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phisticated approach to accounting, based, Moore says, neither on good theory nor on good observations. It is "a regulation imposed to accommodate a problem in a previous regulation. But this new one made the problem worse."

Moore is not alone in his criticism of the NRC's accounting system. In 1979 Moglewer wrote a memo to the former NRC chairman, Joseph Hendrie, warning that because of problems in collecting data, the NRC "cannot meaningfully use ID data to detect diversion." The statistics are so weak, he wrote, that the entire regulatory framework built around the accounting system is unstable.

Carl Bennett, a statistician at the Battelle Corporation and a recognized industry specialist in the field, says that "it may come as a surprise to some people, but the entire decision structure that's in the current regulations [dealing with inventory losses] has essentially no statistical basis at all." It is, he says, a "purely arbitrary" regulatory system, one that sets off false alarms and demands unnecessary investigations.

Richard Gramann, an official in the materials accounting division of the NRC, reports that the agency is working on an "upgrade rule" designed to improve the accounting system. Changes now under discussion, he says, should make it possible to reduce the number of alarms and resolve discrepancies in data within days, rather than months, as is the case now. He expected the proposal would be ready for a public airing next spring.

Commissioners at the NRC are aware of the trouble with the fuel account books. But if the small sample of opinions taken last week is characteristic, they tend to see it as an intractable physical problem, not as a problem in data gathering. Commissioner Victor Gilinsky, for example, thinks that "people may be getting too sophisticated in trying to keep track of stuff at one or two facilities." The difficulty, he says, is that "you've got some old plants that are not set up to measure things accurately, and they happen to supply fuel for the Navy." Because the fuel is regarded as essential, the normal accounting standards have been waived in at least one case to permit the continuing production of fuel.

Another interested commissioner spoke on background about the problem, specifically identifying the chief source of trouble as the Nuclear Fuel Services plant in Erwin, Tennessee. It is the main supplier of fuel for the Navy's nuclear submarines. The intrinsic accuracy of material measurement at Erwin, he thinks, is not more than a percent or two at best. "The ships must go to sea," says the commissioner, and "although we continue to do materials accounting as best we can, we just have to face the fact that we're not going to be able to have the precision we would like—down in the kilogram range." He concludes: "We're just going to have to live with those ID's until we build a better processing line than Erwin."

Erwin, according to one member of the NRC staff, now produces discrepancies or losses of about 1 kilogram of highly enriched uranium a month. It has been estimated unofficially that it takes no less than 3 and no more than 15 kilograms of weapons-grade material to build a nuclear device. This fact makes the NRC statisticians quite nervous, even though the NRC as an agency has concluded that there is no danger that nuclear fuel is getting into the wrong hands.

The statisticians may have to live with their frustrations and worries for some time. Even the commissioners most sensitive to their concerns seem to think, as one of them said, that the root problem does not lie in statistics, but in ancient machinery which is not going to be replaced soon.—ELIOT MARSHALL

Auto Crash Tests Unsettle Japan and Detroit

Consumer awareness will force auto safety improvements if Joan Claybrook has her way

A newspaper advertisement in the New York area features ambulance attendants loading an accident victim into their vehicle, parked next to a demolished foreign auto. The copy reads, "But it got 43 mpg!" and goes on to ask, "In what are your children driving tonight? Is it a car which passed the latest U.S. safety tests?" The sponsors of the ad are local Chevrolet dealers, whose Chevette autos outperformed their foreign competition in recent crash trials.

The ad is attracting reproof on Madison Avenue and in Japan, but it leaves a smile on the lips of Joan Claybrook, the head of the National Highway Traffic Safety Administration (NHTSA). As the official with primary responsibility for persuading the automakers to design and build safer vehicles, Claybrook has long urged that safety features be advertised competitively. "This is an area where we can compete quite successfully, because the Japanese have never given a priority to safety," Claybrook says. "There's no question but that the U.S. manufacturers have missed a bet in terms of sales and have really denied the public the kind of protection it should have and that's really a shame."

