ATMOSPHERIC RESEARCH

NSF Draws Up Plans For $70 Million Plane

A new $70 million jet designed to probe Earth's upper atmosphere has been cleared for a budgetary takeoff by the policy-making body of the National Science Foundation (NSF). Last month's approval by the National Science Board puts the new plane in line for inclusion in the agency's fiscal year 2000 budget request, to be submitted later this month to the White House.

Backers of the project say the aircraft, called the High-Performance Instrumented Airborne Platform for Environmental Research (HIAPER), will provide much-needed capability to explore the tropopause, the area between the upper and lower atmospheres that features a vital exchange of solar energy and contains the tops of thunderstorms and hurricanes. Little is known about this key region, says Ron Phillipsborn, a commander in the National Oceanic and Atmospheric Administration (NOAA) corps. "It's like the dark side of the moon."

But some scientists worry that the cost of outfitting and operating the aircraft could drain money from smaller, university-based research programs, as well as from important upgrades to existing platforms. "I'd like to see more money put into low-altitude aircraft," says Judy Curry, a professor of aerospace and atmospheric sciences at the University of Colorado, Boulder, who has flown on both low- and high-altitude planes. She and others worry that NSF will concentrate resources on HIAPER to the detriment of other low-altitude craft operated by the National Center for Atmospheric Research (NCAR) in Boulder, which is also expected to manage HIAPER.

The idea for HIAPER grew out of a series of workshops on U.S. experimental aircraft capabilities. Scientists complained that the existing NCAR planes could not carry heavy equipment at high altitudes nor fly in icy cloud conditions or through most violent storms. They asked for a sophisticated high-altitude aircraft that could perform these tasks and more. NSF's answer, nearly a decade later, is HIAPER.

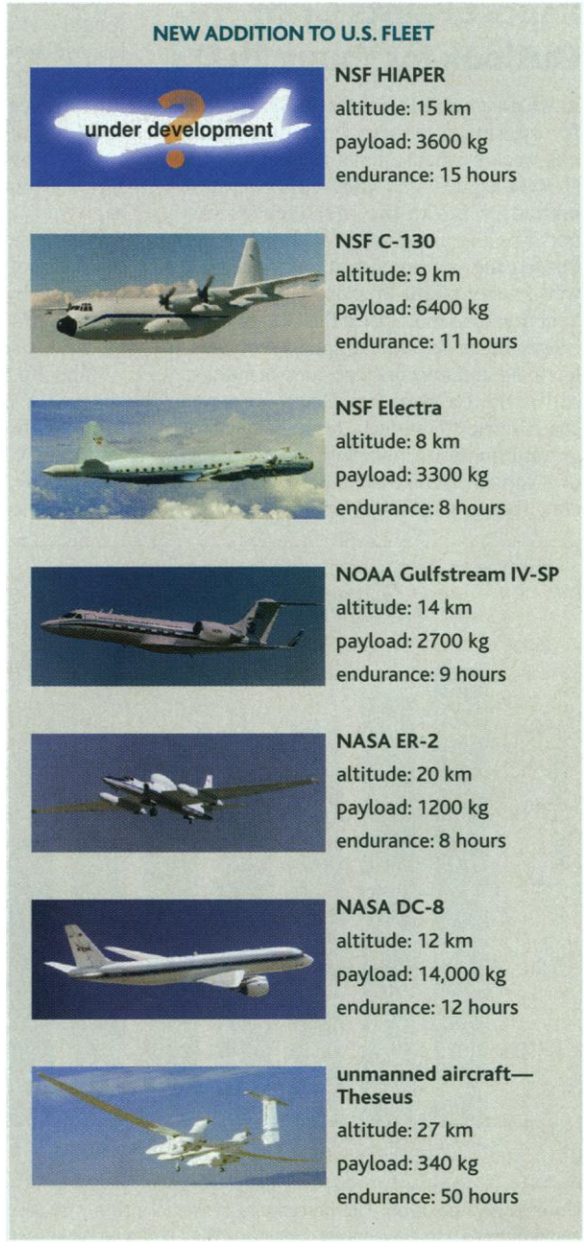
A modification of a top-of-the-line corporate jet, HIAPER would offer a total package not available in a single existing aircraft. "I think it's fantastic," says Naomi Surgi, mission manager of NOAA's weather services. "NSF can benefit tremendously from this kind of platform." NCAR's stable includes a 30-year-old Lockheed Electra owned by NSF and a newer, leased C-130. HIAPER would be able to fly almost twice as high, for almost twice as long, as the Electra, which is scheduled to be retired from service in 2005 if HIAPER takes off. The proposed jet is also much more powerful than the C-130 (see chart). Among other agencies, NASA's high-altitude jets are already heavily oversubscribed, while NOAA's new Gulfstream must be available when needed for hurricane study. That means a scientist flying a mission between June and November could be forced to abandon a research project suddenly if a major storm developed.

