Space shuttle: costs and technical delays raise political doubts

AFTER almost 10 years of preparation, technical delays and uncertainties are turning the final development stages of the National Aeronautics and Space Administration's Space Shuttle programme into something of a political cliffhanger.

A succession of last minute technical problems, although not unusual in a project as complex as developing a re-usable launch vehicle able to place and subsequently retrieve objects from an earth orbit, are receiving wide press attention and close public scrutiny. And Congress has already told NASA that, in a year of tight budgets, the agency cannot be guaranteed of receiving the extra \$185 million it has requested for covering the extra work involved. Current estimates of the cost are 8-9% higher than originally estimated in 1971. If granted, the additional money would take the total science budget for the financial year 1979 above a previously agreed ceiling.

If NASA does get the extra money, it is confident that Space Shuttle can be in orbit by the end of the year. Even though it publicly admits that the chances of meeting the planned 9 November launch date are "relatively low", it has criticised the National Academy of Sciences which suggested a launch date of April 1980, as being "unduly pessimistic".

But if NASA does not get the money—and the request is being closely scrutinised by the Senate budget committee, in particular since money for space research comes under the heading of discretionary funding—then the agency could be in deep trouble.

Under such circumstances, according to associate administrator John F. Yardley, the first manned orbital flight would be delayed an additional six to nine months. The delivery of production orbiters would be delayed up to one year, and this could seriously disrupt planned launch schedules.

Among the projects affected could be the European Space Agency's Spacelab, whose first launch is currently scheduled for August 1981. Initially planned for launching at the end of this year, cost increases for Spacelab—some made necessary by changes in the design of the Space Shuttle—have already exceeded the limit above which participating nations are entitled, if they wish, to withdraw.

Since being given the go-ahead by President Nixon in 1972, the Space Shuttle programme has had to run a continuous gauntlet of congressional criticism. Among past critics is Vice-

President Walter Mondale, today silent on the issue, but in 1972 claiming that the Shuttle was many times worse than supersonic transport "in the magnitude of its cost, in the folly of its concept, and thus in the damage to the country."

Such opposition has kept the research and development programme to a skeletal minimum, a far cry from the lavish spending on the Apollo moon programmes. Mr Yardley complains that requirements carried out in 1974, 1975 and 1976 have taken their toll, and that "further reductions in programme content are not considered possible".

Funding pressure has forced hard managerial decisions on NASA, and some of these were commented on by an *ad hoc* review group set up last year at the request of a senate committee by the National Academy of Sciences under the chairmanship of Dr Eugene E. Covert, professor of aeronautics and astronautics at Massachusetts Institute of Technology.

In an initial report last March, the committee pointed out that unlike previous programmes, the development strategy for the Shuttle programme as devised by NASA was "success oriented", and based on the assumption that each piece of development hardware and its subsequent verification test would succeed at the first attempt.

"It may be that this strategy has already saved time and money However, if or when malfunctions occur during the testing of the operational engine, new hardware may need to be designed, constructed and retrofitted, causing delays in the programme", the report said.

Such indeed has turned out to be the case. There have been problems, for example, both with the turbine blades and with the heat exchanger in the Shuttle engine being developed by Rocketdyne—the latter being a component which the review group singled out for concern. And the temporary tiles which broke loose during a flight last week and damaged some of the fitting had been made necessary by un-

expected delays in fitting the permanent tiles—of which there are 5,000, each requiring 650 man-hours of work.

There have also been problems with weight. Design changes in the launcher vehicle have caused problems for, for example, the Galileo orbiter probe to Jupiter, planned for launch in 1982, but on present specifications now requiring 109% of the engine's theoretical thrust.

The big question now is how smoothly the rest of the pre-launch development programme goes. NASA admits that its present schedule is a "success oriented schedule with a minimum of contingency time", but adds that "it has been our experience in the past that such success schedules result in minimum cost and earliest actual dates",—in other words that even if unrealistic, planning for sooner rather than later helps to keep the pressure up.

The Covert committee is less optimistic. "We think it highly likely that there will be more problems before the first orbital flight", one member of the committee said last week. This sanguine perspective led the committee last month to recommend next spring as a more realistic date. NASA says that this is based merely on "intuitive feeling".

Meanwhile NASA officials are busy trying to persuade Congress to give them the extra money needed to let the shuttle programme proceed to its conclusion as planned. The supplemental request is being examined for Senator Muskie by the General Accounting Office of Congress. The 1980 request for NASA contains no new space science starts largely because of the pressure on Shuttle funding.

There is already talk of NASA possibly needing a supplemental to its 1980 budget, even though it may mean the agency coming back to Congress cap in hand. Ten years ago, the money would have been provided eagerly—today no-one is taking bets on the outcome.

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