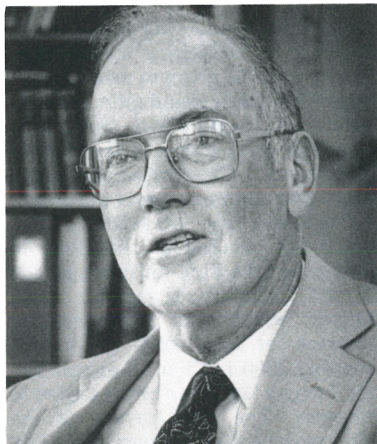


DOES 1992 MARK THE END OF AN ERA FOR DOE'S CROWN JEWELS OF PHYSICS?

When Sir Winston Churchill became prime minister for the second time, in 1951, many of Britain's colonies were seeking to go the way of India, which achieved its independence in 1947. Accused by opponents of dragging his feet on ending British imperialism, Churchill growled: "I did not become prime minister to preside at the dissolution of the empire." For his part, William Happer, since becoming director of the Department of Energy's Office of Energy Research on 6 August, has devoted much thought to whether he might now say: "I did not come to this job to dismantle the DOE's great research empire."

Just four months on the job, Happer, who arrived with such high repute and high hopes (see *PHYSICS TODAY*, September, page 65), is now receiving fierce criticism from many who had considered themselves his colleagues and champions. The cause of all the hostility was the subject of a series of meetings Happer had called, where representatives of the physics community were asked to set priorities for the fiscal 1993 budget in four fields: nuclear and particle physics, magnetic fusion and basic energy sciences. While such efforts are difficult enough in the best of times, the panels of physicists were shocked to learn that DOE's fiscal 1993 budget, which President Bush will release in late January, might contain some painful cuts in these programs. Accordingly, a mood of pessimism and powerlessness pervaded their deliberations over whether some of the crown jewels of US physics are to be discarded into the dustbin of history.

On joining DOE, Happer was granted a reprieve of a few weeks in meeting the Office of Management and Budget deadline of 1 September for submitting his fiscal 1993 budget request. He was told that OMB targets pointed to a flat budget for virtually all his programs through fiscal 1996, with the exception of those designated as Presidential initiatives. Those favored few programs include global climate change, high performance computing, human genome mapping and, of course, the



Townes: A task involving cultural shock.

Superconducting Super Collider.

Blame for the fiscal predicament goes only in part to the 1990 Budget Balancing and Deficit Reduction Act, which enabled the White House and Congress to set ceilings on all domestic and defense discretionary spending for five years, beginning in 1991. Washington scuttlebutt that the caps would be removed or revised, because of the collapse of the Soviet Union and the persistence of the US's stagnant economy, proved wrong. As a consequence, DOE, like most of the government, has little budget flexibility.

Priorities by physicists

To make matters worse, DOE has taken on the massive job of cleaning up the long-neglected nuclear weapons production complex and of making certain that nondefense laboratories comply with all Federal and state agreements, laws and regulations covering radioactive and toxic contamination and occupational safety and health. Achieving all this, say sources in the Administration and Congress, is likely to cost about \$40 billion over the next decade. To be sure, spending by the department's Environmental Restoration and Waste Management Office has increased from \$900 million in the first year of the Bush Administration to

more than \$5 billion in the current fiscal year, which began on 1 October. For the past few months DOE has argued with OMB to raise the environmental cleanup portion of its budget to \$5.8 billion in fiscal 1993 and to allow the department to hire some 3000 new employees (to augment its current total ceiling of nearly 19 000). More staff is considered essential for mopping up contaminated weapons plants, repairing neglected buildings and facilities at all the labs, improving contractor oversight and auditing the books at field offices and laboratories in search of irregularities.

The funding crisis dominates Happer's agenda. He wasted no time in dealing with it by recruiting a panel of 15 prominent physicists, assembled under the auspices of the Secretary of Energy Advisory Board and the chairmanship of Charles H. Townes of the University of California at Berkeley. The Townes task force met on 19–20 September to listen to 20 program reviews by lab directors and DOE officials, to receive statements by representatives of professional societies and user groups, and to discuss program priorities—all of which were deliberated politely in public with little partisan wrangling, considering the seriousness of the situation.

