OTA to NASA: Accidents Will Happen

Even as Congress wonders how it is supposed to pay for the National Aeronautics and Space Administration's (NASA's) $16-billion space station—not to mention President Bush's $400-billion vision of manned lunar bases and expeditions to Mars—the Congressional Office of Technology Assessment (OTA) has delivered a not-so-gentle reminder: the price of continued human activity in space will be more than just money. Inevitably, more space shuttles will be lost and more astronauts will die.

"If the United States wishes to send people into space on a routine basis," declares the OTA's newly released report on human space flight,* "[the Nation] will have to accept the likelihood that loss of life will occur."

The mathematics are ineluctable, the report points out. Suppose, for example, that NASA is correct when it says that the shuttle is 98% reliable. That works out to a 50–50 chance of losing an orbiter during the next 34 flights. Carrying the calculations a few steps further, that means a 72% chance of losing an orbiter before the first space station assembly flight (flight 92) and an 88% chance of losing an orbiter before the station is finally completed (flight 134).

If NASA could guarantee 99% reliability, the odds against loss of life improve considerably. But that's a big step. Including the Challenger disaster, the shuttle's overall success rate on the 30 launches to date is 96.67%. The agency contends that its post-Challenger fixes have made the shuttle substantially safer than it was, but by just how much is difficult, if not impossible, to say.

So piloted flights will always have risks. "If such risks are perceived to be too high," says the report, "the Nation may decide to reduce its emphasis on placing humans in space."

That message seems to be resonating strongly on Capitol Hill, where the space subcommittees have long been urging NASA to minimize the shuttle launch rate as a matter of simple prudence. Just recently, in fact, the House of Representatives passed an amendment to the agency's 1990 authorization act that prohibits NASA from using the shuttle to launch satellites, or to do anything else that does not absolutely require human presence, unless the NASA administrator explains why in writing.

"We need to shift our view," says one congressional insider. "The shuttle should not be a truck, but a manned platform"—and one to be used sparingly. Politically and economically, he says, the country simply cannot sustain a space program that destroys an orbiter and kills a crew every 3 years or so.

In fairness, NASA's post-Challenger flight plan does call for flying many of its former shuttle payloads on expendable rockets. But OTA points out that if and when the agency starts building its space station in the mid-1990s, the shuttle goes right back to being a truck: the current construction timetable calls for eight flights per year for several years just to haul the pieces up and put them together, and then about five flight per year to keep the station resupplied.

With that kind of schedule, even the nonfatal loss of another shuttle orbiter could be disastrous. "It doesn't have to be this horrible explosion-type thing that occurred," said Representative Bill Nelson (D–FL), chairman of the House Space Science Subcommittee, at a news conference marking the release of the OTA report. "It could be the complete elimination of an orbiter in a mistake made in preparation, a crane drops something on the fuselage and it is suddenly out of commission for 2 or 3 years."

With just such possibilities in mind, the OTA devotes the bulk of its report to analyzing the prospects for more robust and reliable human-carrying launch systems, as well as unpiloted launch vehicles. But the bottom line is that like flying on an airplane, space travel has a certain risk, and there's just no getting around that.

■ M. MITCHELL WALDROP

*"Round Trip to Orbit: Human Spaceflight Alternatives," Office of Technology Assessment, Washington, D.C., 2 August 1989.

Wanted: $25 Million for Mouse House

At a time when decrying pork-barrel politics in science is popular, the Jackson Laboratory's attempt to win congressional support for a special $25-million appropriation may be the exception to the rule.

