US space research

Nobody knows what will happen next

Washington

THE destruction last week of the Challenger space shuttle and the subsequent suspension of the whole US shuttle flight programme has thrown into disarray what was to have been the most ambitious year yet for space science. The thirteen shuttle flights planned for the rest of 1986, including four military missions, now face an indefinite delay. Some will miss launch windows that will not recur for more than a year.

The National Aeronautics and Space Administration (NASA) is setting up an exhaustive accident investigation in order to discover what caused the explosion; with hundreds of photographs and abundant wreckage being discovered, as well as telemetry data intact on the ground, there seems to be a good chance that a definite cause will be found.

NASA personnel are avoiding public speculation about the cause of the accident, but it is most likely that something caused a failure of the hydrogen containment. Photographs released by NASA last weekend appear to show that the right solid-fuel booster rocket burnt through its casing about one quarter of the way up from the nozzle at least 14 seconds before the final explosion. Flames from the breach may well have played on the large external fuel tank containing liquid hydrogen and oxygen, causing it to explode.

How long the remaining three orbiters will remain grounded is anybody's guess. While some communications satellites might conceivably be switched to the European Ariane launcher (although Arianespace has full order books for the next two years), the scientific missions are designed in such a way that they have to be flown on the shuttle.

When it exploded, Challenger was carrying in its payload bay a low-cost satellite called Spartan–Halley that was to have observed ultraviolet emissions from comet Halley at its closest approach to the Sun, and a tracking and data relay satellite (TDRS) that was to be the second of what will eventually be four NASA satellites in geosynchronous network for low Earth orbital operations. The first TDRS was launched in April 1983, and a third was to have been launched next July. The TDRS system will eventually replace NASA's network of groundstations throughout the world, some of which have already been transferred to deep space uses.

The TDRS system was to have been used (though incomplete) for several planned space science missions during the year. An ultraviolet observatory known as Astro was to have been flown by the orbiter Columbia in March, with one of its principal objectives being to observe Halley at the same time as the European Giotto and Soviet Vega spacecraft intercept the comet. Dr Arthur Davidsen of Johns Hopkins University, principal investigator of one of the Astro instruments, said last week that he had not given up hope that Astro might fly in time to make observations of Halley — any time before the start of May — but admitted that the chances were slim.

Davidsen said it was particularly unfortunate that the accident had occurred just before the first ever shuttle flight devoted exclusively to scientific observations, rather than to engineering demonstrations relating to science. The loss of one TDRS would not have affected Astro, but NASA officials said there is "no chance" of Astro flying in time to see Halley anyway.

The loss of one of the TDRS system satellites will have important consequences for the Hubble Space Telescope, if it is now launched before the system has two functioning satellites. The telescope had already slipped from its scheduled August launch spot to October before last week's accident, in order to give increased "contingency time" for its journey by sea from California to Florida through the Panama canal. When it will now be launched is unknown, but an incomplete TDRS system would limit data flow rates significantly, if not enough to be a "major deterrent", according to NASA.

Two major science missions that are certain to be affected are the joint NASA/European Space Agency solar polar Ulysses mission, and NASA's Galileo Jupiter probe. Both were to have been launched in May, by Challenger and Atlantis respectively, and both have a launch window that will not recur for 13 months. If neither is flown in May 1986, as now appears quite likely, then both may be competing for the same launch window 13 months later. The maximum separation of the two launches is about five weeks, which is not enough time for one orbiter to be refurbished for a second flight, and with one less orbiter in the fleet, either Ulysses or Galileo may have to wait for more than two years.

The list of space science missions that might be affected depends on how long the shuttle fleet is out of service and how NASA rearranges flight priorities. The Earth Observation Mission scheduled for launch in August must now also be in jeopardy; NASA programme managers at Marshall Space Flight Center are putting all their effort into the investigation of the Challenger explosion and have not yet studied its effects on science missions.

The Department of Defense will also have its nose put out of joint by a long grounding of the shuttle fleet; three classified payloads were to have been flown this year, in addition to a July flight including Teal Ruby, an infrared tracking experiment with applications to the Strategic Defense Initiative (SDI), and Cirrus, a US Air Force Geophysical Laboratory experiment on infrared emissions from Earth's aurora.

Further SDI experiments had been expected in 1987, and pressure from the Pentagon for shuttle payloads to make up for lost time once the fleet is back in operation will doubtless be intense; the Pentagon can "bump" civilian payloads if it chooses.

Tim Beardsley

SDI on campus

Washington

A NEW study of research contracts let by the Strategic Defense Initiative (SDI) organization highlights the Pentagon's growing influence on basic research at US universities. The Department of Defense (DoD) now supports 16 per cent of all federally funded research, up from 10 per cent in 1980. DoD represents the fastest-growing source of research support and now exceeds support from the National Science Foundation, if off-campus research is included.

The new study, by the New York-based Council on Economic Priorities, shows that more than half of federally funded work in mathematics and computer sciences is supported by DoD, as is 82 per cent of astronautical engineering and 56 per cent of electrical engineering.

The trend is likely to continue, according to the study. The SDI organization's innovative science and technology office, which targets university research, is planned to account for 5 per cent of the SDI budget; its 1986 budget is $100 million but could expand to $300 million by 1988. The study voices concern that, despite the SDI office's insistence that basic research will remain unclassified, secrecy clauses will be invoked as soon as the research starts to yield results of military significance.

Of SDI contracts let to universities, the great majority by value have been to Massachusetts Institute of Technology (MIT). Including the off-campus Lincoln Laboratories, MIT has so far received over $59 million from SDI. Other major university recipients of SDI contracts are the University of Texas ($5.6 million), Georgia Tech Research Company (4.5 million) and Johns Hopkins University ($2.9 million).

Tim Beardsley

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