The scene was set for the panel by Energy Secretary James D. Watkins, a product of Hyman Rickover's nuclear Navy. Watkins commanded a nuclear attack submarine and a nuclear cruiser and later served as chief of naval operations, the service's top post. After his retirement as a four-star admiral in 1986, Watkins was tapped by President Reagan to head his Commission on AIDS, which was then mired in controversy and nearly moribund. Watkins has generally received high marks from the White House and from Capitol Hill for hard work, good intentions and willingness to listen. Unlike some of his DOE predecessors who preferred not to rock the boat, Watkins steered into storms, charting a new National Energy Strategy that crossed conservationists and environmentalists, and opening the hatches of the decrepit

nuclear weapons complex, which had been battered down from public scrutiny since the 1940s. Critics in Congress have pilloried the department at angry hearings over its past mistakes and proposed strategies, though Watkins emerged almost unscathed. The situation is different for physics research. The collision between the physics community and Watkins and his hand-picked point man, Happer, has resulted in shockwaves that are near the top of the Richter scale.

"There is no way the department can do everything that everyone wants us to do," Watkins told the Townes task force at its first session. Watkins said he didn't expect the panel to write Happer's research budget but rather to provide some sensible guidance for ranking projects in 1993 and in the rest of the decade. He warned committee members that he would not tolerate attempts to stretch out the schedule for any facility under construction. During his years in the Pentagon, Watkins had experienced procurement delays and cost overruns. His remarks to the panel suggested that none of this will occur on his watch at DOE. A week later, Watkins told DOE's Fusion Energy Advisory Committee that he would not abide any protestations about the R&D budget guidelines that were set by OMB or any proposals to "slip the camel's nose under the tent" with projects that would start out small in the early years and ramp up steeply in subsequent years.

By telephone from Pasadena, Thomas Everhart, president of Caltech and chairman of SEAB, provided the Townes panel with a few criteria to use in judging the programs. "I believe you should give serious consideration to prioritizing on the basis of return to society [compared] to dollars spent by society." Additional tests, said Everhart, could include the economic impact of projects, their contribution to the training of new scientists and engineers, and "more narrow scientific priorities." Townes reminded the panelists of the gravity of their assignment. "We are taking on a very difficult job," he said, "both emotionally and intellectually."

In mid-October, just as Happer delivered his budget to OMB, the Townes panel issued a five-page draft letter to Watkins containing some shocking ideas whose time presumably had come. There is a certain seamy fascination in watching an empire picked apart. Because the final day of deliberations fell on Friday, the task force's conclusions were quickly dubbed the "Friday massacre" and "black Friday."

The report begins on a conciliatory note in a section called "general recommendations": "All of the programs reviewed by the task force were of high quality. If budgets were not constrained, there would be no objection... to proceeding with all of them.... Every effort should be made to secure a future ER budgetary profile that is more in keeping with the outstanding scientific opportunities before the nation and the traditional role of the DOE as the major source of support for fundamental science and engineering research.... In times of budgetary stress, high priority must be given to maintaining support for the best and most creative researchers, particularly those who are at the early stages in their scientific careers." This stated, the panel report finds that enough is too much:

