# Nuclear Safety (III): Critics Charge Conflicts of Interest

One February day in 1971, the Oak Ridge National Laboratory (ORNL) in Tennessee received a bit of bad news from Atomic Energy Commission headquarters in Washington that still evokes feelings of anger and resentment among the laboratory staff. With only a brief explanation, Oak Ridge administrators were told that a project they considered to be the laboratory's single most important piece of nuclear safety research—a study of how reactor fuel rods might behave during a major loss-of-cooling accident—was going to be canceled, even though it was nowhere near completion.

Oak Ridge had already absorbed significant cuts in its $5 million safety research budget, and the laboratory had suffered them in relative silence. But this was too much to bear: The project had run only 2 of a scheduled 4 years; it pertained to a problem that the AEC itself had said demanded urgent attention; the study was the only one of its kind then under way; it pursued issues of great interest to the AEC's regulatory staff, which depended on the safety program for technical support; and above all, in the opinion of Oak Ridge researchers, the fuel-rod study had begun to raise some troubling questions about the margins of safety in nuclear power plants then under construction.

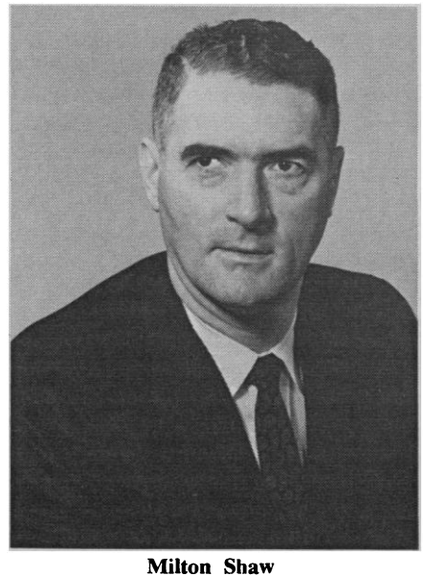
"We are astounded at your decision to discontinue this experimental work," William B. Cottrell, ORNL's director of nuclear safety, protested in a memorandum to his counterpart at AEC headquarters, Andrew J. Pressesky, the assistant director for nuclear safety.

"This matter is of such grave concern to so many persons," Cottrell wrote on 4 March and again on 30 April, "that I expect ORNL management to raise questions with others in AEC. . . . No one really knows what will happen in a reactor core in the event of a loss-of-coolant accident [and] the AEC in general—but Regulatory in particular—needs an in-house program to assess this very complex matter."

The safety director's pleas were fruitless, however, and the project was killed. The official explanation had to do with a general shortage of funds for safety research, but one Oak Ridge administrator, who insists on anonymity, says that Pressesky offered a remarkably different explanation in private. "You won't find this in writing," the administrator said, "but the reason he gave for canceling the study was that it raised more questions than it solved."

Safety researchers took that to mean their findings were rubbing the reactor "vendors" or manufacturers the wrong way, but Pressesky denies this inference. In a recent interview he asked whether his quoted remarks were written or oral. Informed they were oral, he said, "What I probably meant was that I had misgivings about how well these experiments represented real nuclear fuel."

Whatever the truth of the matter, the incident served to reinforce a growing conviction among safety researchers, both at Oak Ridge and at the National Reactor Testing Station in Idaho, that authorities in Washington were shaping the safety program more to fit the desires of the nuclear industry than to accommodate the needs of the AEC's own regulatory and licensing staff. In its haste to get on with developing the breeder, Washington seemed to researchers in the field to be methodically sidestepping grave uncertainties that still surrounded ordinary, water-cooled nuclear power plants. Why it should do so was something of a mystery, but two possible motives suggested themselves to worried researchers at Oak Ridge and Idaho. Either officials in Washington attached far less urgency to water-reactor safety than they professed to, or they were deliberately attempting to "keep a low profile" on embarrassing safety questions that threatened to jeopardize the industry's financial support of the breeder program. "I am convinced," says one research manager at Idaho who subscribes to the latter view, "that RDT [AEC's Division of Reactor Development and Technology] is simply in bed with the vendors. Everyone wants his merit badge for the breeder."



