

DEFENCE EXPENDITURE AND NATIONAL ECONOMIES

| Country | Defence expenditure (US \$ million) | Expenditure per head 1967 (\$) | Expenditure as a percentage of GNP | | |
|----------------|-------------------------------------|--------------------------------|------------------------------------|------|------|
| | 1968 | | 1965 | 1966 | 1967 |
| Britain | 5,450 | 97 | 6.3 | 6.0 | 5.7 |
| France | 6,104 | 106 | 5.6 | 5.4 | 5.3 |
| Germany | 5,108 | 93 | 4.4 | 4.8 | 4.3 |
| Portugal | 305 | 32 | 5.8 | 6.3 | 6.7 |
| Sweden | 1,008 | 125 | 4.4 | 4.2 | 3.9 |
| Switzerland | 415 | 64 | 2.5 | 2.6 | 2.4 |
| Czechoslovakia | 1,538 | 100 | 5.7 | 5.7 | 5.7 |
| East Germany | 1,715 | 62 | 3.0 | 3.3 | 3.7 |
| USSR | 39,780 | 147 | 9.0 | 8.9 | 9.6 |
| Israel | 628 | 124 | 11.7 | 12.2 | 13.8 |
| UAR (Egypt) | 690 | 21 | 8.6 | 11.1 | 12.7 |
| China | 7,000 | 9 | 8.5 | 8.9 | 9.2 |
| Japan | 1,172 | 11 | 1.3 | 1.0 | 0.9 |
| North Korea | 629 | 37 | 8.9 | 15.4 | 17.3 |
| North Vietnam | 500 | 27 | 19.7 | 23.1 | 25.0 |
| United States | 79,576 | 368 | 8.0 | 9.2 | 9.8 |

Sinkiang province where nuclear tests are carried out, and possibly because of a partial failure of the last Chinese nuclear test in December 1967, these predictions have not been fulfilled. Continuing references in the Chinese press to a second artillery and a missile launching force suggest, however, that deployment of missiles is not far off.

Information about Russian military developments is relatively easier to come by, and the past year is outstanding for the rapid expansion of the Russian ICBM force. The Russians apparently now have about 800 of these weapons, almost twice as many as in 1967, and approaching the American total of 1,054, and the newer weapons are being deployed in hardened and widely separated sites. The Russian ICBMs are generally of greater megatonnage than those of the USA, but the American Minuteman force is powered by solid fuel rockets, which give a faster reaction time than those of the Russian liquid-fuelled rockets. The United States maintains its superiority over the Soviet Union in submarine launched rockets, with about 650 against 125. The Russians are said to have deployed a limited anti-ballistic missile defence around Moscow, but the so-called Tallin Line along the eastern Baltic coast and north-eastwards is now thought not to include any ABM system.

In the past year, Russian conventional forces have continued to develop a policy of flexible response to both conventional and nuclear war and there has been a build-up of airborne and marine troops. The invasion of Czechoslovakia attests the efficiency of the airborne force, and Russian tank-landing and helicopter carriers in the Mediterranean are being watched with interest. The military balance on the ground in Europe is reaching parity; although the Warsaw Pact forces have twice as many brigades as the NATO forces and more than twice the number of tanks, NATO brigades are nearly twice the size of Warsaw Pact brigades. Thus, in terms of manpower at least, the opposing forces are more or less equal and the Warsaw Pact superiority in armour is offset by the NATO forces' superiority in anti-tank defences. In the air the roles are curiously reversed. NATO aircraft have significantly higher performance and are predominantly strike and ground attack weapons, whereas the Warsaw Pact air forces are equipped primarily for defence. Defence expenditure in terms of percentage of gross national product

(see Table) is highest in the Middle Eastern countries, North Korea and North Vietnam. In Europe the proportion has either stayed constant or dropped in the past three years, with the exception of Portugal which is paying for its colonial policy. The United States and the Soviet Union spend virtually the same percentage, 9.8 and 9.6 per cent respectively. The comparison also clearly reveals the cost of neutrality. Sweden spends more per head on defence than any other European country and Switzerland is high up in the list.

SOCIAL SCIENCE RESEARCH

No Policy Here

DURING the two and a half years that the Social Science Research Council has been in existence, selected committees and ad hoc panels of specialists have been compiling information originally intended to guide the council in its future policy. This information—which includes the views of some of the “leading workers in the field” on current research developments, likely developments in the future, research needs in terms of manpower, money and other resources and research organization—has now been published for the council by Heinemann. So far, opportunities for research in automation, international organization, political science, social anthropology and poverty have been considered. In practice, however, no doubt because of the very general terms of reference, few tangible policies emerge. When Mr Andrew Shonfield, at present director of studies at Chatham House, succeeds Dr Michael Young as chairman of the council at the beginning of January, he is unlikely to find that all his work has been done for him. The reviews do pin-point some of the problems facing social scientists and sometimes provide sensible suggestions as to how these could be solved.

There is also a common theme in several of the reviews—the complaint that social scientists have little time to spend on research compared with the time they have to spend on teaching. Also, there seems to be a need for more opportunities to establish “intellectual contact” with other workers, especially abroad. (The case for sabbatical leave is clearly emphasized.) There are several suggestions that the career structure of social scientists should be expanded; and at least three of the reviews suggest that the time has come for interdisciplinary research projects going against the grain of the traditional university set-up. Among suggestions for overcoming these obstacles is that there should be set up research units for social scientists, with emphasis on research rather than on teaching, in which people from various disciplines could put their heads together over the solving of problems. The council is also urged to bring pressure to bear in the provision of better library facilities, and the co-ordination and exploitation of research data.