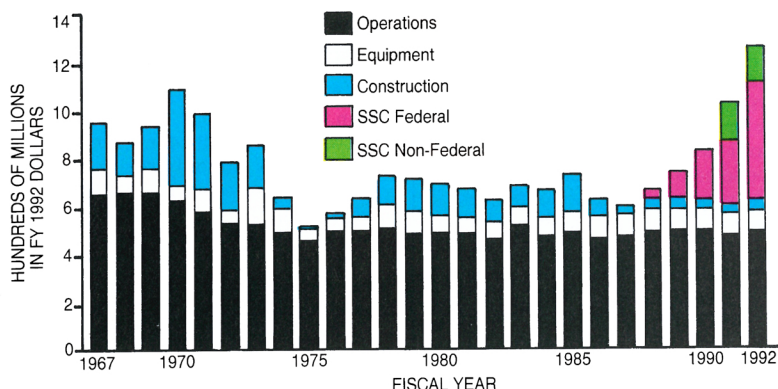
▷ **High-energy physics.** DOE should not proceed at this time to build either the \$181 million upgrade for the Fermilab Tevatron's main injector, which was authorized by Congress for fiscal 1992, or SLAC's proposed \$200 million "B-meson factory," which has yet to be presented to Congress. The 1990 review of the field, conducted by a group headed by Frank Sciulli of Columbia University for the High Energy Physics Advisory Panel, had rated Fermilab's main injector the highest priority after the SSC, but the advice was based on the optimistic assumption of modest budget increases in the first half of the decade, followed by a "compensatory" decrease during the second half. Because this budget scenario is no longer valid, the task force suggests that HEPAP should conduct another review of the base program priorities in the shadow of a flat or declining budget. As for the first priority of high-energy physics, the department "should make every effort to ensure the success of the SSC," which the Townes panel calls "the flagship" for the community.

▷ **Nuclear physics.** Following the explicit recommendations made in the Nuclear Science Advisory Committee's 1989 long-range plan, the task force could find little wrong with the priorities for the field's two big machines—the Continuous Electron Beam Accelerator Facility, now being completed at Newport News, Virginia, and the \$397 million Relativistic Heavy Ion Collider, just getting started at Brookhaven National Laboratory. These should be built, according to the NSAC plan, "even at the expense of other facilities." The plan also identified the Bevelac at Lawrence Berkeley and the Holifield Heavy Ion Accelerator at Oak Ridge

for phasing out. While the Townes group makes no clear statement on whether to proceed with RHIC, it notes that incremental costs of the machine will make it necessary to trim other programs in the department and proposes that NSAC should be asked to take another look at ways to economize. One possibility would be to curtail the operation of the Los Alamos Meson Physics Facility, better known as LAMPF. "The sense of the task force," the panel states, is that university-based facilities, presumably those such as MIT's Bates Lab and Yale's Wright Nuclear Physics Laboratory, "should be preserved in whatever arrangements are made to cope with budget limitations over the next several years."

▷ **Fusion energy.** The magnetic fusion program, having suffered from various raids by Congress in recent years, should be given modest growth increases of about 5% per year, "even at the expense of other programs." The Townes task force argues that this recommendation derives from the opportunity to participate in the International Thermonuclear Experimental Reactor, a major tokamak project in which the US, Japan, the European Community and the Soviet Union are collaborating, as well as from the recognition that no large fusion facility has been authorized since 1976 and that in the interim several facilities have been canceled or mothballed. Such unexceptional growth is incompatible, says the panel, with the proposed Burning Plasma Experiment, the first large-scale US fusion facility since Princeton's Tokamak Fusion Test Reactor was turned on in 1982. The physics of burning plasmas will need to rely upon the ITER program, although useful data is likely to come earlier from TFTR and the Joint European Torus, located in Culham, England. The primary issue for the panel was that BPX, touted only last year as a \$1 billion reactor capable of producing at least five times as much energy as it consumes, is now estimated to cost \$1.9 billion, which would require doubling the budget for magnetic fusion.

▷ **Materials science.** The design effort at Argonne for the 6-GeV Advanced Photon Source, the highest priority of the 1984 National Academy of Sciences study of major materials facilities, received a vote of confidence. Though the task force claimed that Oak Ridge's proposed Advanced Neutron Source is "much needed," it argued that "this need is not so urgent that the project must advance to architectural/engineering studies in fiscal 1993." In fact, the task force



High-energy physics funding at the Energy Department has had its ups and downs in the past 25 years, as measured in constant fiscal 1992 dollars. Operating budgets have remained fairly steady, taking inflation into account. The big difference is in construction dollars for new facilities, with the SSC ramping up rapidly since 1989.

recommended that ANS be put on hold at the current funding level "while the materials sciences community examines the optimal timing for the construction of this facility under budgetary constraints."