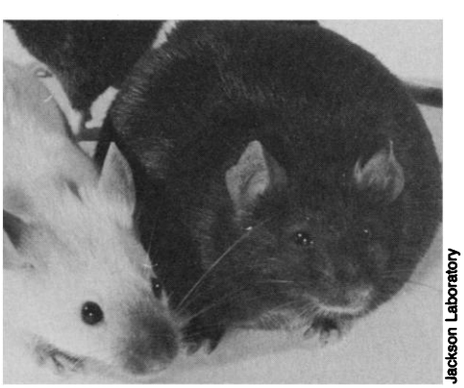
Three months ago fire swept through the lab's giant mouse house, leaving scientists nationwide bereft of the inbred and mutant mice that are the stock-in-trade of biomedical research (*Science*, 19 May, p. 767). The devastating conflagration consumed 500,000 research animals and wiped out the lab's production building. For researchers who count on weekly shipments of JAX mice it was a real blow. The National Institutes of Health alone uses 117 types of JAX mice. "This loss is currently creating very serious problems for research scientists all over the world," said James B. Wyngaarden, then director of NIH.

Fortunately none of the lab's foundation stocks, or the mice that Jackson scientists were using in their own research, were lost. The mouse colony can be repopulated but it will take time.

Several foundations have come forward with donations—notably the Howard Hughes Medical Institute with three quarters of a million dollars—and so far $1.2 million has been collected. But it is not nearly enough. The total cost of rebuilding is likely to be $40 million. Laboratory director Kenneth Paigen estimates that "it would take years" to rebuild with private donations.

With only $9 million in insurance, Jackson lab director Paigen has turned to Congress for help. This month, Democrat George J. Mitchell of Maine, who luckily happens to be majority leader of the Senate, introduced a special bill providing $25 million to make sure the country's supply of rare mice is restored. Reflecting what may be a new congressional reluctance to go in for earmarking for scientific facilties, Mitchell's bill says $25 million should be awarded through a "competitive application process." "If another laboratory can gear up better and faster than Jackson, they have a chance at these funds," Mitchell says. Although no one expects that the Jackson lab will have any serious competition, the tone of the bill rejects what could be called traditional "pork-barrel" politics.

The Mitchell bill, which has the backing of both Democratic senator Edward M. Kennedy and Republican senator Orrin G. Hatch of the Committee on Labor and Human Resources, has passed in the Senate,



Jackson Laboratory

Depleted resource. *Genetically valuable mice, such as this obese mutant, are in short supply since the fire.*

and the House is expected to take it up in September when Congress returns to Washington after its summer vacation.

What are the Mitchell bill's chances? Paigen is optimistic that Congress will see the bill as good for science overall. "The lab," he says, "has got to be viewed as a national resource." And that's just how he has been pitching his plea for $25 million in recent meetings with one member of Congress after another. Paigen the mouse geneticist has become Paigen the lobbyist and crusader. "Of course, rebuilding the mouse production facility is vital to the lab," he says, "but I also think it's vital to the country, so when I go to Congress I wear two hats—one as head of JAX, the other as a mouse researcher who has depended on its mice all these years."

To make his point, Paigen cites a hip-pocket survey he's completed. "We surveyed 19 genetics journals over the past 6 months," he said. "There were 431 papers reporting studies of inbred mice. Two hundred ninety-three of them used JAX mice, with an average of nine different kinds of JAX mice *per* paper. I was astonished."

He probably shouldn't have been. The lab produces about 1700 different kinds of mice in all—including fat mice for the study of obesity, "NOD" who has diabetes, "twitcher" who gets a form of inherited diseases that includes Tay-Sachs, the "nude" mouse who has no thymus and, therefore, no immune system, and a little creature called "cocoa" who has a blood clotting disorder.

With all this going for him, Paigen has chosen not to seek the services of one of Washington's fancy lobbying firms—Cassidy and Associates, for example, which has a reputation for getting money for research institutions by bypassing the normal channels of grant application and peer review. "We thought about it," Paigen told *Science* in July, "but decided that was not the way to go. We went directly to Senator Mitchell and our Maine congressmen, who have been very supportive." Not surprising: with some 200 employees when it is at full strength (nearly half were laid off after the fire), the Jackson lab is the second largest employer in eastern Maine's Hancock County.