Claybrook, 43, is critical of the industry for failing to provide better passenger restraints, improved crash protection, tougher tires, and exteriors less likely to cause serious pedestrian injuries. She recently wrote to the presidents of the large automakers (Ford, Chrysler, General Motors, and Volkswagen of America) and exhorted them to do better. "With the introduction of large numbers of small cars on American highways," she wrote, "we can anticipate an increase of 10,000 to 15,000 lives lost per year. You should consider that in the years ahead the automakers' view that safety has no market value could prove to be just as wrong as their attitude a year or two ago toward fuel efficiency."

Combative language is not unusual for Claybrook, who previously worked as an attorney for a public interest group funded by Ralph Nader, the industry's initial bête noire. She has received no official word from Andrew Lewis, Reagan's choice for secretary of transportation, but fully expects to be replaced. The industry, at least, would be delighted to see her departure. During the past 4 years she presided over controversial investigations of fuel tank hazards, tire hazards, and transmission defects; she also signed recall orders affecting three times as many autos as her predecessor

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did. Richard Kimball, a top safety and environmental engineer for the Ford Motor Company, remarks that "Claybrook has been a strong consumerist, which swayed her objectivity. We have strong differences of opinion."

Ironically, the fuel economy and safety standards implemented over the last 5 years have probably improved the industry's position on the international market. But the heyday of regulation is now over, if the transition team's advice is taken. NHTSA "has effectively exhausted its ability to increase automobile safety at reasonable social cost," the team wrote to Reagan recently. Also, "the frequency and magnitude of recalls may have passed way beyond a reasonable cost-effective limit." The team suggests letting the marketplace force future improvements in fuel economy.

Science recently talked with Claybrook about her views on auto safety design. She reported that her chief complaint against the automakers is that safety devices already invented have not been put to adequate use. She points to a program in which NHTSA contractors developed prototypes of the "safe car for the 1980's." The purpose of the program was to demonstrate the feasibility of the agency's anticipated safety regulations. William Boehly, NHTSA's chief research engineer, explains that "you hear from one side that any car capable of protecting its occupants in a 45 mph crash will look like a Sherman tank and cost $45,000. The program disproved that."

The most recent NHTSA prototype, publicly displayed last year, features an advanced air-bag system (which inflates automatically in lieu of seat belts), a soft bumper, hood, and front fender (less threatening to pedestrians), run-flat tires (capable of rolling at 50 mph after a puncture), antiskid brakes, and a radar warning system to forestall rear-end collisions. The prototype's body is constructed of high-strength steel filled with lightweight plastic foam; as a result, passengers can sustain front-end collisions at 50 mph with only minor injuries. It has an automatically shifted manual transmission for good fuel economy (33 mpg combined city and highway); and a small engine that meets all EPA emission standards. None of the car's principal safety features have been incorporated in mass-produced autos.

The car, developed by Minicars, Inc., of Goleta, California, is not perfect. Donald Friedman, the company's president, says that the auto weighs more than it should, and that crash test results have not been uniform. He says it also has minor design characteristics awkward for reproduction in large quantity.

