Atmospheric chemistry

Time to make up for neglect

THE UK Natural Environment Research Council (NERC) is being asked to designate atmospheric chemistry a special topic, which in NERC parlance means that special funds will be allocated for coordinated research grants, not reacting to applications brought in by the mails. The new initiative follows a meeting of scientists from universities, government laboratories and the research councils that highlighted the fragmented state of this discipline in the United Kingdom.

Considerable research effort has, over the past few years, been spent on stratospheric chemistry, primarily as a result of concern over the effect of man-made emissions on the ozone layer. The new initiative reflects recent concern about chemical ignorance of the troposphere (the lowest 10 km or so of the atmosphere), typified most publicly in the problem of acid rain (see also *Nature* 298, 9; 1982).

British efforts in atmospheric chemistry have declined over the past four years. The main government laboratory — the Environmental and Medical Sciences Division at Harwell — has decreased in staff from 8 to 4 over the period as a result of cuts by the Department of the Environment. The number of university groups in the field is in single figures — dwarfed by the United States in proportion to the populations.

This comparison will be unavoidable at a meeting on atmospheric chemistry in Oxford in August where, of the 160 papers scheduled for delivery, 100 or so are from the United States and only 16 from the United Kingdom. Of the latter, only four are from university departments.

The three essential areas of attack highlighted by the meeting were measurements in the troposphere, modelling (for example to understand meteorological effects on chemistry) and laboratory kinetics. The first two aspects of the problem fall under the NERC umbrella, whereas laboratory kinetics is supported by the Science and Engineering Research Council (SERC)'s Science Board.

The need for coordination is obvious and, unsurprisingly, the main proposal that came out of the meeting was for a coordinating committee to be set up with representatives from NERC, SERC, the university community and Harwell (as the most relevant government laboratory).

NERC will decide on this proposal at the beginning of June. Only after such a committee has produced an opinion, and possibly with the help of the Advisory Board for the Research Councils, will NERC decide whether to designate atmospheric chemistry as a special topic and how much to spend on it. **Philip Campbell**

Space Telescope

Counting the astronomical cost

Washington

MANAGEMENT errors by the National Aeronautics and Space Administration (NASA) and a plague of unforeseen technical hurdles have caused massive new cost overruns in the development of the Space Telescope and all but ruled out the possibility of launching it until 1986 or even later. Congressional investigators have told the Appropriations Committee of the House of Representatives that the final cost of building the telescope, originally planned to be \$435 million, is now expected to rise to \$1,000 million.

The investigators' report, by far the most gloomy assessment yet of the troubled programme, pins the blame for soaring costs and delays squarely on the shoulders of NASA and one of its major contractors, the Perkin-Elmer Corporation in Danbury, Connecticut. Perkin-Elmer is building the Optical Telescope Assembly, the heart of the spacecraft and the instrument which

should enable astronomers to observe objects 50 times fainter and 7 times farther away than any existing ground-based device.

Perkin-Elmer has run into major technical difficulties in completing the assembly (see below) but many of them could have been avoided with better management, according to the congressional report. The report says both NASA and the corporation "grossly underestimated" the difficulties likely to arise from the advanced technology being used in the telescope, and NASA consciously decided to bypass the development of "prudent" engineering test models.

One of NASA's biggest errors, the report says, was a decision to limit the number of headquarters staff allocated to the Space Telescope to 90 people, about half the number usually allocated to programmes of similar magnitude and too few to cope with the complexity of the project.

Eventful history

TECHNICAL difficulties have plagued the development of the Space Telescope throughout its life, and congressional investigators have warned the Appropriations Committee that three major hurdles are still threatening to cause long delays, increase costs and impair the efficiency of the telescope when it is eventually launched. The three components causing anxiety are:

- **The Orbital Replacement Unit (ORU) Latches.** Perkin-Elmer is designing 64 latches to perform two crucial functions — aligning and securing the scientific instruments, fine guidance sensors and technical devices within the orbital unit, and enabling space shuttle astronauts to replace the instruments when needed.

In tests at the Marshall Space Flight Center, the latches have tended to chafe and thus prevent an exact fit when they are reclosed. As a result, it is not possible to align the scientific instruments and the fine guidance sensors, which "aim" the telescope, with sufficient accuracy. Perkin-Elmer hopes it can solve the problem by coating the latches with tungsten carbide, but NASA is considering transferring the whole project to Lockheed Missiles and Space Company.

- **The Fine Guidance Sensors.** Four fine guidance sensors, interferometric devices essential to aim the telescope at target objects, are to be built by Perkin-Elmer but the first is only half-finished. NASA doubts whether the corporation is capable of building sensors to meet its own design blueprints, and a review committee has recommended treating the half-completed

sensor as an engineering model for extensive testing. If accepted, the recommendation would add \$100 million to the project and delay a launch until at least April 1986. NASA officials are considering asking Lockheed to take over the project and use Perkin-Elmer as a subcontractor. A partial solution also being considered is to accept some reduction in the pointing accuracy of the telescope.

- **The Primary Mirror.** NASA is asking the scientific community to consider relaxing its specification for the cleanliness of the mirror. After 15 months in a "clean room", dust contamination on the mirror already exceeds the allowable level (no more than a quarter of one per cent of the surface to be contaminated and no dust particles exceeding two-tenths of one millimetre). The dust already accumulated means the mirror can only perform at 70 or 80 per cent of its specified level, raising unresolved questions about how the mirror should be cleaned. The problem of molecular contamination has been warded off by "baking" part of the structure, but at increased cost and with further delays in the timetable. The dust problem is compounded by the fact that the mirror will be in storage for several years.

A fourth technical problem looming over the project, but not formally part of it, is the performance of NASA's new sophisticated communication satellite, TDRS (Tracking and Data Relay Satellite System). Communication between the telescope and Earth is to be through TDRS, but the first TDRS, launched in March, tumbled into the wrong orbit and the launch of a second has been delayed until NASA can discover what went wrong. □