

landing, is not the case), it is once again at a loose end — whence the plan to build a space station. Although nobody — not scientists, not the military, not even NASA itself — has been able to figure out just why the United States needs a space station, President Reagan is expected to approve the project when he releases his budget for fiscal year 1985 later this month.

Perhaps it was just a coincidence, but just before Christmas, Congress's Office of Technology Assessment released a report that seemed to answer NASA's prayers. The report, a sober description of the Soviet Salyut programme, has been seized upon to provide the ultimate justification for an American space station; the Soviets have one. Unfortunately, an American crash programme to build a space station will fail to correct the real problem in the US manned space programme that the report identifies, and in the process will also do considerable damage to American space science efforts — an area in which the United States really does lead the Soviets.

All the media hoopla over the red menace has ignored the more serious underlying failing of the US space programme compared with that of the Soviet Union: while the Soviets have plodded steadily forward towards a directed goal — a continuous manned presence in space, built up through mastery of automatic docking and long stays in space — the United States has gone in for space spectaculars, virtuoso efforts that reflect a dazzling technical ability and lead nowhere. The Apollo project (which, as a Tom Lehrer song has it, spent billions of dollars of taxpayers' money to put some clown on the moon) was not part of a larger plan.

The shuttle, also a crash programme that took the lion's share of NASA's resources, has suffered from a lack of a sense of direction. NASA, in a political decision to sell the shuttle to Congress, tied everything it could to the shuttle — if space science was needed, the shuttle would do space science; if it was military satellites, the shuttle would do military satellites. To make sure, NASA ditched its reliable expendable launch vehicles. The result was a disaster for space science, though not for the reasons usually given. The shuttle project itself probably did not steal funds away from science; what it did, however, was to delay by four years the Galileo mission to Jupiter (Galileo, of course, was designed to use the shuttle), and the funds needed to keep Galileo going for four years (it will finally be launched in 1986) eliminated the possibility of doing anything else in space science in the meanwhile. Also, the early promises of 28-day missions have given way to the reality that it does not make economic sense to park a billion-dollar launch vehicle in orbit for a month. The presence of men on a scientific platform can also be drawback, particularly for sensitive pointing apparatus. The shuttle was not needed for science; in many ways, it has hurt science.

The space station seems to be following the same path. And it will be a tragedy if science is once again constrained to suit NASA's political expediencies. If the space station goes ahead as another NASA crash programme, there will be another two decades of original research on why astronauts vomit and whether you can make the perfect ball-bearing in space.

If the Administration is truly concerned about staying ahead of the Soviet Union, it would do well to concentrate on the existing strengths in the US programme. The series of inexpensive near-Earth space probes being developed by the Jet Propulsion Laboratory (see p.6) is one obvious avenue to pursue. Another is being studied by the Space Science Board and would make the shuttle into a truly useful scientific vehicle; it is to build a module, called Spartan, that could be dumped overboard from the shuttle, allowed to co-orbit with the shuttle (unmolested by men bumping about) and then picked up just before returning to Earth.

At the same time, more care and effort should be put into the shuttle and the space station, but in terms of an engineering development project — not a crash programme to build the space vehicle for the next decade. It is of course only a matter of time before there will be some real scientific (and perhaps military) needs for a permanent space station, and plans should be made for that. Meanwhile, the United States should learn something from the Soviet Union, and not waste energy on bursts of light and heat that hurt only itself in the long run. □

The year that never was

If 1984 is not as fearsome as in Orwell's novel, there are still important battles to fight.

AT the beginning of George Orwell's year, the first thing to acknowledge is that 1984 never came. The idea that governments might become so preoccupied with their own survival, and so adept at the exploitation of technology for bending the inclinations of their people to that simple goal, that personal liberty would cease to be, remains a nightmare — one, nevertheless, that will not go away. Moreover, this does not imply that governments are consistently more enlightened now than, say, a year ago, or that the suppression of liberty has by magic been banished from the face of the Earth. On the contrary, new pockets of despotism are forever cropping up. The mercy is that the practitioners of wayward offences against people are but crudely practised. Bullets, in their books, are more convenient than mind-control. And, as illiberal governments repeatedly discover, their wish to make their people toe some predetermined line is repeatedly undermined by the personal courage of those they would control. Precisely that obdurate unwillingness of people to forsake human dealings with each other is, after all, what changed Orwell's book from a political tract into a novel. Although the profession of science is superficially indifferent to the ways in which governments choose to treat their citizens, the health of science rests on the freedom with which new ideas flow from one place to another, from any person to any other. That, of course, is why professional scientists are concerned with the way in which their colleagues elsewhere are dealt with and why the fortunate among them have an obligation to assist those less fortunate by all possible legal means.

Against Orwell's predictions, the more serious anxiety during 1984 is not that governments will find it prudent to deprive their people of liberty but that they will choose to blow each other's people to smithereens. Outwardly, this again is an issue separate from the practice of science as such, or in which it might be held that professional people have a right to intervene only in their capacity as citizens. In many circumstances, that would be true. But if it is the case that the means of waging nuclear war, and the means by which the risks of nuclear warfare might be avoided, depend to a large extent on technical considerations, the technical community may be held to have an obligation to throw what light it can on the questions that arise. That is why journals such as this have always taken the position that comment on the steps which are being taken (or not being taken) to avoid the dangers of nuclear and other kinds of wars is not merely permissible but obligatory. And 1984 promises to be a busy year in this respect.

The year ahead also bristles with threats to the well-being of the scientific enterprise. The long recession is far from over (and will not be completed until the present period of rapid technological change has worked its way through the world's advanced societies). So even the most prosperous and far-sighted governments are in their different ways looking for ways of cutting costs wherever possible. The ambition is legitimate and laudable; the practice, unfortunately, is often ill-considered. This is why 1984 is likely to see a running battle between governments anxious to trim budgets by making science a pensioner of industry and those who see that the exploration and understanding of the world we live in cannot be trusted to such chance. Orwell's great book was written in 1948, when the first rudimentary electronic computers had just come into service, when the distinction between the pi and the mu mesons had just been discovered, when neither transistors nor lasers had been invented and when the mechanisms of inheritance were still unknown. That industrial needs have been the engines of many of these developments is not in question, nor is the prosperity that industrial developments have brought. The issue that will be fought in the months ahead is the extent to which free inquiry should depend on such adventitious interests. That battle too, looks like being a long and loud one. □