Paigen's decision to be his own lobbyist now seems prescient. Senate appropriation chairman Robert C. Byrd (D–WV) this month actually blocked an earmarked grant to West Virginia University after he learned that the university had paid Cassidy and Associates to lobby for it (see page 705).

So mouse-researcher-turned-lobbyist Paigen will battle on into the fall, trying to secure every congressman's vote he can. If the House goes along with the Senate and the Jackson lab wins the $25 million to rebuild its mouse production facilities, Paigen estimates that it will be 2 years before things are back to normal, with worldwide distribution of 2 to 3 million mice per year, up from its present distribution of some 15,000 animals a week.

That will be satisfying to Paigen, but it's a far cry from what he's imagined when he first left the University of California at Berkeley this spring to head the Jackson lab. Then, he had visions of expanding its scientific staff of 20. He dreamed of building a new research facility and of attracting numbers of young scientists to Maine's Mt. Desert Island, a fabulous summer retreat that reverts to a kind of monastic isolation the rest of the year. But the fire changed the priorities and research expansion has to take second place for now.

■ BARBARA J. CULLITON

Strasbourg Home for Frontiers

London

The search for a European home for Japan's international megaproject—the Human Frontiers Science Program—touched off a multinational tug-of-war over which country would get the geopolitical plum. In the end, after months of hard-fought negotiations, Strasbourg has emerged as the consensus choice to house the program once described as "the biggest ever international collaborative program in the biological sciences."

Japan first proposed the Human Frontiers program 5 years ago at a summit meeting of the world's seven largest Western nations. Its motives were twofold: Japan hoped to assuage constant criticism that it does too little to support basic research, and as a strictly peaceful project, Human Frontiers was viewed by government officials as a symbolic response to the United States' request for international research cooperation on a military project, the Strategic Defense Initiative.

As originally conceived, Human Frontiers was to be a vast program examining all aspects of the biological basis of human functioning and behavior. But budget pressures and skepticism about the scope of the undertaking has resulted in a scaled-down program that will focus mainly on molecular biology and brain research.

After seeking, with little success, financial support from other nations, the Japanese government finally agreed to foot most of the bill—$17.5 million is allocated for its 1989 budget. But this still left a quandary: where to house the Human Frontier's secretariat?

Last year Britain's Medical Research Council offered to locate the headquarters near its own offices in London as part of an in-kind contribution to the program by the United Kingdom. That raised the hackles of some of the French scientists who had played an active part in Japan's plans for the program. French President Francois Mitterrand reacted similarly, reportedly ordering a French candidate site to be put forward as soon as he learned of the British offer.

Strasbourg became that site for several reasons: it was already home to a number of important biological research laboratories, and it is just across the West German border, helping to win Germany's political support. And then there was the financial angle: the city of Strasbourg had offered to make a substantial contribution toward the costs of running the program.

There was even a purely domestic reason for choosing Strasbourg: the French government was anxious to make amends for failing to secure the new European Synchrotron Radiation Facility for Strasbourg as promised.

But Strasbourg won no cheers from Britain. Not easy to get to, they cried, a complaint echoed in Washington. Rome was mentioned as a compromise, but that idea went nowhere. Then France sweetened the deal, offering to put up 8.5 million francs ($1.3 million) a year for 3 years.

After a meeting in Berlin last month a combination of Gallic fever and geopolitical horse-trading won the day for France. Thanks in particular to pressure from the United States, the program participants agreed to a detailed agreement on intellectual property rights. There are also rumors that to sooth ruffled feathers in London over losing headquarters, a British candidate may be chosen as first secretary-general of the Frontiers program. London has already been chosen as the European base of the Human Genome Organization.

Having solved the headquarters problem, the Frontiers program can concentrate on its main mission: sponsoring international seminars, scientific exchanges, and joint research projects, all from its home near the Rhine. ■ DAVID DICKSON