HYDRAULICS

Along the Seaway

ONE of the longest hydraulic models ever built is being put together at the Department of Mechanical Engineering of the National Research Council in Ottawa.

The model represents some 340 miles of the St Lawrence, a seaway vital to the prosperity of Canada, and one which for much of the year is blocked by ice. The purpose of the model is to understand the flow of the river in the hope that ways can be devised for extending the shipping season. Although it is still incomplete, the model covers an impressive area of ground and is some 750–800 feet long. It varies in depth from 8 feet at the mouth of the river to only an inch or so in the middle of Lake St Peter, a large shallow lake through which ships must follow a careful course to avoid running aground.

In a model this long, the hydraulic transients caused by disturbing the flow take three hours to disappear before more measurements can be taken. So as not to waste time, the model has been provided with a computer which is used to control the experiments. It is quite possible for the operating staff to go home at night, leaving the computer to put the model through an entire series of test runs and to record the results on magnetic tape. Results obtained in this way can then be compared with a mathematical model of the flow of the river which has already been prepared, and can be used to refine the mathematical treatment. The final magnetic tapes will continue to be useful even after the actual model has been torn up, as it will be possible to use them to predict the effects on the flow of the river caused by projected changes in the waterway. The first task is to calibrate the model; this is done by comparing its behaviour with observations of the actual river. The flow in the model can be adjusted by moving short strips of metal which project upwards into the flow from the concrete bed of the model. These are introduced simply as a means of creating a friction in the model which can be altered until it is exactly the same as that observed in the river. So far, the group operating the model has no firm ideas about how the St Lawrence can be kept free from ice. One suggestion put forward by Dr Bruce Pratt, a member of the team, is that it might be possible to let the tide travel farther up the river, introducing a movement which would prevent the ice from forming. A dam or lock would be the easiest way of raising the level, but it would probably be opposed by the shipping firms, who are unlikely to agree to anything which would tend to obstruct the seaway. In the end, the best chance may be that the building of nuclear power plants along the river will warm the water sufficiently to prevent it from freezing. The most far-fetched scheme (not taken very seriously by the team at NRC) is to provide a siphon which would collect water from the bottom of the Great Lakes. Because water reaches its maximum density at 4° C, the water at the bottom of the lakes is warmer than that at the top, and it has been calculated that if it were siphoned off and reached the sea within two weeks, freezing would not occur.

Meanwhile, a group at the Toronto factory of Litton Systems (Canada) Ltd is interested in improving the control of traffic in the seaway, using techniques developed for aircraft. At the moment, traffic densities are near to the theoretical capacity of the seaway, but L. A. Borth, director of engineering at Litton, believes that the capacity could be extended if ships were controlled by a computer system. Mr Borth says that Litton is willing to tackle the project, if money were provided by federal or provincial authorities.

PHILANTHROPY

New Ways of Giving

THE Ford Foundation, still learning to live with Mr McGeorge Bundy, has embarked on an adventurous programme of grant-giving designed deliberately to win social benefits. To begin with, the trustees of the foundation have agreed that something like \$10 million should be spent on projects in this category. Although this amount is a comparatively small part of the foundation's expenditure of \$228 million a year on the support of various kinds of projects, it is significant not merely for the social benefits it will bring but also for the example it will set for other charitable foundations, not simply in the United States.

The starting point for the foundation's new departure, now spelled out in a policy statement called *New Options in the Philanthropic Process*, is the deliberate search for more effective instruments in "the struggle against poverty and racism". As Mr Bundy puts it, "we must enlarge our kit of tools for trying to help in the social crisis of our time". In practice, the foundation has already allocated most of its initial bite of \$10 million for a number of social projects, three of which have been identified. First, there is a loan of \$1 million to the Congaree Iron and Steel Company in South Carolina, which was founded ten years ago with the possibilities of community development much in mind, and which is now planning to put aside some ten per cent of its assets and 15 per cent of future profits in a trust fund which is being established for the benefit of its employees, mostly negroes. The loan from the foundation will provide enough liquid capital to offer some promise of success. The Ford Foundation is also taking up some \$300,000 of stock in a project called Progress Enterprises, which is based in Philadelphia and which is chiefly concerned with training Negroes and then finding jobs for them. The foundation is also buying \$1 million shares in the project called Mutual Real Estate Investment Trust, which has for some years been buying and operating apartment houses in a manner intended to demonstrate that integrated housing is practical. So far, the trust's commercial record has been good, and it has declared seven successive quarterly dividends of 3 per cent.

Although the projects which qualify for this new form of support will not be required to pass the strictest commercial scrutiny, the foundation is by no means reconciled to losing the money it puts up for various kinds of community developments. To Mr Bundy, the new ventures are comparable with the ways in which, at present, the foundation's accounts place money not actually spent on grants in places where it will earn the best return. The difference is that "a modest part of our portfolio" will now be invested in projects "directly related to philanthropic programmes". In practice, however, what are called Program-Related Investments will be made on the recommendation of the grant-giving side of the foundation's staff, and investments will be made only in projects which the foundation considers it would be sensible to support by outright grants. One by-product of all this, the foundation hopes, is that some progress may be made with the difficult problem of trying to work out criteria for deciding when social investments are acceptable. In the long run, however,