- Study how to educate users and potential users of microelectronics, particularly in relation to maintaining employment.
- Help develop new programs and languages appropriate to a personal computer (Servan-Schreiber version).
- Propose the means of transferring the technology to the Third World.

Robert Walgate

Magnetospheric experiment

UK joins in

The Science and Engineering Research Council has decided to fund participation by the United Kingdom, to the tune of £2 million, in the Active Magnetospheric Particle Tracer Explorers project (AMPTE). The council's Rutherford Appleton Laboratory, in partnership with the Mullard Space Science Laboratory of University College London and other university groups, will be developing the satellite as a separate component of the Ion Release Module satellite being developed by the Max Planck Institutes of

Astrophysics and Aeronomy in West Germany. The two satellites, together with the Charge Composition Explorer satellite being developed in the United States, will all be launched in mid-1984 on a Thor Delta rocket, hastily acquired following space shuttle delays.

The magnetosphere is the region where the magnetic field of the Earth interacts with the charged particles and magnetic fields of the solar wind, the continuous flow of plasma from the Sun. The aims of the experiment are to release lithium and barium ions into the Earth's magnetosphere and, by monitoring their subsequent behaviour, to investigate several fundamental aspects of the magnetosphere as well as to simulate conditions near other planets. The Ion Release Module will be placed in a highly eccentric orbit, so that ions may be released both inside and outside the magnetosphere.

One of the problems to be tackled by the Charge Composition Explorer is to determine whether or not the magnetosphere is "open" — that is, whether the Earth's magnetic field lines can connect with those of the interplanetary medium so that solar plasma can enter the Earth's field

from downwind. To this end, ions will be released just upstream of the bow-shock. The Charge Composition Explorer, in an equatorial orbit, will detect those ions only if the magnetosphere is "open".

The UK satellite will be placed in an orbit with that of the release module, maintaining a separation of 100 km or so. The particle and field detectors on board will monitor the behaviour of the ejected ions immediately after release. Lithium ions, being light, should pick up a large component of the velocity of the solar wind unless disturbed by plasma instabilities.

The release of the barium ions should produce rather more spectacular results. Because they are more massive than most components of the solar wind, the surrounding plasma will be impeded and a glowing comet-like structure will be produced. If the barium ions are released within the high-velocity plasma of the magnetosheath near dawn or dusk, the cloud will be visible from the ground, and will simulate conditions to be found in comets and in the magnetosphere of Venus. When released "downwind" in the magnetotail, where plasma flows more slowly, conditions will be more similar to those near Io and Titan within the magnetospheres of their respective planets Jupiter and Saturn.

Philip Campbell

NASA budget

Small is necessary

Washington

As the National Aeronautics and Space Administration (NASA) locks horns with the Reagan Administration over just how large a budget cut it must face next year, US space scientists are trying to devise a strategy for exploring the Solar System within the tight budget constraints likely to dominate for the next few years.

For the fiscal year beginning 1 October 1982, the Office of Management and Budget (OMB) has told NASA to prepare for cuts of about \$1,000 million in a budget previously projected at about \$7,000 million. Agency officials are strongly resisting this request, arguing that such a cut would severely damage all NASA's programmes; they have already gone over OMB's head to the White House in an attempt to get the proposed cuts reduced before the budget is formally submitted to Congress in January.

However, the prospects for NASA in general — and space science in particular — are likely to be bleak for the next few years. In this context, the agency has set up a Solar System Exploration Committee to take a close look at the type of projects it should be planning for the future. "If something disastrous were to occur to NASA's budget next year, it would be even more important to plan how we should recover", Dr Noel Hinners, the committee's chairman and director of the National Air and Space Museum in

Washington said last week.

The main aim of the committee is to increase the efficiency of planetary and other Solar System missions while reducing the costs, in particular by breaking down the scientific goals of the missions into "smaller bites" than those represented by, for example, Voyager.

One way of achieving this goal would be to build directly on the experience of previous missions. For example, the Ames Research Laboratory is looking at ways of developing Pioneer-type orbiters to some of the inner planets, using derivatives of terrestrial orbiters to study the geological characteristics of the Moon or Mars.

Pioneer-type spacecraft would only be able to achieve relatively limited scientific objectives, and would produce a relatively low data rate. But a mission could be launched for between \$100 and \$150 million, the same order of magnitude as the Explorer satellites currently being successfully used by NASA.

As well as looking at ways of using smaller spacecraft, the committee is investigating how to save money by increasing operations efficiency, for example by reducing the length of trips, compressing the scientific data to be transmitted back to Earth or the sharing of individual pieces of equipment between different research groups.

Four subcommittees will meet next month at the Jet Propulsion Laboratory to work out the type of programme that could be developed on the basis of such components. The subcommittees expect to report to NASA with specific mission proposals by next summer.

Dr Hinners said last week that he had discussed this new approach in some detail with officials at OMB, who expressed general approval but raised two possible objections. First that a list of the various missions which could be included in an overall envelope of between \$300 and \$400 million a year — only slightly above the current level — looked like an ambitious shopping list; and second, that breaking down planetary missions into smaller projects might lack the public appeal of Apollo or Voyager.

To the first objection, NASA replies that it is the size of the effort and the balance between costs and return that should be measured rather than the number of space vehicles flown. The second objection raises a broader question faced by NASA: can the apparently-increasing enthusiasm among the public for space exploration, particularly in the light of the excitement generated by photographs sent back by the Voyager spacecraft, be interpreted as a mandate to increase spending on space science?

Those who do believe that the public will be eager to support ambitious plans for space exploration are still pushing hard for what they consider should be the next major mission, a manned sample-return space vehicle to Mars. NASA administrator James Beggs told the advisory