

reason to think that the expedient which the council has hit on is more than an irritating gesture in that direction.

On research grants, penny wise may also mean pound foolish. The council says that lack of funds has forced it to turn away projects which would otherwise have qualified for grants, but, in spite of this, spending on grants has gone up from £7.8 million to £10.2 million. And it will probably do very little harm if the high-flux magnet laboratory and the high-flux beam reactor—both of them potential candidates for houseroom at Harwell—are postponed for a year or so. Those who back the reactor (at a capital cost of £7 million) will be lucky if it is provided with funds by the time the council's next report is out. It is also entirely proper that the proposal to increase the intensity of the proton beam in the NIMROD accelerator has been postponed—indeed it would have been unseemly if the nuclear physicists had pressed hard both for the NIMROD project and for a British contribution to the new CERN machine. Large items of capital equipment seem also to have done well in astronomy and in other related fields. It is particularly pleasing that the Isaac Newton telescope will soon be working, and that there will be some access to the Australian instrument in the seventies. But is it also wise to cut down on grants for high energy physics when there is evidence accumulating of how scientists from Britain make much less use than they might do of central installations such as the CERN machine at Geneva, sometimes for lack of funds? The council is right to boast of what it has done to support biology in the past few years (although its boast in the report is somewhat too reverential), but it would have been splendid if it could have given some real evidence that it is alive to the needs and interests of all the newer universities—even the smaller ones. And what, in any case, about the polytechnics?

All this implies that the council is if anything too modestly unwilling to acknowledge the central position which it occupies in the planning of academic research in Britain. Unlike the other research councils, it is deeply involved in higher education, partly through the research grants and partly through its support of postgraduate students. It has stronger industrial links than the other councils (and there are some passages in the new report which suggest that the council is not entirely sure where it stops and the Ministry of Technology begins). But this, of course, implies that the council could with advantage occupy some valuable ground which has so far tended to stay untenanted—it could play a much more vigorous part in planning the development of science in Britain than has been its inclination in the past two years. This by itself, of course, is no complaint. The council is still only two years old, and it is only now becoming clear what kinds of tasks the Council for Scientific Policy can undertake and what it must leave to others. Yet it is becoming plain that academic science is going quite soon to be as much in need of a strong and independent buffer between itself and the Department

of Education and Science as the universities were in need of the University Grants Committee several years ago. The council could make a good beginning by seeing that it represents in public, not just at committee meetings, any discontents which it may have about the financing of research.

HOVERCRAFT AHEAD

THESE are happy days for hovercraft enthusiasts. Next month the largest hovercraft yet built will emerge from the works of the British Hovercraft Corporation at Cowes. Within the next few months, work will also begin on a flat strip of fenland north of Cambridge, where the first tracked hovercraft will be built and tested. If appearances are to be believed, the development of hovercraft in Britain is being pursued with vigour. The National Research Development Corporation will no doubt be grateful if the bustle of activity drowns for a time the criticism of the way in which development has been handled in the past.

The NRDC has been responsible for hovercraft since it first backed them in 1957. It set up a subsidiary, Hovercraft Development Limited, to handle research and the issuing of licences to companies wanting to build hovercraft. Research was carried out by a technical group at Hythe, but this was transferred earlier this year to the control of the National Physical Laboratory. Development work was carried out by the companies licensed by HDL. There seems from the start to have been a determination to concentrate the industry in a small number of powerful companies—as recently as 1966, for instance, NRDC was congratulating itself in its annual report on the merger of the two largest licensees, Westland Aircraft and Vickers, into the British Hovercraft Corporation, now the most powerful company making hovercraft in Britain. Most of its £5 million equity (65 per cent) is owned by Westland. The NRDC itself keeps 10 per cent. At the time only one other company (Cushioncraft) had been licensed, but more recently there has been a gradual change of policy on licensing agreements. In February this year, NRDC awarded a licence to Hovermarine, a Southampton company formed to specialize in submerged wall hovercraft, and work started on the first two versions of a sixty-seater hovercraft. The licence was the result of long negotiation, for the company had been formed nearly eighteen months before. This week, NRDC has announced that Vosper Thorneycroft is also to be allowed into the market. The basis of the industry is thus becoming broader, although there is no evidence that NRDC has abandoned its scorn of duplication. Elsewhere, both Bell Aerosystems in the United States and Mitsubishi in Japan have negotiated licensing agreements with BHC; although this has been the occasion for some criticism, it was really no more than bowing to the inevitable. Few of the patents on hovercraft exclude other manufacturers, and sales from Britain to the United States would be

particularly difficult without a licensee. The argument is that for each hovercraft Bell and Mitsubishi build, BHC will receive royalty payments and that, if hovercraft establish themselves, there will be enough business for all three.

