

## SSC Sites: Then There Were Eight

*A National Academy of Sciences committee has selected eight states as leading candidates for the Superconducting Super Collider, but DOE is under pressure to restore others to the list*

FIRST there were 43, then 36, and now just 8 candidate sites remain for the proposed Superconducting Super Collider (SSC). Arizona, Colorado, Illinois, Michigan, New York, North Carolina, Tennessee, and Texas have been selected by a committee of the National Research Council\* as the best locations for the \$5.3-billion particle collider. The committee made its selection from 36 site proposals, backed by truckloads of supporting documents, that the Department of Energy (DOE) asked it to review.

Not surprisingly, the choice has proved controversial. At least four states—California, Ohio, Mississippi, and Nevada—are lodging protests with Energy Secretary John Herrington, claiming that they should not have been cut. Herrington is reviewing the committee's recommendations and will announce a list of finalists next week.

At stake for these and other states is a last shot at securing a project that will bring long-term economic growth to the area where it is located. At its peak, the construction of the collider will require a work force of 4500. Once in operation, the laboratory will employ about 2500 and have an annual operating budget of \$270 million.

Thus, it is not unexpected that some states are unhappy with the decisions of the academy's Super Collider Site Evaluation Committee. But Christopher M. Coburn, science and technology adviser to Ohio Governor Richard Celeste, contends that the academy's 62-page report supporting its selection is itself deficient. "I find no comfort in this document," says Coburn, noting that it is hard to discern why the Michigan site, for example, was deemed superior to Ohio's. The site selection decisions, he argues, "have to be explainable and rational—and if they are not, then I think the future of the SSC is in question."

Ohio is not the only state that wants a clearer explanation of why they did not make the grade. David Murphree, coordina-

tor of Mississippi's SSC group, contends that his state is a victim of regional and elitist bias. "It appears like it is just the peer system taking care of their own," he says, vowing to take the state's case to Congress, if not to the courts.

From a political standpoint, lobbyists say privately, the academy's list poses some problems. The exclusion of Mississippi from the contest may have offended some key legislators—Senator John C. Stennis (D-MS), chairman of the Senate Appropriations Committee; Representative Jamie L. Whitten (D-MS), chairman of the House Appropriations Committee; and Representative Tom Bevill (D-AL), chairman of the

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subcommittee on energy and water development. Without their support the project is unlikely to be funded soon. Likewise, the failure of California, which has 45 voting members in the House, to make the academy's list could hurt the SSC, lobbyists say.

In July, DOE is scheduled to pick a single, preferred site for the 52-mile, racetrack-shaped SSC. A final site decision is to be made in January 1989, following completion of an environmental impact statement. Whether the project actually goes forward then will depend on Congress. The Administration had planned to request \$348 million for fiscal year 1989, but now is expected to cut that back to about \$100 million to help contain the federal budget deficit.

With fewer states vying for the project, however, it is not clear that the SSC will continue to command a high level of support in Congress. In recent action on the fiscal year 1988 budget, Congress appropriated \$25 million for research and site selection work, but declined to provide \$10 million for construction-related activities.

The academy committee was not bound

to limit its list to 8 locations. DOE, however, had indicated that it wanted the 21-member review panel to identify a relatively small group of best qualified sites. Still, the selection process spelled out a year ago leaves open the possibility for Herrington to amend the academy's choices. The process calls for DOE to review the academy's action and issue an official list next week.

But a decision to add states to the list could be create as many political problems as it solves. Not only may finalists object, but the action could adversely affect public perception about the integrity and fairness of the federal government's efforts to select the best site for the collider.

"I think the project could die if that happened," comments Roy F. Schwitters, a Harvard particle physicist who served on the academy's site selection committee. Schwitters contends that the academy site selection process was apolitical.

"We got into all the [political] questions [about effects of not choosing a particular state]," but that did not influence the outcome, he says. Indeed, Victoria J. Tschinkel, a Florida attorney who served on the academy committee, says panel members chose to ignore the political issues. "We decided that that was not our problem."

Schwitters says the committee arrived at 8 sites as a result of an "up and down" vote. "If it were political," he notes, "there would be different states on that list."

While the losers in the SSC sweepstakes may not be able to argue that politics affected the academy's selections, they question whether the panel had adequate time to review the 36 proposals. "At minimum, they should have given [the academy] 3 more months to evaluate the applications," says Martin D. Franks, vice president of Charles Walker Associates, Inc., a Washington lobbying firm retained by Ohio.

Each member of the academy's 21 panel members received an estimated 750 pounds of proposals to wade through over a 3-month period. The reviewers undertook the task on a voluntary basis without compensation, but were reimbursed for expenses, says Raphael G. Kasper, staff director for the site selection committee.

The task was difficult, says Schwitters,

\**Siting the Superconducting Super Collider*, National Academy Press, 1988. Copies are available from the Super Collider Site Evaluation Committee, National Research Council, 2101 Constitution Avenue, N.W., Washington, DC, 20418.

# Shuttle Setback

On 29 December, just one day before the shuttle's redesigned booster rocket was to leave a plant in Utah for shipment to the launch pad in Florida, engineers discovered a critical flaw in the nozzle. Now the rocket motor must be torn down and analyzed, a process that will take "a couple of weeks," according to officials of the National Aeronautics and Space Administration (NASA). Because the shuttle is running on a very tight schedule again, the problem immediately triggered a delay of the next launch, which was set for 2 June.