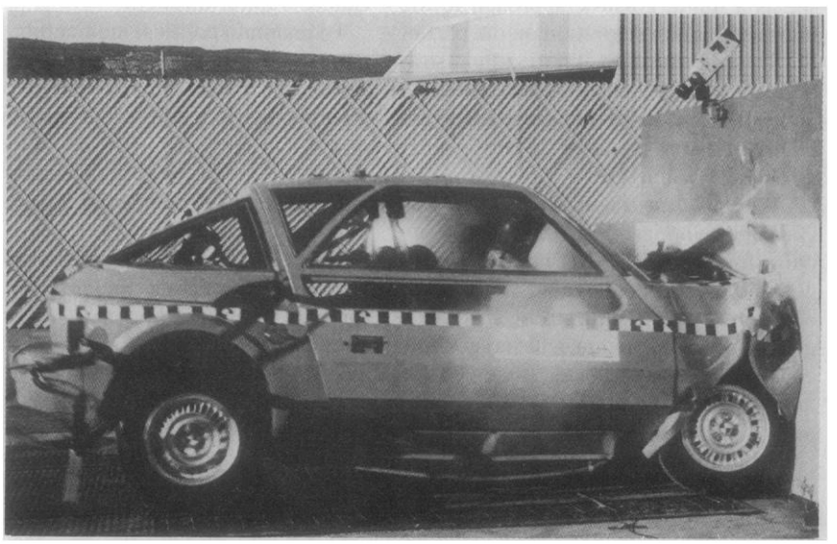
Joan Claybrook

"A safer auto can be built today"

Still, Claybrook insists that the large auto manufacturers "could build this car today. It's just a matter of whether they want to." The existence of this technology proves that "there is nothing inevitable about injury in an auto crash," she says. "The cause of a crash and the cause of an injury are two entirely different issues. The crash has in many cases something to do with driver error, but that's not necessarily the cause of the injury."

The reason that the prototypical "safe" car has not been mass-produced is its extra cost to the industry, says Claybrook. "The automaker's first question is how do I design a car so it has the kind of appeal in luxury items that will give a person the incentive to buy it. Safety investments are a lesser priority. While they are not very expensive, they do add expense. I assume the mindset goes like this: Manufacturer A puts some safety things in their car. Manufacturer B comes along and says by God, they've been successful, we're going to do it better, and all of a sudden it could cost big money, particularly in the short-term. If one moves forward, then that becomes the state-of-the-art." So each manufacturer becomes reluctant to take the first step. Claybrook criticizes such fiscal timidity, claiming that if given a chance, car buyers would indeed support air bags, redesigned safety belts and steering columns, laminated windshields, roof supports, interior padding, and backseat fire barriers.

The auto companies do not see it the same way. Kimball, of Ford Motor Company, says there is little public demand for added safety features. "When features such as seat belts, padded front panels, and safety steering wheels were still optional, they had little success in the marketplace," he says. "When General Motors offered air bags as an option, they had to give most of them away. [GM says they sold fewer than expected.] People don't want to think they'll be the ones involved in accidents"—evidence of which is found in the extremely low percentage of drivers that use seat belts. Supply should follow demand, he says, particularly when added safety results in an economically uncompetitive design. Features such as those on the NHTSA-designed car would be offered if the public wanted them. "We respond to the market for the



Minicars, Inc.

NHSTA's prototype car in a 50-mph crash test

The "passengers" survived with only minor injuries; similar tests with other models moved the engine into the front seat.

most part, we don't push it. That hasn't worked," Kimball says.

Why has there been no general clamor for safer, albeit more expensive automobiles? Claybrook says the reason is that consumers commonly lack information about comparative auto safety, a circumstance she has tried to amend by publishing the results of government-sponsored crash tests.

Perhaps the best test of public interest in safe autos will occur when Minicars, Inc., begins to manufacture the NHTSA-prototype cars for general sale. Friedman says that production at a plant in Puerto Rico will begin in 1984 if requisite financing can be obtained. He anticipates eventual sales of 30,000 cars a year, each priced at $10,000—roughly 20 percent more than comparable cars lacking the NHTSA-developed safety features. Friedman predicts that many of the buyers will be previous auto accident victims or their relatives. Kimball is skeptical. "I don't believe it. Let's let them try it."

A partner in the firm responsible for the Chevette ad claims that it has resulted in higher sales. But the safety ad's future is troubled. A spokesman for General Motors, maker of the Chevette, is reported to have said the company was "not terribly proud" of it. *Automotive Age*, the industry trade journal, said the ad "demonstrates execrable bad taste" and called it shocking, foolish, and stupid.