In sum, the Townes panel delivered a painful message: DOE's construction program needs to be downsized to make ends meet. To a man, the Townes group admits that what's good for the budget is certain to be bad for physics.

Speaking after lunch at the Hotel Washington on 17 October, Happer told some 100 university supporters of CEBAF that canceling several big physics projects, as proposed by the Townes task force, will not be enough to meet the budget shortfalls in the next few years. Happer observed that the research budgets for the National Science Foundation and the National Institutes of Health keep increasing despite last year's budget containment deal by Congress and the White House. In NSF's case this is because both Presidents Reagan and Bush decided to double its budget by the early 1990s; the NIH budget is raised each year by Congress. "Unfortunately, Secretary Watkins feels that there is no prospect of new funds for DOE," Happer informed his audience, made up mostly of members of the Southeastern Universities Research Association, "and in fact the situation may get worse for DOE in the next few years." Happer cited CEBAF and RHIC as examples of large construction projects causing "a very distorting influence on the scientific base programs of the field."

DOE is not only the nation's largest patron of big science, declared Happer, but it also is the main support for

basic research at the labs housing the big facilities. Indeed, it was the Atomic Energy Commission, DOE's predecessor, that created a special relationship with high-energy and nuclear physics after World War II, largely to advance nuclear weapons research, and successive energy agencies have considered themselves "custodians" of the fields ever since. More recently, DOE has extended its reach into other disciplines, particularly biotechnology and environmental science. Happer asked rhetorically: "In a time of limited budgets, how should one partition limited funds between all these disciplines? The simplest solution would be to prorate the available funds based on last year's funding profile, but this is not intellectually justified nor is it the most cost-effective solution. Our current partitioning of funds is more or less accidental, the result of years of small changes and political give and take. This haphazard planning is not the worst strategy for times of steadily increasing budgets, but it is not acceptable for times of hardship."

While the draft report of the Townes task force was being circulated for comment, Happer called on NSAC and HEPAP to meet in special sessions. At both meetings Happer asked the committees to assume that their programs in fiscal 1993 would be 10% below the current 1992 budget and might even have to absorb a reduction of as much as 5% more to account for inflation. A 10% cut "would have a calamitous impact on the field," said the NSAC report, signed by the committee chairman, Peter Paul of the State University of New York at Stony Brook. "NSAC is unanimous in its commitment to

RHIC as a central element of the intellectual activity in nuclear physics. . . . Under the scenario of a 10% cut, we reluctantly, but unanimously, advise that the FY93 RHIC construction funds be reduced from the projected amount in order to maintain a reasonable level of research at LAMPF. . . . The previously recommended orderly phase out of the Bevelac and Holifield programs might be accelerated. We do not suggest these steps lightly. . . . Nevertheless, a reasonable level of LAMPF operation in FY93 has a higher priority than keeping these other facilities in operation." The anticipated budget cut, Paul stated, would probably result in a 10% reduction in graduate students supported by DOE, mainly working at LAMPF.

"It is difficult to avoid the perception that the sudden deep cut in the FY93 nuclear physics budget is in contradiction to the Administration's statement that the SSC would not be built at the expense of the basic science program," Paul declared in obiter dictum. "With the total budget for the high-energy physics effort including the SSC increasing significantly in FY93, the nuclear physics program is seemingly being subjected to unwarranted cuts. These abrupt reductions, in the presence of a growing ER budget, appear inconsistent with the management objectives of DOE as principal steward of the nation's research effort in nuclear physics."