Milton Shaw

The AEC's congressional testimony over the past few years leaves no question that large segments of the water-reactor safety program are lagging far behind schedule. What remains open to debate is whether these delays were as deliberate as they might appear. An article last week traced some major delays and shortages of funds to cost overruns and other administrative problems in building two major research reactors at the Idaho installation. This current article takes up the critics' contention that, fundamentally, the safety program's difficulties derive from serious conflicts of interest within RDT, of which the safety program is part.

Allegations of an inborn conflict of interest—on the ground that it both promotes and regulates the nuclear industry—are old hat to AEC. It has long since learned to shrug off such accusations with the argument that there was no reason why the same agency could not carry out both functions independently and with equanimity, so long as the proper checks and balances of internal power prevailed.

With this in mind, the AEC reorganized itself in 1961 in an effort to separate regulatory functions from the agency's "development" programs. These functions—including all the administrative machinery for licensing nuclear power plants—were joined together to form a distinct regulatory arm, whose director answered to the five commissioners. Glenn Seaborg, the former AEC chairman, has written that this organization "evolved for one simple reason: so that the right hand would know what the left hand was doing, yet be independent of it."

Looking back though, it appears that

things never quite worked out that way. The regulatory staff never achieved full independence. Moreover, right from the beginning and all through the years, communication and coordination between the two sides was notoriously poor—in part because the commission simply neglected to establish clear and reliable lines of administrative contact between the two "hands" of its staff. Indeed, in April 1967, more than 5 years after a distinct regulatory staff came into being, Congress's usually friendly and paternal Joint Committee on Atomic Energy found itself imploring the commission to improve its internal communications:

> It appears to the committee that not all the necessary steps have been taken in the past to coordinate the work of these two organizations. The supposed ease of exchanging information and views between the operating and development staff, on the one hand, and the regulatory staff, on the other, is one of the chief arguments made against a complete separation of the AEC's regulatory functions from its other activities. It is most important that this exchange take place in fact as well as in theory, and that one of the results be a meaningful nuclear safety research effort.

The 1961 reshuffle had left both sides—the regulatory and development units—in a difficult situation, pregnant with conflicts of interest. For one thing, the safety research program had remained behind in the AEC's main development arm, the RDT. While this probably made eminent sense at a time when nuclear power plants were still under development and far from a commercial reality, times changed. Five years later, the regulatory staff would depend heavily on the safety program for help in assessing the safety of dozens of power plants coming up for licensing. Thus, in the middle 1960's, the RDT found itself in the position of conducting a research program that was actively engaged in raising pointed questions about the very reactors the RDT had worked so hard to develop. Moreover, the division could scarcely have hoped to avoid accusations of mutual backscratching with the industry when, precisely at the time the AEC began cutting back its reactor safety budget, it began spending lavishly on the breeder program and encouraged utilities and reactor vendors to do the same.

To make matters worse, the regulatory staff remained almost totally dependent on the charity of the RDT to pay for research on any broad, pressing questions that new designs of nuclear power plants might raise. Whereas "Reg" could let small, special purpose consulting contracts to universities or private firms, the commission gave it no money for a coherent research program of its own. Nor has the regulatory arm ever had the option of paying money directly to the RDT for work it wanted done. Instead, the

## Saccharin: Future Uncertain

About half a dozen rats in Wisconsin developed bladder cancer not long ago. Apparently, they got tumors from eating too much saccharin and, because of their unfortunate condition, saccharin could go the way that cyclamates went before it—off the market.

Although a ban on saccharin is by no means certain, it is a very distinct possibility. Food and Drug Administration (FDA) commissioner Charles Edwards says that the agency will probably take no action until several studies on the toxicology of the artificial sweetener are completed within the next few months; he already has asked the National Academy of Sciences (NAS) to review the data when they are in.

The Wisconsin study was conducted by Paul Nees and his associates at the Wisconsin Alumni Research Foundation in Madison. According to Nees, long-term studies began 2 years ago and were recently completed. About 6 rats (he wishes to withhold the exact number until his data are published) in a group of 20 developed tumors that he considers malignant. For 2 years, the 20 male animals daily consumed saccharin in a dosage that constituted 5 percent of their diet. Other groups of rats, fed saccharin as 1 percent of their diet, or less, showed no evidence of tumors at the end of the study. Nees's experiments were supported by the International Sugar Research Foundation.