The projected costs of HIAPER are causing some concern, however. A proposal to seek more than half the money in the first year of a 4-year construction cycle must first earn a spot in a special account for new research facilities that is part of NSF's upcoming budget submission. If the project is funded, NSF estimates annual operating costs at $3 million, the same level as the Electra's. "We do not expect to have any [cost] surprises," says Cliff Jacobs, whose section oversees NCAR, which receives about 65% of its $80 million annual budget from NSF.

Still, says Curry, "people shouldn't have their blinders on as to how much this is going to cost." Joined by other academic and NOAA scientists, Curry wonders if NCAR can afford the additional personnel and instrumentation that HIAPER will require. And although many researchers welcome the idea of having access to a more capable plane, they nevertheless say that NSF is flying into uncharted skies. "There's not a lot of experience" in maintaining a research jet of this caliber, says Michael Rodgers of the Air Quality Lab, part of the School of Engineering at Georgia Institute of Technology in Atlanta, making any cost estimates unreliable. Whether NCAR will manage to operate HIAPER without diverting staff and funds from other projects, he says, remains to be seen.

A bigger problem than routine maintenance is the cost of making full use of HIAPER's capabilities. NSF has budgeted only about $100,000 a year for upgrades to the aircraft, but some scientists say the figure could soar far higher if several new instruments were to be purchased and the airframe modified to accommodate them. "An experimental airplane has to keep evolving," says meteorologist Ed Eloranta of the University of Wisconsin, Madison.

Despite those issues, the science board had no qualms about approving the request at its August meeting. "This was a relatively clean item," says recently retired board member John Hopcroft, dean of engineering at Cornell University, who led a review of the proposal. He said the board was convinced that the plane would require few modifications to the initial package of Doppler radar, air-probing sensors, spec-



On top. NSF says HIAPER would give scientists a unique high-altitude platform.

(BOTTOM TO TOP) BOTTOM THREE: NASA DRYDEN; GULFSTREAM AIRCRAFT INC.; BOB BUMPAS/NCAR; CARLYE CALVIN/NCAR

trometers, and other equipment to be installed. HIAPER's price tag, he added, represents only a tiny slice of NSF's annual $3.5 billion budget. And NSF has reviewed its cost projections for HIAPER with officials from the Air Force and NOAA, says Jacobs.

NCAR officials are also confident they can handle HIAPER, which they see as the inevitable next step for atmospheric research. "Scientists want to go higher, further, and stay up longer," says Warren Johnson, assistant director of NCAR's Atmospheric Technology Division. "We believe it's time for a high-performance jet aircraft."

–JENNIFER COUZIN

CAREERS IN SCIENCE

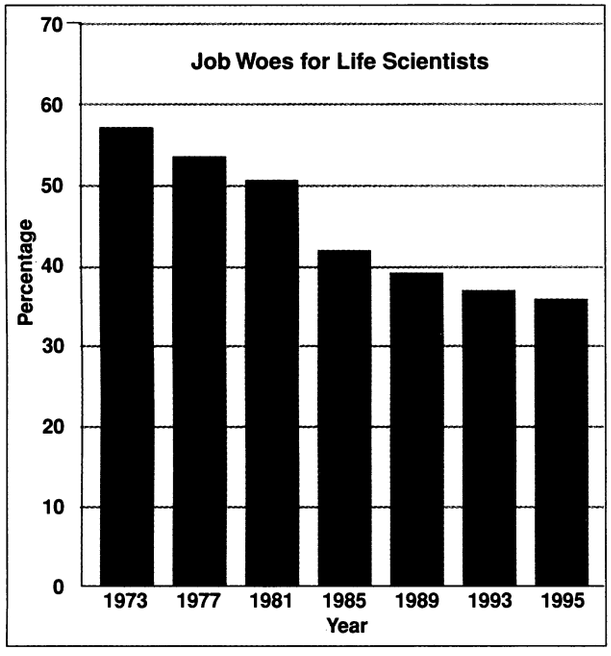
Report Paints Grim Outlook for Young Ph.D.s

In what surely will make depressing reading for aspiring researchers, a report released this week by the National Research Council (NRC) argues that the supply of newly minted Ph.D.s in the life sciences vastly outstrips the availability of desirable jobs. Putting the imprimatur of authority on the well-known plight of those laboring in the trenches, the report states that young life scientists these days are trapped for years in low-paid and transitory postdoc positions. "I call it the La Guardia effect," says panel chair Shirley Tilghman, a molecular biologist at Princeton University. She has a vision of "a lot of trained scientists who are circling, burning up very important and useful fuel, and waiting for their turn to land."

