ment are still not bright. European involvement in post-Apollo would probably cost about £250 million initially if that involvement is to mean anything, and Europe is therefore unlikely to decide that it can afford both ELDO and the shuttle (not that Britain, who is no longer a member of ELDO, is going to put anything into Europa III). Unless sufficient common ground can be found by the ministers at Paris, a full blown meeting of the European Space Conference would still seem to be just another waste of time.

ENGINEERING

New Concept Needed

A CALL for universities to run more postexperience courses in engineering was made by Sir Brian Flowers, chairman of the Science Research Council, when he delivered the 1972 Maitland Lecture to the Institution of Structural Engineers yesterday.

Sir Brian also extolled the virtues of the SRC's Engineering Board set up in 1969 on the demise of the University Science and Technology Board. One of its jobs, according to Sir Brian, is to ensure that the "natural and desirable development of engineering activity would [not] be hindered . . . by the imposition of criteria more appropriate to research in the pure sciences".

In engineering, continued Sir Brian, there is a need to take into account the needs of industry when deciding what research the SRC should support in universities and in deciding what kinds of postgraduate training in engineering the SRC should encourage.

Sir Brian also called for greater cooperation between university engineering departments and industry. The universities should be encouraged to set up postexperience courses in topics which the engineering industry needs—or "can be brought to see that it needs", while engineering employers will have to learn not to dismiss instantly techniques and ideas which emanate from university engineering departments.

The engineering board of the SRC, said Sir Brian, is keen to encourage more first degree students in engineering to carry out postgraduate research after first having spent a year or two in industry. At present, 36 per cent of the 1,915 SRC postgraduate students in engineering have spent some time in industry either before taking their first degree or between their first degree and starting their postgraduate course. Such an arrangement, said Sir Brian, "helps to bring about a greater degree of collaboration and understanding between university and industry". But for more students to pass between university and industry a positive change in attitude must take place to ensure that such a transition does not finish an engineer's prospects for a career in industry. This fear, which he had heard expressed, said Sir Brian, could be partly the fault of the universities "but I doubt if industry is blameless".

A survey has shown that only 13 per cent of engineers employed in industry are involved in research and development activities while 17 per cent are engaged in design, 29 per cent on general administration with the remainder divided between production, construction, consulting, commerce and other disciplines. Sir Brian pointed out that with an ever increasing proportion of engineers receiving postgraduate training the traditional PhD degree based only on research is not really appropriate

To cater for the needs of industry, said Sir Brian, the Engineering Board was considering supporting a PhD with a new concept in engineering—that of "Total Technology". In such a PhD the student would study design, planning, and operational management, as well as carry out some research. Industry, continued Sir Brian, would have to be convinced of the usefulness of such a PhD although most industries would at present be prepared to accept a one-year course in Total Technology as appropriate training for a career in engineering. Companies which had been approached were, however, clear that a person entering upon a Total Technology course would need some years of industrial experience first.

Sir Brian pointed out that companies are not going to send their employees on a three-year course in Total Technology unless they are convinced of the value of the course. So, said Sir Brian, proposals for courses and doctorates in Total Technology should, at first, be implemented on a pilot scale until industry's reaction has been assessed and the value of the scheme established.

The Engineering Board's proposal for the PhD course in Total Technology is that the course be made up of three overlapping phases. The first would consist of intensive course work on the chief sectors of industry, with formal courses, studies of the operations of small companies and case studies.

The second phase would consist of courses on background subjects such as design, economics, production technology, plant maintenance and marketing as well as specialized courses in advanced technology to prepare students for the third phase, which would be a project.

The emphasis in the course would be on real industrial situations discussed in tutorials and simulated in the laboratory. This combination of studies, emphasized Sir Brian, will remove any danger of the course being shallow—a fear which is generally expressed about broad based PhD courses. A PhD based on such a course, said Sir Brian, would be just as much, if not more, of an intellectual challenge to the best engineering student as a conventional PhD course.

Computer Posts

THREE new members have been appointed to the Computer Board. The Department of Education and Science announced recently the appointment of Professor A. J. Brown, Professor of Economics at the University of Leeds, Professor H. H. Rosenbrock, Professor of Control Engineering at the University of Manchester Institute of Science and Technology, and Professor N. Wells, Professor of Computing Science and Director of Computing Services at the University of Leeds, to serve until July 1974. The board, which was created in 1966, advises the government on the provision of computers at universities and guides the research councils in their use of computing.

Professor Brown will represent the University Grants Committee on the board. Professor D. J. Finney, Professor of Statistics at the University of Edinburgh, and a member of the board since its inception, has been appointed chairman, also until July 1974.

SOVIET SCIENCE

Glaciers Studied

from our Soviet Correspondent

FOR more than 40 years, Soviet glaciologists have maintained a permanent observation station on the Fedchenko Glacier in the High Pamirs. Press coverage (*Izvestiya*, September 27, 1972) of the servicing of this station by helicopter reflects increasing concern as to how this large glaciated area (several thousands of square km) affects the climate, and how water from these glaciers can be used for the irrigation of Soviet Central Asia.

A helicopter exploration expedition carried out in 1971 established the existence of eleven previously unknown glaciers in the High Pamirs which feed the Vartang basin. The expedition, however, used helicopters only for aerial survey, and no attempt was made to land.

In June 1971, V. A. Litosh, a young geologist at the Kh. N. Abdullaev Institute of Geology and Geophysics in Tashkent, working on data of glacio-