Rebuilding NASA's labs

Washington

OVER the past decade, while the National Aeronautics and Space Administration (NASA) was staggering under a series of debilitating technical and management failures, its research quality appears to have suffered as well. From the mid-1970s to the mid-1980s, overall NASA research citations dropped from above to below average in their fields, according to a new study by the Philadelphia-based Institute for Scientific Information (ISI).

Of NASA's eight largest laboratories, half saw a fall in citation levels from the 1970s to the 1980s. Some others remained solidly mediocre, consistently producing papers that earned fewer citations than other papers in the journals in which they were published. Overall, NASA research declined 10 per cent during the first half of the 1980s, according to the ISI study, which will be published in *Science Watch* later this month.

But among the sobering statistics, one NASA facility — the Jet Propulsion Laboratory (JPL) — showed a consistent improvement over the decade. That JPL is the only NASA laboratory to be run by a university, rather than the space agency itself, may suggest how NASA can best rebuild its research structure in line with the conclusions of the Augustine panel, commissioned by the White House, which released a preliminary report last week (see *Nature* 348, 569; 13 December 1990). Among its recommendations, the Augustine panel suggested that NASA begin the gradual conversion of some of its centres to become university-affiliated laboratories like JPL, as part of the process of refocusing the space agency's priorities back on science.

The problem with NASA's research, as the Augustine panel saw it, is that its researchers are civil servants, who have neither the responsibilities nor the incentives of university scientists. "The personnel policies embodied by the civil service system are, in the opinion of the Committee, hopelessly incompatible with the long-term maintenance of a leading-edge, aggressive, confident and able work force of technical specialists", the report concludes.

JPL researchers, on the other hand, work for the California Institute of Technology, not NASA directly. When the newly formed space agency adopted JPL in 1958, it agreed to pay CalTech a fee to run the laboratory. As a result, JPL's 7,000 researchers and technicians retain many of the employment perks of university researchers. Perhaps more importantly, they also know they can be dismissed if their performance is below par. At JPL there are no unions and few of the job protections that make dismissals so

difficult in the civil service.

While the rest of NASA was in the throes of its post-Apollo slump, research quality at JPL improved by more than 15 per cent, according to ISI analyst David Pendlebury.

Much of JPL's research success is due to its operation of the Voyager series of planetary probes, which surpassed all expectations in more than a decade of exploration. Similarly, some of the decline in research quality at other NASA laboratories is no doubt due to the shortage of

Impact of NASA articles with and without Voyager papers. The years indicate the year of publication and the following 4 years during which citations were counted. Citation per NASA paper relative to average citation per NASA journal paper.

good missions; the Challenger space shuttle accident and budgetary cutbacks conspired to keep NASA from launching a major mission for nearly a decade after the Voyager series. During that dry period, NASA laboratories such as the Johnson Space Center, which had scored impressive citation rates from its studies of the lunar samples returned by Apollo, floundered.

But in the view of the Augustine panel, management issues were at least partially responsible for JPL's success, as well as the sluggish performance elsewhere in NASA. The panel suggested first that the government reform its regulations to exempt researchers from the salary caps and other restrictions of the civil service. Should that prove difficult, NASA should try to put at least 10 per cent of its own employees under a specially tailored system to encourage scientific quality, the panel said.

Both of those suggestions have been raised before, but are generally considered to be politically unacceptable.

The third possibility — converting more NASA laboratories to fit the JPL mould — is more likely to get a sympathetic ear. But would more university-operated laboratories turn NASA's research decline around? Former JPL director Bruce Murray is sceptical. The laboratories that are best suited for university management are the ones in least need of improvement, he says. The Ames Research Center has ties to nearby Stanford University that could be ex-

panded and the Goddard Space Flight Center could be operated by the Johns Hopkins University, which already runs the Defense Department's Applied Physics Laboratory. But both Goddard and Ames have remained relatively steady in research quality in recent years. "You'd be fixing the labs that have the least need to be fixed", Murray says.

On the other hand, the weakest research centres on the citation criterion — Johnson and the Kennedy Space Flight Center, where NASA does much of its space medicine research — are large facilities where science takes a back seat to the design and construction of spacecraft. The probable incentive for a university or consortium of universities to take over such a centre would be profit, rather than prestige or research ties.

A more likely scenario, Murray says, would be for NASA to turn some of its laboratories over to private contractors, as the Department of Energy has with some of its national laboratories. That would permit industry-like management policies without requiring the unlikely reforms of the civil service that were recommended by the Augustine panel.

Even that change may prove difficult, however. Another concern expressed by the Augustine panel was that NASA headquarters appears to have lost control of its centres, allowing research overlap and a general blurring of focus. Contractor-run centres would probably be even stronger and more independent, notes John Pike, space policy analyst for the Federation of American Scientists. "NASA is a collection of spare parts flying in close formation, rather than a complete airplane", he says. "If you turn the field centres over to the contractors, that could just make the situation worse." He suggests increasing the number of political appointments at NASA headquarters as a means of giving the agency more clout — perhaps enough to rope in even contractor-run centres.

In the cold light of the statistics documenting a research decline, increasing congressional pressure for reform, and now the hard-hitting Augustine report, NASA would appear to be poised on the verge of a major restructuring programme.

But long-time observers warn that the most likely immediate action may be no substantial action at all. NASA has so far dismissed most of its failures as the result of congressional or White House meddling, or of past problems now fixed.

Accepting the need for fundamental change could take something as drastic as yet another disaster. "This is just a stage in a growing crisis, not the end", says one former NASA official.

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