The British Hovercraft Corporation is hoping that the breakthrough to profitability will be soon. Next month, its first serious attempt to capture a share of the transport market, the *SRN 4*, will be rolled out from the factory at Cowes. (BHC firmly uses aircraft terminology, so that the *SRN 4* will not be "launched"; the Board of Trade, not yet sure how to define hovercraft, is to invent a special category for them.) Although the nine-ton *SRN 6*, which can carry 38 passengers, has been used on regular scheduled services within the British Isles and for pleasure trips from seaside beaches, it is a calm-water hovercraft. *SRN 4*, as well as being nearly twenty times as big, will have to operate in far worse conditions. It will weigh 160 tons, and be capable of carrying 800 commuter passengers, or 256 people and 30 cars at a speed of 70 knots. This is clearly a great advance, but potential buyers are behaving warily. So far, only two have appeared. Hoverlloyd, a Swedish company, has ordered two for a service between Ramsgate and Calais, and British Rail has ordered one. If these two operators are successful, other buyers will undoubtedly come forward.

It is hard to feel as optimistic about another hovercraft project announced last week. Several months after NRDC proposed the idea, the Ministry of Technology approved the construction and operation of a tracked hovercraft in East Anglia. The tersely worded announcement from the ministry gave few details of the project, the broad outlines of which have been established after computer studies and model testing at Hythe. The design provides for hovercars 50 feet long by 10 feet wide, weighing 10 tons and running on a T-shaped reinforced concrete beam 4 feet from the ground. The cars would be propelled by the linear induction motor developed by Professor E. R. Laithwaite at Imperial College, London, and would reach a speed of 300 m.p.h. In order to test these ideas at full scale, twenty miles of fenland north of Cambridge have been obtained on lease from the Great Ouse River Authority, and a track will be built there. The ministry says that the cost will be £2 million over the first two to three years, but nobody seriously believes that will be the final cost. The track alone will cost more—probably £0.25 million a mile for a device of 70 tons. The experiment may well be cheaper, but if 300 m.p.h. is to be reached at least 20 miles of track will be needed. It is hard to see how this could be done for less than £3 million, and then it will be necessary to build a vehicle filled with electronic equipment. By publishing a figure of £2 million, even with the proviso that it will cover only the first few years, the ministry has laid itself open to criticism when, in five or ten years time, the cost turns out to be £5 million or even £10 million.

Certainly it will be possible for tracked hovercraft

to provide a more rapid service than conventional trains or the aircraft now in service. Even allowing for improvements in transport between airports and city centres, a hovercraft travelling at 300 m.p.h. would still be quicker on journeys of up to 600 miles. This assumes that hovercraft would be allowed to operate from city centres, but that is plausible. Hovercraft may be able to compete with aircraft, but this calculation takes no account of the improvements which are possible in conventional train services.

The estimates produced by HDL make tracked hovercraft seem a dubious proposition. Double track would cost about £0.5 million a mile, and one car, seating 200, would cost £420,000. For routes handling fewer than 2 million passengers each year, air travel would be cheaper. At higher densities, the figures begin to look more attractive, but only on routes handling more than 6 million passengers a year would hovercraft be able to offer cheaper transport than trains. The greatest density on any British Railway route in 1965 was 5 million passengers a year, so that there seem at present to be no routes in Britain on which the hovercraft would be cheaper than the trains. The ideal hovercraft route must be one on which the density of traffic makes the idea economically attractive but long enough to make use of the greater speed the hovercraft offers. Nothing in Britain can compete effectively with the Northeast Corridor in the United States as a route for introducing hovercraft. The hovercraft men in Britain may have to turn their sights to Stansted if the Government really decides to make that London's third airport, but that is another matter—political as well as economic.

All this is not to say that hovercraft will never supply an acceptable alternative to conventional systems of transport, but they are obviously more attractive where alternative systems are slow and inconvenient, as with the cross-Channel ferries. Even there, the Channel Tunnel may reduce the amount of traffic carried above the surface. Where existing systems operate at higher speeds and are capable of considerable development, the case for hovercraft looks slim. British Rail, losing £130 million a year on rail services, has been castigated for its reluctance to embrace the hovercraft. In retrospect, it may turn out to have been wiser to concentrate on the improvement of existing services.

ASK FOR MR JONES

THE British Government is well on the way to making a great muddle of its policies towards the nationalized industries, particularly in fuel and power. The immediate cause of trouble is the announcement two weeks ago of higher prices for the electricity sold to domestic consumers. It has been known since May this year that electricity prices would have to go up, but domestic consumers (who are also usually voters) have not taken kindly to the suggestion that they will have to pay an extra 16 per cent. Mr Richard Marsh, the Minister of Power and the custodian of electricity