Shuttle reports for duty…despite the risks

Tony Reichhardt, Washington

Excitement was mounting at NASA last week as a space shuttle rolled onto the launch pad for the first time in more than two years. But although NASA managers are confident that they have done their best to fix the problems that brought down Columbia and its crew in February 2003, the risks facing the 21-year-old shuttle are still significant.

Columbia was doomed after foam insulation from its giant fuel tank hit the vehicle during its ascent to orbit, ripping a hole in the insulating panels on its wing that caused it to burn up as it re-entered Earth's atmosphere. The Columbia Accident Investigation Board, set up after the tragedy, recommended a suite of fixes and additional safety measures before a shuttle could fly again.

Discovery, set for launch from Kennedy Space Center in Florida between 15 May and 3 June, will take seven astronauts to the International Space Station, returning to Earth 12 days later. NASA estimates that, by next year, it will have spent $1.4 billion on the safety measures, which are focused mainly on preventing the same scenario that caused Columbia's demise. Engineers have redesigned parts of the tank and changed some methods for applying foam. But they still can't guarantee that a small piece of foam might not cause enough damage to prevent a safe re-entry.

So ground-based cameras will track any falling foam pieces, and a laser imaging system and camera attached to the shuttle's robot arm will inspect the vehicle in space. Astronauts on the space station will also photograph the shuttle as it turns a slow somersault before docking.

NASA/KSC

On view: the space shuttle Discovery moves towards its launch pad at Kennedy Space Center.

If these inspections detect trouble, NASA has two choices — try to fix the damage in space, or dock Discovery to the space station and send up a second shuttle to bring the astronauts home. Either method carries risks.

Engineers have yet to devise a reliable way of repairing the shuttle in space. On this flight, spacewalking astronauts will test some of the proposed methods. Yet NASA would be reluctant to rely on experimental techniques to fix a real hole in Discovery. Plan B — launching a second, rescue shuttle — has also never been tried.

But shuttle flight director Paul Hill says that two years of studying the details of insulation damage has made his team better able to make the necessary judgement calls.

And judgement is what flying the shuttle ultimately comes down to. For all the time and money spent, most observers say the risks of shuttle flight are essentially the same as before the Columbia accident.

Ali Mosleh, an expert in reliability engineering at the University of Maryland in College Park, has worked with NASA on a probabilistic risk analysis for the shuttle. "There's no question they have improved aspects of the shuttle system," he says. But "it's unlikely they'll be hit by the same scenario", he points out. Two years on, the risk is "better probably by some percentage", he says. "But not by an order of magnitude." ■

Ideas abound as Japan aims to boost its space image

Ichiko Fuyuno, Tokyo

Japan has launched an ambitious 20-year plan that would rejuvenate its stagnant space programme. Objectives announced by the Japan Aerospace Exploration Agency (JAXA) last week include Earth observation, a Moon probe and a manned space shuttle.

But critics are worried that the vision lacks focus, and that a thinly spread budget could cause problems for the agency.

Public support for JAXA has plummeted in the past couple of years in the wake of some failed missions. New launches were stalled after an H-IIA rocket malfunctioned in November 2003, and a month later the agency lost its Mars probe Nozomi.

JAXA's first long-term plan, announced on 6 April, was well timed, however, coming some six weeks after the successful launch of an advanced H-IIA rocket.

JAXA

Japan wants to send a shuttle to the Moon.

All the projects in the new plan are "important for the nation and its people", says Ryosuke Futamata of JAXA's strategic planning division. For the first ten years, the main objective is to develop systems for Earth observation and disaster information.

One aim is to give people disaster warnings and evacuation information on their cellphones in the event of an earthquake or tsunami. Another proposal is to develop a system that can measure carbon dioxide emissions in different countries. And space research, including sending probes to the Moon, Mars and Venus, is also a priority.

Most media attention has focused on the part of the plan that includes a manned space shuttle and a base on the Moon. But this phase faces the most uncertainty — Futamata points out that JAXA won't even ask the government for the money for at least a decade.

Even so, critics are concerned that, with a current annual budget of just ¥180 billion (US$1.7 billion) — about a tenth of NASA's — JAXA is trying to do too much. Akimasa Sumi, a special member of the government's Space Activities Commission, says that part of the problem is the agency's inability to stop projects once they are under way. This year, five or six satellite launches are planned, with more in the pipeline. "I wonder how these can be funded," Sumi says. "JAXA's plans tend to be pie in the sky."

But Sumi acknowledges that the agency needed a plan that was inspirational, rather than practical. It is thinking big "to win public support amid a backdrop of falling confidence", he says. "It can't say things that sound familiar to people." ■

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