Every young life scientist knows colleagues who have struggled to find jobs, and the report* sees no reason to expect that the hard times will soon come to an end. "There is no sign in the data that this [problem] is going to peak," says Tilghman. So the panel recommends a painful remedy: To trim the swelling Ph.D. ranks, it calls on universities to freeze the size of their programs and to develop no new ones "except under rare and special circumstances, such as a program to serve an emerging field or to encourage the education of members of underrepresented minority groups."

The current Ph.D. glut appears to have begun building about a decade ago. Until 1987, the number of new Ph.D.s in the life sciences increased at an annual rate of roughly 1%. Since then, however, the rate has averaged about 4% a year, climbing to 5.1% in 1996. Overall, the number of new life sciences Ph.D.s has grown from 5399 in 1987 to 7696 in 1996, a 42% increase. If such a growth rate is sustained, the report says, the number of new life sciences Ph.D.s each year could double in just 14 years. Swelling the ranks "could adversely affect the future of the research enterprise," the report says, by breeding "destructive" competition and suppressing scientific creativity by causing scientists to play it safe.

The Ph.D. surge has already deeply chilled job prospects for today's grads. The proportion of Ph.D.s holding permanent jobs 5 or 6 years out has decreased from 89% in 1973 to 62% in 1995. "The average life scientist [nowadays] is likely to be 35 to 40 years old before obtaining his or her first permanent job," says the report. As a result, morale is sagging: "The feelings of disappointment, frustration, and even despair are palpable in the laboratories of academic centers."



SOURCE: NRC

Untenurable position. The percentage of life scientists with faculty appointments 9 to 10 years after receiving their Ph.D.s has plummeted.

The report takes a dim view of alternative careers as a means to ease the plight of young life scientists. Competition for science-related jobs in law, journalism, business, or precollege teaching is stiff and the pay is often low, the panel states. "I wish I had a dollar from every graduate student who said they wanted to be a science writer," says Tilghman. Says the report: "Our analysis suggests that opportunities in these fields might not be as numerous or as attractive as advocates of alternative careers imply."

Instead, the NRC panel advocates some old-fashioned belt-tightening. It recommends that federal agencies take greater control over the number of Ph.D. students by supporting graduate study through training grants and individual fellowships, rather than through research grants. Limiting the number of grad students a principal investigator can hire could help constrict the pipeline, Tilghman explains. The panel also recommends that the government subsidize "career transition" grants so some postdocs can set up their own research projects even before they have obtained permanent posts. The Ph.D. degree itself, the committee affirms, should neither be diluted nor redesigned: It should "remain a research-intensive degree, with the current primary purpose of training future independent scientists."

–CONSTANCE HOLDEN

* Trends in the Early Careers of Life Scientists, available at www.nas.edu

CRYSTALLOGRAPHY

Transfer of Protein Data Bank Sparks Concern

On 19 August, structural biologist Joel Sussman got a call no manager wants to receive: A federal official phoned to say that funding will soon be withdrawn from the Protein Data Bank (PDB), a catalog of molecular images and structural data Sussman runs at the Brookhaven National Laboratory on Long Island, New York. The National Science Foundation (NSF), he was informed, has decided to shift the contract for managing the database to Rutgers University in New Brunswick, New Jersey. As news of the decision—agreed to by PDB's other sponsors, the National Institutes of Health and the Department of Energy—began to filter out last week, it kicked up a ruckus among crystallographers. As one of them says: "We feel it was done behind our backs." Some want the decision reviewed.

The contract at the center of this tussle is small, about $2 million per year. But as Sussman says, its impact has been "huge." Thousands tap into the database daily via the Internet, logging 1.5 billion hits per year. (Some journals, including *Science*, require that crystal structures be deposited in the PDB at the time of publication.) Sussman, who also holds a half-time appointment at the Weizmann Institute of Science in Rehovot, Israel, says he was "surprised" and "shocked" by the decision to yank funding for PDB, which he views as "an international resource held in trust" by Brookhaven. He claims that Brookhaven has sharply im-