Congress reminded of perils of space flight

- Shuttle accident statistically likely
- Alternatives needed for flexible programme

Washington

JUST two weeks after US President George Bush celebrated the twentieth anniversary of the moon landing with renewed enthusiasm for the space station and a stirring call for a manned mission to Mars, the congressional Office of Technology Assessment has issued a sombre reminder that manned space flight is still a very risky business.

The report says that it is "statistically likely" that another space shuttle will be lost or damaged if launches continue at the

a little flexibility would be for Congress to order a fifth shuttle. Three shuttles are ready and a fourth, the Endeavor, will be complete in 1992. But a fifth would cost around \$2,500 million and could not be ready until 1996, too late to be of help in building the first phase of the space station. And by that time the shuttle design will be more than 25 years old.

Flying the shuttles less often would reduce risks. That means alternative, unmanned launch vehicles would have to be developed. Shuttle-C, an unmanned

Fully reusable Partially reusable Expendable stages

planned rate and warns that "the United States . . . will have to accept the likelihood that loss of life will occur". If a devastating blow to the space programme by the loss of a shuttle is to be avoided, then Congress will have to decide soon what it needs — and what it can pay for — to transport humans into low Earth orbit.

Shuttle reliability is estimated at 98 per cent which means, the report says, that "there would be a 50–50 chance of losing an orbiter within 34 flights". As approximately 140 shuttle flights are needed to complete the first stage of the space station, there is only a one in eight chance that the space programme will advance that far without losing one of the shuttles.

But that grim estimate does not imply that the terrible disaster of the Challenger is likely to be repeated. A shuttle is more likely to be put out of commission by a mundane mishap — an accident with a crane during flight preparation for example — than by a major catastrophe.

The report lays out a shopping list of alternatives that could keep the space programme on schedule even if an accident occurs. The most obvious way to gain

Horizontal takeoff

Some of the 'Advanced Manned Launch System Concepts' under review. These hypothetical vehicles were penned by NASA's Langley Research Center based on 1992 technology — except for the horizontal takeoff craft which required more advanced airbreather/rocket technology.

cargo-carrying version of the shuttle offers a relatively quick solution. It could be ready by 1994 and be used to ferry space station components, thus substituting for the purchase of another shuttle. As Shuttle-C could carry 100,000-pound payloads into space, twice the capacity of a manned shuttle, fewer flights would be needed.

Launch capacity could also be increased by improving the existing shuttles. Several different options are available: further improving the solid-fuel rocket boosters, developing a new design, or switching to liquid-fuel rocket boosters. Liquid-fuel boosters are more powerful and considerably safer. Each booster would contain four motors, making a safe landing possible even if there were a partial engine failure during launch. But liquid-fuel boosters will cost \$3,000 million to develop and could not be ready before 1997.

Beyond these options comes the Advanced Manned Launch System, which could eventually replace the shuttle. Five concepts are under consideration (see figure) running from a fully reusable

Israel approves new horizons

Tel Aviv

ISRAEL'S Ministry of Science and Technology has approved next year's budget for the two scheduled payload projects under development for the Israel Space Agency's Ofteq (which means "horizon" in Hebrew) satellite programme.

The projects, each of which receives \$100,000, include an X-ray telescope developed by an interdisciplinary team at the Technion Israel Institute of Technology and an ultraviolet imager devised at Tel Aviv University. The Technion project has been finally approved for the first Ofteq III payload, scheduled for launch in 1992: the latter project is still awaiting final approval.

Both projects easily met the Israel Aircraft Industries' (IAI) requirements that a payload should weigh 20 kilograms or less and consume not more than 20 watts of energy.

The second Ofteq III payload, which has yet to be approved finally, is an ultra-violet imager that will observe "interplanetary dust at wavelengths that have not been studied until now, particularly in primeval galaxies", said Professor Yuval Ne'eman, chairman of the Space Agency.

The first Ofteq was launched last September; it was a 'deaf' satellite, Ne'eman said, being able to send signals to Earth but not receive any. With that launching, however, Israel became the eighth power in the world and the first in the Middle East with the potential capacity to gather intelligence on its neighbours.

Ofteq II, which is scheduled for take off early next year, will be controllable from Earth but Ne'eman insists that this function will not be used for intelligence purposes. It will probably be launched with the same solid-fuel Shavit rocket as its predecessor, a rocket that Ne'eman compared with the Chinese Long March III or the Soviet Vostek SA3.

Ne'eman said that lack of funds, not technological hurdles, was the biggest obstacle to the development of satellites and rocket guidance systems. He also stated that Israel had not encountered any resistance to its satellite programme.

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combination of a piloted orbiter and unpowered glideback booster, through combinations of a small glider and a powerful expendable rocket (similar to the ESA Hermes design), to a rocket-powered orbiter carried on a horizontal take-off air-breathing space plane (resembling the German Sänger design). But none could be ready before 2005.

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Round Trip to Orbit: Human Spaceflight Alternatives, Special Report of the Office of Technology Assessment.