Other long-term studies of the toxicology of saccharin are nearing completion at FDA laboratories and elsewhere. Jean Taylor, who heads the FDA experiments, reports no evidence of tumors among groups of rats that have been consuming a diet containing as much as 7½ percent saccharin. She calls this a very "suspenseful" time during the experiments because the "animals will develop tumors now if they're going to. We should know more in just a few months."

A man or woman who uses saccharin in coffee, drinks artificially sweetened colas, and eats foods containing saccharin consumes the chemical as an estimated 0.1 percent of his diet in a day.

As far as FDA is aware, no other group has duplicated the data of the Wisconsin investigators as yet. Once each experimental team turns in its results, an academy committee—probably the same one that reviewed the cyclamate case—will evaluate the data to determine the validity of the various studies, the conditions under which they were performed, and so on.

Then, if NAS finds that saccharin can induce tumors in rats, the Institute of Medicine will convene a panel to consider the broad question of the need for artificial sweeteners by persons with various metabolic diseases, particularly diabetes. The institute would ask, for example, whether there is medical justification for making saccharin a prescription drug if the FDA is forced to ban it from food shelves under the Delaney amendment that prohibits the use in human food of any agent known to be carcinogenic in animals (*Science*, 18 August).

The matter of saccharin and some half-dozen cancerous rats also raises once again the whole issue of the validity of the Delaney amendment, which some scientists and government officials would like to see modified. One way to tackle the question, many officials believe, is to begin with a scientific meeting on the issues involved, a meeting that would be sponsored by a private foundation or other disinterested party. There are various plans afoot to organize such a meeting which, its advocates hope, would force members of the scientific community to stand up and be counted rather than to express themselves off-the-record and in private as they generally have thus far.—B.J.C.

POINT OF VIEW

# Solzhenitsyn on Scientists

*The speech that Alexander Solzhenitsyn would have delivered had he been allowed to receive the 1970 Nobel Prize for literature was published last month in the Nobel Foundation's yearbook. The Russian author observes that the civilized world "has found nothing to oppose the onslaught of a sudden revival of barefaced barbarity, other than concessions and smiles." Two forums where such opposition might be expressed are the United Nations and among scientists; but both, he argues, have failed to act. Of scientists, Solzhenitsyn, who was himself trained as a mathematician, has this to say.*

It would seem that the appearance of the contemporary world rests solely in the hands of scientists: All mankind's technical steps are determined by them. It would seem that it is precisely on the international good will of scientists, and not of politicians, that the direction of the world would depend. All the more so since the example of the few shows how much could be achieved were they all to pull together. But no: Scientists have not manifested any clear attempt to become an important, independently active force of mankind. They spend entire congresses in renouncing the sufferings of others: Better to stay safely within the precincts of science. That same spirit of Munich has spread above them its enfeebling wings.

most it could do was submit a formal "request for information" and hope Shaw and his division could see their way clear to spend the time and money required. There is abundant evidence to suggest that, more often than not, the time and money was not available and the questions went unanswered.

The inherent drawbacks of these arrangements might have remained mostly academic, had two unforeseen problems not developed in the middle 1960's.

First, around 1966, the regulatory staff encountered what appeared to be major gaps in the information generated by the safety research program. Utilities had begun ordering nuclear plants of unprecedented size—with capacities of 1000 megawatts electrical, more than ten times the size of any pressurized water reactors then in operation—but the technical reports of the safety program dealt mostly with much smaller reactors. New information and new experimental data were needed to assess the safety of the mammoth plants that the utilities wanted, and the safety program would have to produce it as expeditiously as possible in order to make any contribution at all to the licensing process.

Then the second problem popped up. Just as the regulatory staff requested this new research, the budget for water reactor safety research hit a plateau and then, incredibly, declined.

What apparently triggered the regulatory staff's hunger for information was an application from Consolidated Edison of New York for a permit to build an 873-megawatt nuclear plant named Indian Point 2. The design of the plant proposed a dramatically high power level that in turn implied a new reliance on such safety features as the emergency core-cooling system to protect the reactor, as well as the nearby public, from an accidental loss of cooling water and a potentially disastrous melting of the core.