'A formula for mediocrity'

On 24-25 October HEPAP came to DOE headquarters in Washington to review the Townes report. After Happer explained the 10% solution for curing his budget woes in 1993, the deliberations sometimes became tempestuous. The effect of such a whack in ER's \$628 million budget for particle physics would total nearly \$63 million. To John Peoples, director of Fermilab, a \$21 million reduction in his \$225.6 million budget for 1993 would be "a formula for mediocrity." Burton Richter, SLAC's director, figured that a cut of 12% in his \$145 million budget would result in 200 to 250 layoffs, premature shutdown of one of the lab's main detectors, the SLD, and cancellation of R&D for the next generation linear collider. He said the proposed cuts in DOE's basic science activities exceed OMB's planning guidance for fiscal 1993 by more than \$100 million. "I will not support the budget that is going forward," Richter told HEPAP and then warned them, with a line from a Dylan Thomas poem: "Do not go gentle into

After Townes, Physicists Voice an Appeal to Reason

As the Department of Energy comes to grips with proposed reductions in its basic research budgets over the next few years, many in the physics community sense that the impending changes are neither temporary nor cyclic but are likely to have lasting effects that will weaken two fields in particular—nuclear and particle physics. Some believe physics will be so hard hit by the decisions being made by officials in the department that the character and culture of the fields will be altered for years. In an attempt to head off any adverse decisions, eleven prominent physicists, of whom seven are Nobel laureates, sent a letter on 11 November to William Happer, director of DOE's energy research office, protesting the proposed budget cuts as well as the process the department used in obtaining advice. Copies of the letter also went to Energy Secretary James D. Watkins and to the President's science adviser, D. Allan Bromley. Within a few days the letter was signed by another 141 physicists, most of them graduate students and postdocs, who run the risk of being casualties in the coming battle over nuclear and high-energy physics. The contents of the letter follow:

"We the undersigned members of the scientific community are deeply concerned about the seriously damaging effects of the sudden and precipitous actions taken recently by DOE on the funding of the two vital basic research programs, nuclear physics and particle physics. We are alarmed by what has taken place in the decision-making process of these two national research programs of which DOE is the present custodian.

"Our understanding is that on 19–20 September the Secretary of Energy Advisory Board Task Force on Energy Research Priorities, chaired by C. H. Townes, met in Washington, DC, to consider scientific priorities for a number of fields, based on a nearly flat budget scenario. A draft report was made available for public comment through 31 October 1991. This draft contains scientific recommendations calling for consultation with the nuclear physics and high-energy physics communities. However, before the deadline for comments, the DOE called a meeting of the Nuclear Science Advisory Committee for 23 October to discuss the scenario that for fiscal 1993 would be an approximately 10% reduction (effectively 15% when cost-of-living increases are counted) from the fiscal 1992 budget. The Townes Committee had not been alerted to the possibility of so abrupt and so sharp a cut. Then, on 28–29 October the High Energy Physics Advisory Panel was also convened with the same budgetary reduction scenario for high-energy physics, excluding SSC. In addition, contrary to the usual practice, parts of both the NSAC and HEPAP meetings were not open to the public.

"A drastic cut of this magnitude clearly would have a calamitous impact on these fields both immediately and long term, destructive to our national leadership in science and discouraging to our young people planning to work in these important areas. Especially damaging to the credibility of the DOE is the significant difference in the budgetary charges given to the Townes Committee and to NSAC and HEPAP. The inconsistency between these charges and the reason for it have not been explained to the community; this in turn will cast serious doubt on the planning process of the DOE's research program among its own best scientists.

"In order for us to maintain leadership in advanced science and technology, it is necessary to have a vital, forward looking and rational national policy on basic research. A responsible management program obviously entails planning on time scales relevant to the activity under consideration. For most basic research areas, including nuclear physics and particle physics, that time scale has to be about three to five years. It is set by the technical considerations of building and conducting experiments as well as by the educational needs of graduate students and postdoctoral training. We are mindful of the present budgetary stress. This means each new change and new initiative will require even greater care and more attention. It is crucial that we do not lose the confidence of the very best of our young researchers and talented students. Our long-term national interest must be our first priority, and it is essential that we preserve openness in our scientific decision-making process."

