number of companies. There is also a firm injunction, however, that if a first injection of money does not bring competitiveness, support should then stop.

Fluidics is the technology which uses the flow of fluids for sensing, computation or control and it has developed rapidly in the last ten years, particularly in the United States. In the report, some of the considerable publicity given to fluidics is shown to have been somewhat exaggerated, but the authors, D. C. Bain and P. J. Baker, believe that there are several important areas—in the automation of simple operations—where fluidic devices could be profitably employed.

There are two chief types of fluidic devices. Pure devices, like the turbulence amplifier, use fluid jets and contain no moving parts, but moving part devices use floating or deformation, usually of a diaphragm or leak spring. By far the greatest effort in Britain has been in digital switching devices, and although some work is being carried out on proportional devices, these are in a much earlier stage of development; problems of lack of linearity and performance repeatability have yet to be solved. The digital elements at present used most widely are the turbulence amplifier and the wall attachment. The first operates by causing a laminar flow to become turbulent by the action of a perpendicular control jet and is thus capable of one logic function. The wall attachment uses a jet which can be switched from one output channel to another, and it can serve as a memory element. The chief advantages of fluidic devices are that they resist environmental effects such as extreme temperatures, mechanical vibration and shock, a corrosive atmosphere or the presence of electromagnetic radiation and that fluidic sensors are often simpler and cheaper than alternative devices such as photoelectric cells. They are reliable in the sense that they should have a long life and that maintenance should be simple and cheap. The fundamental disadvantage of all fluidic systems, however, is that they are slow compared with electronic devices. In the present early stage of development, there are high development costs and peripheral equipment is scarce.

The survey on which the report is based estimates that the total expenditure on fluidics in the United Kingdom to the end of 1967 was about £2·5 million, while the total sales amounted to £300,000. The authors consider that effort is fragmented and wasteful, with many more firms involved than the market will support, so that British organizations are not competitive in Europe. The prediction is that, unless the ministry supports fluidics, future markets will within five years be completely dominated by the United States and European organizations. This is a familiar tale, but for all that it could be true as well.

RADIO ASTRONOMY

Cambridge Threatened

from our Astronomy Correspondent

NOBODY—except occasionally the Science Research Council—sites an optical observatory where skies are cloudy or near the bright lights of a city. The conditions for radio astronomy are less stringent, but radio interference can still cause havoc with sensitive observations. This means that a radio observatory being built now ought to be at least fifteen miles from any major industry. The worst offender which radio astronomers can think of would be an international airport, with its arrays of navigational radars, the industry it would encourage and the people it would bring into the area. This is why Professor Sir Martin Ryle and his colleagues are alarmed at the prospect of London's third airport being built at Nuthampstead, twelve miles to the south of the Mullard Radio Astronomy Observatory at Lord's Bridge, near Cambridge. Nuthampstead is one of four possible sites for the airport, and the Roskill Commission is inquiring into which should be chosen. On Tuesday, Professor Ryle gave evidence to the Roskill Commission, meeting at Royston near the Nuthampstead site. The essence of the evidence which he submitted is that if Nuthampstead is chosen the observatory will have no alternative but to move.

Professor Ryle has a strong case. Lord's Bridge has been built up since 1956 to a total capital investment of about £900,000, and only last week in the shadow of the enquiry work began on the £2·1 million three-mile telescope. A move to a new site would take at least £3 million, Professor Ryle estimates and, worse, would cost the observatory four years. Although Lord's Bridge is only five miles south-west of Cambridge, the level of interference is low because Cambridge is not heavily industrialized and because the observatory has taken pains to suppress local electrical equipment, sometimes out of its own pocket. If the airport were built, there would be extra interference from ground equipment either reaching the observatory after reflexion from aircraft or by the direct path, from equipment in aircraft (particularly VHF radios and radar altimeters) and from the new town of about 200,000 likely to grow up around the airport.

Exactly what level of interference can be expected is hard to predict until detailed plans are made, but Professor Ryle says that if the surveillance and airfield control radars just meet the internationally accepted standards for spurious radiation, it will be impossible to observe on at least two radio astronomy bands.

Cambridge has already had experience of interference from airborne equipment, in particular a radar altimeter in Boeing 707 aircraft which was only dealt with after representations to the Board of Trade. The request that in British airspace the altimeter should be switched off took more than a year to be accepted.

The other half of the British radio astronomy effort, the Nuffield Radio Astronomy Laboratories at Jodrell Bank, finds life hard at roughly the same distance from Ringway airport, Manchester, as Lord's Bridge is from Nuthampstead, which is why the Mark 5 telescope is to be in Montgomeryshire. Ringway had no airport radar when observations first started, but since then usage of the airport has increased vastly and the sensitivity of telescopes and receivers has improved. Overhead powerlines, and especially an electric railway adjacent to Jodrell Bank, have also caused trouble. In particular, interference has put a stop to observations at low frequencies. But close cooperation with the local population, the Post Office and British Rail seems to have kept Jodrell Bank free of interference. Much the same kind of consultation goes on at Cambridge. In the long run, however, the next generation of radio telescopes may have to be sited in regions which are closer to the ideal of radio silence.