread very thin through this number of suspects. A staff of about 200 is expected to be available by 1974, but Mr Sharpe conceded that the IAEA would have to make use of the domestic safeguards systems which many countries have already instituted for their own purposes. He expressed confidence, however, that a small bunch of observers placed at key spots in the conveyor belt of fuel production—whether on reactor sites or at an earlier or later stage—should be capable (logistically) of uncovering any frauds perpetrated by the home team. But even if this were conceptually sound, the political and legal barriers to its implementation are considerable.

Why should a non-nuclear country accept the inevitable encroachment into its commercial activities when the nuclear powers are exempt? Can the staff of the IAEA themselves not only be trusted but also be seen to be trusted? These are questions which are receiving realistic appraisal from both the IAEA and its member states, and the governments of those nuclear powers that have ratified the treaty have