The AEC issued Con Edison its permit on 14 October 1966, but evidently did so with some misgivings. Two days earlier, the AEC's semiautonomous Advisory Committee on Reactor Safeguards (ACRS) issued a statement stressing an urgent need for new research to ensure the reliability of the hitherto untested backup cooling systems. Two weeks later, on 27 October, then director of regulation Harold L. Price took the unusual step of appointing a "task force" of 12 prominent scientists and engineers to review the information available on loss-of-cooling accidents, and the backup systems that were intended to lessen the consequences of such accidents. One year later, the task force, headed by the late William K. Ergen of ORNL, issued its findings in a 221-page report that pointed to a host of technical uncertainties. More had to be learned about the mechanisms and circumstances of pipe rupture, the presumed cause of a coolant loss. More had to be known about the behavior of fuel rods and the fission wastes inside the fuel rods during an accident. Improvements, based on experimental work, were needed in existing computer simulations of accidents.

The Ergen report was scarcely one to inspire confidence, and even at that, according to one man who helped write it, the document represented a "serious compromise" between the least sanguine members of the task force and the far more optimistic industrial participants. The AEC did eventually publish the report but went to no great lengths to encourage its circulation. The public version bore no date, price, or address of any place where it might be obtained, nor did it bear the identification numbers customarily assigned to such reports.

If the available correspondence on the subject is any indication, the RDT's response to the demands for new research on loss-of-cooling accidents was phlegmatic at best. To his credit, Milton Shaw in 1967 reoriented a major research reactor then under construction at Idaho to emphasize studies of emergency cooling problems. But the project, called the Loss of Fluid Test facility (LOFT), ran into prodigious cost overruns and delays and began gobbling up money that might have gone into research. More than 2 years after the Ergen group had dropped its bombshell, the ACRS complained to Glenn Seaborg, then chairman of the AEC, that its exhortations for more work on loss-of-coolant accidents and related problems seemed to be falling on deaf ears. In a letter of 12 November 1969, the ACRS told Seaborg:

> The committee has strongly recommended safety research of this kind several times during the last three years; the regulatory staff has also strongly supported such work. However, only small or modest efforts have been initiated thus far.
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> In its comments on 20 March 1969, the committee also recommended that ". . . considerable attention be given now to the potential safety questions related to large water reactors likely to be proposed for construction during the next decade. Larger cores, higher power densities, and new materials of fabrication are some of the departures from present practice likely to introduce new safety research needs. . . ." It appears

# NEWS & NOTES

• **SENATE ENDORSES METRICATION**: The Senate on 18 August passed a bill (S.2483) which would set the nation on a voluntary course of conversion to the metric system. The object is to make metrication "the predominant but not exclusive" system of weights and measures within 10 years.

The bill essentially follows the recommendations of a report completed in July 1971 by the National Bureau of Standards. It calls for the appointment of an independent 11-member board which would be given 18 months to concoct a national plan for metric conversion and outline any new legislation that might be necessary. Federal agencies will take the lead by working out their own conversion schedules and changing procurement practices to reflect the new policy. The bill would authorize the expenditure of $14.5 million over the next 5 years on government research, information, and coordination activities.

Passage of the bill came as something of a surprise because Congress has not exhibited much interest in metric conversion. The House Science and Astronautics Committee is still sitting on its Administration-sponsored metrication bill and is not expected to act before next year.

• **ETHICS ENCYCLOPEDIA**: Georgetown University has announced that preparations are under way for the first comprehensive encyclopedia of medical ethics. Scientists and ethicists of "Protestant, Jewish, Catholic, and humanistic beliefs" will write and edit the four-volume opus, which will take about 3 years to complete. The $400,000 project is being helped along by a $200,000 grant from the National Endowment for the Humanities.

The encyclopedia is a major project of the Joseph and Rose Kennedy Institute for the Study of Human Reproduction and Bioethics, a multidisciplinary organization established at Georgetown a year ago. Editor of the encyclopedia is Warren T. Reich, a former theology professor at Catholic University and now senior research scholar at the institute. The encyclopedia, says Reich, will be a source of "the finest ethical wisdom available," bearing on the unprecedented moral problems that advances in science and medicine have created.

that, because of funding and for other reasons, the recommendations of the ACRS will not be implemented at this time.

It should be noted that this criticism also came 2 years after the Joint Committee on Atomic Energy upbraided the AEC for not fitting the safety program to the regulatory arm's needs.

