

first on a laboratory scale, afterwards more generally.

In the end, the success of RACE will hang on the extent to which it influences the development of a broad-band communications network in Europe — and when. Much will depend on the speed and the vigour with which national governments are prepared not merely to enforce common technical standards but to create market conditions in which broad-band communications can prosper.

There are thus political as well as technical problems to solve, not the least of which is that of requiring European PTTs (most of which remain nationalized industries) to allow outside commercial organizations to lease communications channels in the broad-band network for

the provision of what are called value-added services — video signal transmission, for example.

The obvious danger is that different governments may choose to deregulate their PTTs in different ways, thus replacing the present system in which monopolies do what they wish within their territories to one in which national patterns are as different from each other as at present. The Commission spelled out the dangers in a paper published last year, but it has no power to turn its wishes into reality. RACE itself seems convinced that the pace of technical change will shorten its own timetable, but that may be an over-cheerful view. Political difficulties that remain unsurmounted could work the other way. □

improving the quality of life”.

The Commission concludes that there are five areas in which European efforts should be concentrated, as follows: information technology and telecommunications, industrial materials, aeronautics “where Europe faces a particularly important competitive challenge”, the biological sciences (including biotechnology) and energy.

It is clear that aeronautics will feature prominently in the Commission's next Framework programme. The argument is largely economic, but the competition is exclusively from the United States. The volume of civil air transport is growing at 7 per cent a year, and roughly 40 per cent of operating costs are determined by the cost of the aircraft, while there is also a military market in which, the Commission said in a document published in June last year, US restrictions on the sale of advanced aircraft are worrying.

The plan is that a pilot programme of coordinated research will be drawn up later this year with the intention that there should be a full-blown research programme looking for funds in 1990. For as things are, the Commission said last year, “European industry remains largely divided between national interests. . . . Continuation along this path can only lead to failure”.

This important document also deals with the balance between basic and applied research, noting at one point that many European governments in recent years have effected a redistribution of resources from basic to applied research and adding “there is a risk that the pendulum will swing too far . . . just [when] our competitors are placing a greater emphasis on basic research”. This is said to be a reference to the growth of the US basic research budget during the Reagan administration and to recent calls in Japan for more attention to the same cause.

On the related issue of the discrepancies within the EEC between the performances of different governments, the report notes that spending on research and development in West Germany, France and Britain (in that order) accounts for 75 per cent of all EEC spending, and that the proportion of GDP spent on research and development ranges from a maximum of 2.8 per cent in West Germany to 1.5 per cent in Italy, 0.8 per cent in Ireland and less than half of that proportion in Greece.

The discrepancy is described even more vividly in an annexe to the report prepared by the Irish National Board for Science and Technology, which calculates that the GDP per head of the four poorest countries in the EEC (Ireland, Spain, Portugal and Greece) have an average GDP per head less than 70 per cent of the Community average, but spend (per head) only 25 per cent as much on research and development. □

RESEARCH FOR INDUSTRY

Cause and effect in a competitive world

Brussels

THE European Commission is outspoken about its policy on industrial research, and on research in general. Starting from the calculation that the twelve EEC members spend less on research and development than the United States, both in absolute terms and relative to gross domestic product (GDP), and less than Japan by the second yardstick, the Commission concludes that the objective of its research policy must be to make Europe “competitive”, pursuing “where appropriate, its own technological options”.

The figures, conveniently collected in the *First Report on the State of Science and Technology in Europe* presented to the European Parliament at the beginning of this year, are chastening.

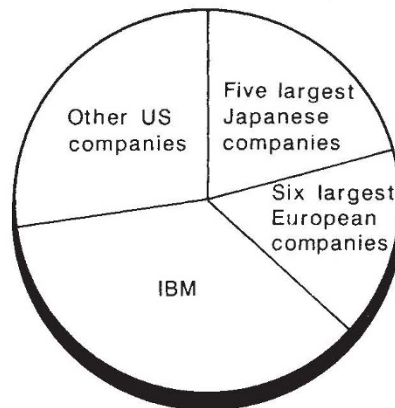
In 1985, EEC spending amounted to 76,250 million ECU, compared with 134,645 million ECU in the United States and 48,056 million in Japan. As a proportion of GDP, European spending was 1.9 per cent, compared with 2.8 per cent in the United States and 2.6 per cent in Japan. The same report notes that non-defence research and development expenditure in Japan is growing twice as quickly (9 per cent a year against 4 per cent a year) as in Europe and the United States.

The Commission is also disturbed by what seems to be a manpower imbalance. According to the US National Science Foundation, in 1986 there were 69 US workers in research and development for every 10,000 in the total labour force, compared with 63.2 per 10,000 in Japan (in 1985) and corresponding figures (in 1984) of 49.1 in West Germany, 41.2 in France and 32.8 in Britain. The report again notes that only the Japanese figure is growing quickly.

The figures for the output end of the

equation are equally sobering. The bulky annexes to the report record in detail that, in industrial sectors as different as chemical production and machine-tool manufacture, EEC performance is in relative decline.

The figure below shows the EEC's estimate of the world's data-processing



Shares in the market (courtesy of Datamation). market in 1987 secured by the 20 largest companies. The report notes that sales outside Europe of even the largest of the European companies are a small proportion (15 to 20 per cent of their turnover).

The Commission's argument from this point on is simple. There is an imbalance between the EEC and Europe's principal competitors both in efforts in research and development, and in industrial performance. So is it not reasonable to link the two as cause and effect?

The conclusion is that the three goals for EEC research are to improve Europe's international competitiveness, to “increase its capacity to pursue its own scientific and technological options, where necessary by reducing its dependence on others” and “to respond to the needs of society by