—R. JEFFREY SMITH

Citizens for Space

Space enthusiasts hope grass roots political action will help boost NASA's budget

Public support of the space program has waxed and waned over the years and some advisers in the incoming Reagan Administration have singled it out for cuts. Yet the recent photographs of Saturn returned by the Voyager spacecraft found a wide and receptive audience. Over the past 5 years, in fact, the number of space enthusiasts has steadily grown, to the point that citizen space groups of one sort or another now command a total membership of some 40,000.

This embryonic space movement has begun to turn to political activism. Buoyed by the Voyager encounters with Jupiter and now Saturn, discouraged by the seemingly endless delays on the space shuttle, dismayed by what many see as a timid, go-slow approach to the future of space exploration on the part of NASA and the last three administrations, and frightened by the prospects under Reagan, more and more space enthusiasts have resolved to raise their voices in Washington.

"We've been dreaming," says David C. Webb, who last spring founded Campaign for Space, the first political action committee (PAC) devoted to funding candidates who favor a strong space program. "Political action will have to become *the* big thing in the space movement if space exploration is to happen at all."

Webb is the first to admit that his committee had no discernable effect on the 1980 elections. Like the similar Citizens' for Space PAC, also founded last spring, he is organizing for 1982 and beyond.

Already, however, space advocates have proved to be effective lobbyists. Last year the L-5 Society of Tucson, Arizona, successfully fought the United Nation's "Moon Treaty" (*Science*, 23 November 1979, p. 915) by hiring Washington lobbyist Leigh S. Ratiner, who had worked for Kennecott Copper Corp. on the Law of the Sea negotiations, to persuade Congress that the treaty would chill any commercial interest in space.

One outgrowth of the Moon Treaty fight was a nationwide telephone network reaching some 6000 people; that network is now a permanent, formal organization. Last summer, for example, it was used to trigger a letter-writing campaign that helped stave off budgetary threats to the space telescope and the Galileo Jupiter mission.

To maintain political momentum, Ratiner has incorporated the "Space Coalition." The idea is that tax-exempt organizations like L-5, limited to spending no more than 20 percent of their funds on legislative action, will pool their money with aerospace companies for a permanent lobbying effort.

Most of the citizens' groups seem receptive enough says Ratiner. But thus far only 3 out of the top 20 aerospace firms have signed up. He and the coalition's new director, Robert Salisbury, chairman of an independent oil and gas company in New York, will seek more corporate support in coming months.

NASA has been targeted by Reagan budget director David Stockman as a prime recipient for cuts, and the coalition's first task may be to persuade Congress to maintain NASA's budget at present levels.

Other space groups, meanwhile, eschew lobbying in favor of public education. One of the most vigorous of these is the Planetary Society, founded in 1979 by Cornell University astronomer Carl Sagan and Jet Propulsion Laboratory director Bruce Murray. In September 1980 the society began its first direct-mail membership drive, using a brochure lavishly illustrated with Voyager and Viking imagery. Some 12,000 people signed up in the first 3 months, at $20 apiece.

A survey by writer Trudy E. Bell in the September issue of *Star & Sky* lists as many as 32 citizen-supported space interest groups, almost all of them founded in the past 5 years. The total membership as of May 1980 was 39,900, although many people belong to several groups.

Bell also quotes the National Opinion Research Center at the University of Chicago, which finds in its annual General Social Survey that public support for the space program, while hardly overwhelming, is on the rise from its all-time low in 1975. In that year, some 60 percent of the respondents thought that too much was being spent on space versus 7.4 percent who felt that too little was being spent. The most recent figures available, from 1978, are, respectively, 47.2 and 11.6 percent.

In their headier moments some space enthusiasts have compared themselves with the environmental movement. Perhaps a more realistic comparison is to the solar energy movement, which likewise has shown that even a small group of people, passionately dedicated to a cause, can have a significant impact on public policy.—M. MITCHELL WALDROP

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