Those needs, of course, had not been ignored altogether. Even the modest effort cited by the ACRS was producing results, and there results were even less encouraging than the Ergan group's findings. According to one man involved in this research at Idaho:

> The more we worked this problem the more it fell apart in our laps. Everything we did to analyze the physical phenomena, to improve correlations, to better describe what happens during blowdown [the explosive depressurization of a reactor vessel] pushed our predicted temperatures higher toward melting and the margins of fuel safety lower.
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> The more we got into this the more it became apparent that RDT was very unhappy with all this. The problems we were raising were upsetting their cozy relationship with the vendors and utilities, whose support they needed for the breeder. . . . It also became clear that Shaw and others just didn't believe a serious accident of this kind could happen, and that it was really worth working on. They'd say all the right things in public, but in the small, executive session their enthusiasm would cool off.

Both sides think the probability of a major accident is low, but low means different things to different people. In the spectrum of estimates, officials in Washington lean toward lower estimates—on the order of one chance in a billion—than researchers in the laboratories. "What bothers me most," says a prominent engineer at Oak Ridge, "is that after 20 years we are still making purely subjective judgments on what is important and what is not in reactor safety. Purely by decree, some things, like the rupture of a reactor pressure vessel, are ruled impossible. To decide these things without some objective measure of probabilities is, to me, almost criminal."

It is difficult for an outside observer to judge the extent to which estimates of accident probabilities have cooled or fired enthusiasm. Shaw and Pressesky acknowledge that differences of opinion exist, but they say the debate is irrelevant. "Our job is to work out these problems," Pressesky says, "and that's what we're trying to do. For our purposes, the probability of an accident is one." Shaw adds that he thinks serious reactor accidents will inevitably occur—but that safety systems will protect public life and property.

And yet, all this time, strange things were happening to the safety budget. As always, Congress authorized money for both breeder reactor and water-cooled reactor safety in one lump sum each year, and between 1969 and 1972 this sum oscillated gently between $34 million and $37 million. Within that essentially constant budget, though, money allocated to breeder studies during the 4-year period rose from $4 million in 1969 to more than $11 million in 1972.

The source of this added money was clear, and so were the effects of its transferral. Over the vigorous protests of the Advisory Committee on Reactor Safeguards and the regulatory arm, water reactor safety research was being sacrificed for the benefit of the breeder.

Who is responsible for this sacrifice is far less clear. One analysis suggests that not all the blame is Shaw's, although he has tended to serve as something of a lightning rod for the rancor of short-changed researchers. In his annual appearances before the Joint Committee's budget hearings, Shaw has forthrightly pointed out that pumping new money into the breeder has brought about cutbacks in "vital and important" studies pertaining to water-cooled reactors. Moreover, the records of the hearings show that he consistently asked for 10 to 20 percent more money for nuclear safety than he ultimately received. Just as consistently, the AEC's own budget-makers and the White House budget office markedly reduced the amount Shaw was allowed to request from Congress. It is difficult to imagine that these cuts were not approved, at least in part, by the five commissioners. And the Joint Committee, in its eagerness to press on with the breeder, has shown no public signs of anxiety over water reactor safety either.*

Nevertheless, the ups and downs of the safety budget, and the emphasis on the breeder, aroused strong suspicions among safety researchers that the RDT had been a bit too intimate with the industry. The suspicions have been further piqued by the RDT's efforts to escape its financial problems by divesting itself of major safety research tasks and in-

* The Joint Committee may also have cast a skeptical eye on AEC requests for safety money after the agency diverted to other purposes or simply failed to spend $12 million or 8.5 percent of the funds appropriated for nuclear safety from 1965 through 1968. The committee said in 1969 that this was "indicative of persistent overestimates of budget needs."

ducing the nuclear industry—especially the utilities—to pay for the work instead. In Washington, it is argued that the industry really ought to shoulder a larger part of the burden for safety research, now that nuclear energy is a commercial reality. "They have to stand on their own two feet," Shaw says of the utilities and vendors.

But a number of the critics at Oak Ridge and Idaho fear that, if the commission is too successful in this endeavor (which to date it has not been), the AEC may cripple its own ability to judge the quality of industry-sponsored work. To Washington, this bears a taint of special pleading, but the critics respond that the entire effort raises still more questions of conflicting interests. As one senior administrator puts it, "This is like asking the agricultural chemical industry to tell us how safe pesticides are."