The extent of the delay is not known as yet. Dom Amatore of the Marshall Space Flight Center in Huntsville, Alabama, says it could last "several months." Too little is known about the problem to make a firm prediction.

Meanwhile, the manufacturer, Morton Thiokol of Brigham City, Utah, hopes to put the situation in the best light. "It's not a safety-of-flight issue," says Rocky Raab, a company spokesman. "An in-flight failure would not have been detected until afterwards, as it was in this case," he says, referring to the fact that a week passed between a test firing of the rocket on 23 December and the discovery that the "outer boot ring" on the nozzle had failed.

The outer boot ring is a flexible strip of carbon material that surrounds the nozzle attachment area inside the rocket cylinder. It is a barrier against the burning gases produced during ignition. Its purpose is to protect a swivel gear that can move the nozzle a few degrees and steer the vehicle on takeoff. Like other parts of the nozzle, the boot ring has caused some concern in the past. According to one engineer, Thiokol found that the boot ring had worn unevenly on earlier shuttle flights, and, for this reason, took advantage of the hiatus in shuttle flights to refashion the part. A new design was included in the first full-scale test of the rocket on 30 August, with great success. A different design was used in the December test.

Thiokol initially judged the recent test a success, but when technicians climbed into the empty rocket several days later they discovered that a four-foot section of the boot ring was missing. A piece more than a foot long was found lying inside the rocket.

According to NASA officials, this test may have put an unusual strain on the boot ring. The nozzle was pointed seven degrees off center, stretching the boot ring to the maximum extent—further than in any other test and further than in a normal launch. Whether or not this caused the failure is not known.

On the same day the nozzle failure was disclosed, Morton Thiokol was hit with another disaster. Five workers were burned to death at a plant near Promontory, Utah, where the first stage of an Air Force MX missile was being assembled. Although the investigation has just begun, early reports indicate that the rocket fuel in the bottom of the missile ignited as workers were removing a mold from the center. (The fuel for solid rockets is poured and then allowed to set like Jello.) Workers may have created an electrostatic spark as they removed the mold.

NASA immediately halted the assembly of shuttle rocket segments pending an investigation of the MX accident. Although the MX and the shuttle boosters use slightly different fuels, the assembly process is similar enough to cause concern. One NASA official says the impact of the MX disaster is a "moot point" because the nozzle problem has already delayed the next launch. But other observers say that if the MX accident investigation finds anything other than a careless mistake, it may be necessary to make changes in Thiokol's rocket assembly process—a potential cause of delay.

According to Raab, Thiokol has stopped pouring rocket fuel for the moment. The shuttle booster segments that have already been unmolded and readied for shipping will be sent to Florida right away, except for two that include the nozzles. These will be held until a decision is made on what to do next. According to NASA, it may be possible to replace the failed boot ring with the design that worked successfully in last August's test. But if it becomes necessary to redesign and test this part, the shuttle may be on the sidelines longer than expected.

The crowded manifest for the shuttle issued by NASA last October thus becomes somewhat tighter. NASA may have to postpone or sacrifice important scientific payloads once again, and one space scientist expects to see "more blood on the floor before long." ■ **ELIOT MARSHALL**

who was teaching a course last semester and who also commutes weekly to Fermi National Accelerator Laboratory. There was "no way" that committee members could read each site proposal completely, he says. "Everybody read the introductory chapters," he adds, and then focused on particular chapters in their areas of specialization.

The academy committee was broken down into seven working groups covering issues such as geology and tunneling, costs, environment, and regional infrastructure. Committee members did not have time to check the accuracy of the proposals. Tschinkel says that committee members had to accept state data at face value.

No single numerical evaluation was used to drive decisions because of the complexity of the undertaking, but various rating methods were employed to guide committee deliberations, the academy says. None of these statistical exercises appear in the academy's decision document. Nor is there any presentation of DOE's cost estimates for constructing and operating the SSC over a 30-year period at various sites. Life-cycle costs, academy officials say, varied only a few percent between sites. The economic evaluations of proposed sites were performed for the committee by a DOE contractor.

The academy group offers no specific explanations for excluding sites from its list. "The very nature of this process," says the panel report, "does not permit determination of the extent to which any specific factor or combination of factors influenced how individual judgments were formed." Edward A. Frieman, the chairman of the selection committee, has asked members not to talk about losing proposals.

The committee report does indicate, however, that many states were knocked out on the basis of geological factors and regional resources, the first and second most important items on DOE's list of site selection criteria.

Schwitters says he can understand some states being upset. "These states put in a tremendous effort. Their proposals were really good." He says that evaluations of site proposals might have been more thorough if DOE had allotted more time. Site visits, which DOE prohibited, might have altered the final list, he adds. The committee, in fact, notes in its report that site visits would have been useful.

Nevertheless, Schwitters and Tschinkel say the panel's decisions were impartial. "I was satisfied that the level of information was sufficient for us to make good decisions," says Tschinkel. What remains to be seen, she notes, is whether Congress will perceive the academy's recommendations as being fair. ■ **MARK CRAWFORD**