The letter's principal signers were Sidney Altman of Yale University; Val Fitch of Princeton; William A. Fowler of Caltech; Sheldon Lee Glashow of Harvard; Maurice Goldhaber, director emeritus of Brookhaven National Laboratory; Ernest Henley of the University of Washington; Leon M. Lederman of the University of Chicago and former director of Fermilab; T. D. Lee of Columbia University; Melvin Schwartz, associate director of Brookhaven; A. J. Stewart Smith of Princeton; and Victor F. Weisskopf, professor emeritus of MIT and former director general of CERN.

that good night." "I won't," he said angrily. Brookhaven's director, Nicholas Samios, drew a bleak picture for the Advanced Gradient Synchrotron, where a cut of 13% in the current year's \$82.4 million budget would allow for only eight weeks of running time, compared with 20 to 25 weeks planned for this year, and would necessitate 75 layoffs.

Jerome Friedman of MIT, a HEPAP member and chairman of the SSC lab's advisory committee, expressed anger at what he termed "a very precipitous cut in the program.... The Sciulli panel warned us that there could be as much as a 50% cut in the base program as we ramp up the SSC. That would damage the university programs and decrease physics productivity. What we face is ominous for the SSC era.... We're looking toward a smaller field, with fewer people and fewer facilities." Referring to the report that HEPAP would write to Happer, Jonathan Dorfman of SLAC was adamant: "Whatever we do, our preamble should contain an enormous primal scream of pain."

Stanley Wojcicki of Stanford University, HEPAP's chairman, began his report to Happer by stating: "It is no exaggeration to say that the recently concluded HEPAP meeting in Washington was by far the most depressing one in my memory. Being asked to respond on such short notice to such drastic budgetary cuts gave us all a feeling that we are being asked to advise DOE on how to implement the demise of high-energy physics research in the US. The budget reduction will undoubtedly cause severe and long-lasting damage to the compelling and balanced program of research investigations in particle physics under way now." The proposed policy of reductions "seems to us especially unwise because the nation is simultaneously investing heavily in a future high-energy physics facility, the SSC. We are very concerned that reductions in the breadth and personnel in the high-energy physics base program at this time will inevitably undermine our ability to exploit this new facility when it turns on in eight years.... We are distressed because if the contemplated scenario does indeed occur, then many exciting physics opportunities will have to be postponed, significantly reduced or, most often, simply thrown away. Hundreds of students will be left with incomplete thesis research."

HEPAP gave the Fermilab main injector its highest priority among ongoing programs because "it is the highest energy collider and fixed tar-

get accelerator in the world, and it is optimally poised to explore many of the key issues in high-energy physics today." But without adequate funding, detector modifications and collider improvements will be delayed or abandoned. Despite Happer's admonition about supporting the injector's upgrade in the 1993 budget, HEPAP endorsed the plan but couldn't agree on how to fund it. In the end HEPAP voted almost unanimously to give Fermilab the \$15 million that Congress appropriated for the upgrade in 1992, even though DOE had suggested withholding the sum.

Beyond the HEPAP and NSAC statements, nearly 100 letters and electronic messages came to DOE—most notably from a group of physicists led by T. D. Lee of Columbia University (see box on page 56). Reactions also came from members of Congress. For instance, Illinois lawmakers warned that they will fight any efforts to cancel Fermilab's main injector improvement, suggesting that they will replay their powerful performance last spring when OMB eliminated \$43.5 million for the upgrade from the 1992 budget (PHYSICS TODAY, April 1991, page 86). "We object to the manner in which the department arrived at its [decision] in its recent priority-setting exercise. Because consideration of the SSC was off the table, the hands of the task force were tied from the outset. We find it highly objectionable that the department has refused to include the SSC in its priority-setting exercise and chosen instead to cut funding in other areas."

