this sequence of events could not be repeated when the faulty engine was tested at NASA's laboratory in Bay St. Louis, Mississippi. In one test, supercold propellants were piped in and a bag of nitrogen gas was placed around the insulation tear, but no substantial drip developed. In another test, frustrated investigators ripped a bigger hole in the insulation, pumped in extra nitrogen, and used a deflector to direct the resultant drip onto the valve. Still, the stubborn valve operated flawlessly, time after time. "Although the drip could have been a contributor, we clearly don't have strong evidence to substantiate its role," says Melvin McIlwain, the engine program chief at NASA's headquarters.

As this is written, three shuttle contractors in Florida and California are closely inspecting the valve and its associated mechanical and electrical equipment for previously undetected defects. One of these components, a compact, highly sophisticated computer, alone has 41,709 parts. Because of the difficulties involved in replicating every potential malfunction, McIlwain cautions that the ultimate cause might never be pinpointed. He is uncertain if the next shuttle flight will be delayed in the event that no clear explanation for the malfunction emerges.

The accident points up the delicacy of the engines, which cost $36 million each. On one previous occasion, several engines were removed from the shuttle for repairs shortly before lift-off, causing a 2-month delay to repair a series of potentially dangerous oxygen and hydrogen leaks. Willis Hawkins, a former Lockheed Company executive who recently served as chairman of NASA's Aerospace Safety Advisory Panel, says that problems are to be expected during the development of such a highly complex piece of machinery. But he believes that the agency should have worked a lot harder than it did to correct them early on. "They've finally got a good program," he says. "It's just late."

Specifically, he says, the agency should have gone to work long ago on the engine's weakest and most vulnerable part: its turbomachinery. Although the engines were ostensibly designed for use in 55 flights without significant refurbishment, shuttle managers have been forced to remove each one after only three flights, primarily to inspect and repair the turbine blades inside high-pressure oxygen and hydrogen pumps. Prior to engine ignition, the blades are chilled to −300°F. They are subsequently heated, in less than 5 seconds, to 1500°F and spin at 37,000 revolutions per

Labs Favored Over Research

Congress has directed the Department of Energy (DOE) to provide a $7-million down payment for a supercomputer center at Florida State University, a $2.3-million planning grant for a science facility at the University of Oregon, $8.9 million to complete a vitreous state lab at Catholic University, and $3 million to continue construction of new chemistry facilities at Columbia University. Although DOE did not request any of these funds, they have been included in the department's basic energy sciences budget, largely as the result of pressure from key legislators.

At the same time, Congress has cut some $16 million from the budgets of a variety of other basic science programs supported by DOE. Although congressional staff members insist that no direct trade-off was involved, as one DOE official ruefully notes, the effect is "a transfer of funds from people to bricks and mortar."

These funding decisions are contained in a DOE appropriations bill, which was approved by Congress on 27 June and is currently awaiting President Reagan's signature.

Florida State will get its supercomputer center largely thanks to support from Representative Don Fuqua (D–Fla.), the chairman of the House Science and Technology Committee, in whose district the university is located (*Science*, 8 June, p. 1075). Fuqua's interest was sufficient to ensure that the House included $7 million for the project in its version of the DOE appropriations bill.

The Senate's version of the bill did not contain any funds for Florida State's center, but it did include money for a science facility at the University of Oregon. This project has the backing of Senator Mark Hatfield (R–Ore.), the chairman of the Senate Appropriations Committee. Although no proposal has been submitted to DOE, the Senate bill directed the department to divert $2.3 million from its research budget to a planning grant to the university for a science facility that will include "chemical physics, materials science, computer science, high-energy physics, geothermal energy research, laser technology, and biotechnology."

When a House-Senate conference committee ironed out differences between the two versions of the bill, it ended up approving both projects. It agreed to the full $7 million voted by the House for Florida State, and directed DOE not only to provide the planning grant to the University of Oregon but also to include funds for construction in next year's budget request.

Funds for the Catholic and Columbia facilities were added to last year's budget through pork-barrel amendments first proposed on the floor of the House. DOE did not request additional funds for fiscal year 1985, however, because it had not received proposals from the two universities by the time the budget was put together. The House and Senate decided to provide the money anyway. The $8.9 million approved for Catholic University should be enough to complete the facility; some $12 million more will be needed to finish Columbia's center.

In contrast to the generous treatment of these university projects, Congress has cut $9 million from the $49.7 million budget proposed for basic research in nuclear science and $7 million from the $141 million proposed for materials science. DOE officials are currently deciding where the cuts will be made, but some university labs are bracing for hard times.

For example, the Stanford Synchrotron Radiation Laboratory, which was planning for a 20 percent increase in operating funds, from $7.5 to $9 million, could end up with a cut of $1.1 million, according to a memorandum written by lab director Arthur Bienenstock.

In addition to shifting funds around in basic energy sciences, the bill also slashes $43 million from the budget requested for fusion research. This cut, which amounts to almost 10 percent, will require some rethinking of the program (*Science*, 22 June, p. 1322). Indeed, the congressional report accompanying the budget bill directs DOE to seek international collaboration and financial participation in future large-scale research devices and demands that a new management plan be drawn up.—**COLIN NORMAN**