

Fixing the Shuttle

NASA's new managers inform the Senate of plans to redesign the shuttle solid rocket motors and describe a "tight schedule" for the next launch

THE space shuttle has acquired many new managers since the accident a year ago. Most of them appeared before the Senate subcommittee on science, technology, and space on 22 January to talk about the program's future.

The committee itself has a new appearance. In November it came under Democratic jurisdiction and is now chaired by Donald Riegle (D-MI). The hearing, which took place as the capital was shut down by a blizzard, revealed that the shuttle is in better shape than it was last winter, but that its problems are far from solved.

The senators probed for weaknesses in the "recovery program," as it is called. It is supposed to have the shuttle flying in about a year. The committee was satisfied with most of the answers and with the work in progress at the National Aeronautics and Space Administration (NASA). Several members offered to give NASA more money.

James Fletcher, NASA's new chief, reported that he had twisted arms and used patriotic appeals to recruit new people for many of NASA's top positions. He felt he had done well. Replacements at the lower levels are arriving more slowly. It has not been hard to find talented people to help in this crisis, Fletcher said, but it will be hard to retain them. Fletcher hopes to install a "human resources" expert who will develop the kind of institutional attractions that will bring more young people to the agency and keep them.

One political item involving Fletcher's role at NASA remains unsettled. Senator Albert Gore, Jr. (D-TN), asked Fletcher to consider recusing himself from any decision on retaining Morton Thiokol, Inc., as manufacturer of the shuttle's rocket motors. Fletcher has personal ties to the company and, as the NASA administrator who bought the shuttle, it is said he may be biased in favor of the original designers. Fletcher denies this and declines to recuse himself. Gore has asked the General Accounting Office to investigate. He and Fletcher are eager to see what comes out in the GAO report.

In fixing the next launch of the shuttle for

February 1988, Fletcher acknowledged, NASA has set itself a "tight schedule." The plan calls for two or three additional launches in 1988 and a buildup to 11 to 16 launches annually in the 1990's. Although it may sound encouraging, the schedule stands in sharp contrast to old promises. NASA used to say the shuttle would fly 24 times a year, a regularity that now seems unapproachable.

Even with 16 shuttle launches a year—a rate that may be difficult to achieve—Fletcher said NASA will need additional capacity to transport all the equipment it plans to carry into space. For this reason NASA will purchase unmanned rockets or "expendable launch vehicles" (ELVs) to create a "mixed fleet." This is quite apart from the military's plans to buy ELVs for some of its own projects. Funds for ELVs have not been requested, but soon may be. Senator Ernest Hollings (D-SC) said this would raise NASA's 1988 budget by \$600 million.

The committee spent most of its time on two immediate problems: repairs being made to the solid rocket motors for the next shuttle launch and proposals for a drastic redesign of the propulsion system (known as the Block II studies). The near-term repairs are limited to those that are "mandatory" for the next flight. The long-term alternatives, laid out in five contract reports costing \$500,000 each, were delivered to NASA in December and are now under review. They are hardly objective studies, for each represents a sales pitch by a hungry aerospace firm. Fletcher promised a decision by 31 March.

J. R. Thompson, the new director of the Marshall Space Flight Center in Alabama, listed the main items covered in the recovery program. They are (i) fixing the rocket casing joint that burned through in the shuttle accident, (ii) improving the turbine blades and turbopumps of the shuttle main engines, (iii) reworking the aft skirt of the solid rocket to avoid cracking, and (iv) strengthening a major attachment strut. NASA engineers claim they fully understand the failure of the O-rings and the casing joint that led to disaster a year ago. The failure has been duplicated in a laboratory

test. A redesigned joint, subjected to the same stresses, did not fail.

Several observers, including members of a National Research Council advisory panel (*Science*, 23 January, p. 425), point out that the new joint is more complex than the old one and may require more care in assembly. The review panel also wrote that it may be impossible to inspect the new joint for corrosion after use, meaning that these modified rocket casings may not be reusable. If correct, this would add to the cost of operating the shuttle. NASA official Arnie Aldrich, Director of the shuttle program, agreed that this is a reasonable concern, one that "requires additional study."

The National Research Council questioned the wisdom of adding additional bolts and small O-rings in the nozzle section of the solid rocket in an attempt to strengthen the troublesome case-to-nozzle joint. It urged NASA to consider another option, such as using a single forged unit. NASA officials reassured the senators that they will take such comments to heart. Thompson added that NASA will use a new test device—the nozzle joint environment simulator—to subject the nozzle to the stresses of an actual launch. The casing joint will be tested in this fashion 20 times; the nozzle joint, 11 times. When these have been completed, NASA will ignite a solid rocket in a full-scale test before approving a real launch.

Discussion of the long-term plans focused on whether or not solid rockets should be cast as a single unjointed unit, or shipped in segments (as at present) to be bolted together at the launch pad. The first option would nearly do away with concerns about the joints and the O-rings. It would also require extensive retooling and retesting of the system. Two companies strongly favored this approach, and Harry Crosby of United Technologies Corporation said this approach would be cheaper as well as more reliable. His company is prepared to prove it. George Brown of Aerojet Strategic Propulsion Company, which hopes to resurrect a rocket manufacturing site in Florida, agreed with Crosby.

A spokesman for Morton Thiokol, manufacturer of the existing segmented rocket, disagreed, saying a single-unit device would incur new and unanticipated risks. Most significantly, he said, it would delay the full operation of the shuttle by years. Another speaker agreed with Thiokol, but argued that his company, Hercules Aerospace Products, could provide better segmented rockets at a lower price. NASA has taken all of this helpful information under advisement, and plans to report back to Congress with a decision in about 60 days. ■

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