Fears for the SSC

In a letter to Watkins, Representative George E. Brown Jr, the California Democrat who heads the House Committee on Science, Space and Technology, said that, given the constraints on the Townes panel, the recommendations... were, in general, highly predictable: They in effect spread the pain as best they could so as not to do irreversible harm... Looking at the short-run practical effect... I fear the SSC may find itself in serious trouble." Brown, a leader in the fight on the House floor this summer to keep the SSC from being cut or canceled from the 1992 budget, said "those opposing the SSC are being provided the leverage they need to once again try to defeat SSC construction in the coming session of Congress." When the Reagan Administration first endorsed the project in 1987, Brown remembered, "the Congress was assured that it would not be funded at the expense of ongoing science and research programs. This

is obviously no longer true... Thus, intended or not, the ground rules provided to the Townes task force are a warning to the other DOE science programs that the increased funding levels required to support the SSC place their programs in peril."

At the second meeting of the Townes task force on 25 November, Watkins spoke about the comments he and Happer received from protesting physicists, lab directors, university administrators and politicians. "The level of unhappiness is about

equal," he said, "and that makes me feel good. I have the intuition that your report is about right." Watkins also told the group that he is "committed to getting as much as I can for the energy research budget." His statement was in contradiction to remarks he made to the same group in September. "I don't think you need to be discouraged that this [scenario of 10% cuts in programs] is the end product... I will be pushing very hard to jack up the numbers."

—IRWIN GOODWIN

WASHINGTON INS & OUTS WITH THOMPSON'S SUDDEN FLIGHT, NASA SEEKS A CHALLENGING CRITIC

To the complete surprise of everyone at NASA, James R. Thompson Jr announced on 17 September that he was resigning as the space agency's Number 2 official, effective 8 November. Thompson's announcement came during a meeting at the Johnson Space Center in Houston, where the "blue ribbon" Augustine committee had been reassembled to discuss NASA's response to the panel's sobering report on space policies and agency management (PHYSICS TODAY, April, page 87). The panel, which took its name from the chairman, Norman R. Augustine, chairman and CEO of Martin Marietta, had counted on Thompson to help reshape the agency. Instead, Thompson, a 25-year veteran of the space program, said he decided to leave because of pressing health problems in his family.

Thompson earned a reputation in Washington for his candor, confidence and combativeness. He refused to be bullied or blamed by members of Congress or officials in the Administration and often stubbornly defended NASA programs and policies against what he considered unfair or unfounded attacks.

On the eve of his departure from NASA, Thompson received a letter from Berrien Moore II, a mathematician at the University of New Hampshire who heads the agency's Space Science and Applications Advisory Committee. After the customary plaudits for Thompson's contributions to the space program, Moore wrote: "What may be less well known has been your wise, challenging and occasionally irritating counsel that you have provided openly to the space science community. No one, and particularly a scientist, likes to be told that he or she was wrong or acted stupidly. When it has been valuable,

you have done so with flare, insight and humor, and as a consequence we have all benefited. Your intense participation in the space science program has become a bellweather which will be difficult to replicate. It is hard for us to imagine a NASA without J. R., but frankly at times it was hard to imagine a NASA with J. R."

Having earned an MS in mechanical engineering from the University of Florida in 1963, Thompson joined the Marshall Space Flight Center in Huntsville, Alabama, as a liquid-propulsion engineer. He played a key role in the Skylab project, and in 1974 he was chosen to manage the development of the space shuttle's main engine, which required a long leap in NASA's rocket booster technology.

In 1983 he left NASA for a managerial position at the Princeton Plasma Physics Laboratory, but he was brought back to the agency to head the Marshall Space Flight Center after the Challenger debacle in 1986 had just about destroyed the nation's confidence in Marshall's leadership. James C. Fletcher, who himself was called back from retirement after Challenger to once again serve as NASA administrator, told Thompson his job was relatively simple: Restore the shuttle to safe and reliable flight.

Vice President Quayle and leading members of Congress are pressing Richard H. Truly, NASA's current administrator, to avoid selecting an insider for Thompson's post. Representative George E. Brown Jr, the California Democrat who heads the House Committee on Science, Space and Technology, argues forcefully for an outsider who can shake up the agency and calm down the criticism. Truly frankly admits that Brown's criteria are a tall order.

—IRWIN GOODWIN ■