These feelings are coupled closely with the researcher's irritation at RDT's practice of letting reactor manufacturers review their proposals for new research, before RDT passes judgment on the proposals. In an interview, an administrator at Idaho expressed the complaint this way:

> Shaw will say, "Have you found a problem? Just send us a proposal." So we send a proposal. First it's screened by teams of engineers in his office before anyone, including REG, has a chance to comment on it. If it gets past this stage, they send it to the vendors for comment. Not to impartial experts in universities or foundations, but to the *vendors*. And great Scott, the industry is very upset by these proposals. We keep raising questions that they'd just as soon not hear about. They've already convinced REG that it's not a problem at all. . . . In the end, RDT chooses to identify with the needs of the industry, not the regulatory staff.

Officials in Washington have an explanation for this procedure, which is simply that they want to ensure that safety research is related to practical problems of reactor design. Pressesky makes the point that proposals go simultaneously to vendors and the regulatory staff, and sometimes not to vendors at all. Accusations of favoritism toward industry are flatly denied. "I hear things about conflict of interest all the time," Shaw says. "I can't let it bother me. . . . Some of the industry people come down on us just as hard."

How are relations now between the development and regulatory sides of the AEC? In some respects things are looking up. Funds for reactor safety are up to $53 million this year, and about half the increase since 1971 has gone toward water reactors. Perhaps the most charitable judgment of the present situation comes from L. Manning Muntzing, the director of regulation, who told the Joint Committee last March that his staff had a "very close working relationship" with the RDT.

If that is true, it would seem to represent a dramatic transformation. Only a month before, the ACRS again criticized the RDT for failing to heed the interests of the regulatory staff. In a letter to the new chairman, James Schlesinger, the ACRS ticked off a list of problems yet unsettled, some still hanging fire from the middle 1960's. Among its demands, the ACRS asked for "special emphasis" on fuel studies of the sort Oak Ridge used to do, and it suggested that, "in the future, the AEC safety research program should reflect more directly in extent and detail the recommendations and needs of the Regulatory staff and the ACRS."

It was a familiar refrain, and one that evidently caught the ear of the General Accounting Office, the investigatory arm of Congress. Although no congressman has asked it to do so, the GAO has initiated its own investigation of the turbulent relations between the safety program and the regulatory staff. The GAO expects to have its report ready sometime next spring.

—ROBERT GILLETTE

# Briefing

## Bill Boosting NSF Moves to House

The Senate's decisive vote passing S.32, the measure which would strengthen the arm of the National Science Foundation (NSF) to raise the cudgel against national, domestic problems, has greatly improved chances of House passage sometime during the remainder of the year. However, there remain a number of obstacles—both to House passage and to the chances that the proposal will ever become reality—not the least of which is a virtual certainty of a presidential veto of the bill, whose chief sponsor is Senator Edward M. Kennedy (D–Mass.).

The solid support from both liberals and conservatives, both Democratic and Republican, which caused the bill to sail out of committee early last summer (see *Science*, 7 July), obviously aided the Senate vote, which was 72 to 8. Some minor amendments were suggested during the debate, but the only important one to pass was one reducing the funds for the expanded NSF over its first 3 years from $1.8 billion to $1.025 billion.

The act would offer various kinds of aid to individual scientists and engineers, and also to certain industries and to depressed technical communities. NSF would become the overseer of a big, new Civil Science Systems Administration, modeled on the National Institutes of Health, to sponsor research and development.

There are now two obstacles to House passage of the bill this session, according to staffers in the Senate and House. One is whether the two key politicians who hold sway over organizing passage will take a strong interest in getting it through. The first is Representative George Miller (D–Calif.), age 81, chairman of the House Committee on Science and Astronautics, whose defeat in the June California primary could affect his attitude toward the final business of his Capitol Hill career. The other, Representative John W. Davis (D–Ga.), who heads the committee's subcommittee on research and development, currently faces a tougher reelection campaign than he expected. If Davis and Miller's interest proves minimal, it won't be the first time that back-home politics have affected a representative's dispatch of regular business in Washington.

A second issue in House passage is Senator George McGovern (D–S. Dak.). Many middle-of-the-road and conservative Democrats are currently wary about associating closely with McGovern's proposals. McGovern is a cosponsor of S.32, and at one time it was thought that he would make a big campaign issue of it—as proof that he seeks improvement in the lot of research and development in nondefense fields. McGovern has been citing the bill in his campaign speeches, but so far, less often than expected, and the current educated guess among House staffers is that the bill's chances of passage will be much better if McGovern keeps it that way.—D.S.