niques and by drawing down reserves. Much of the new drilling since last fall, in fact, seems aimed at the latter goal, rather than at extending known fields or finding new ones.

But the United States is down to about a 9-year reserve, whereas the industry has traditionally regarded a 12-year cushion as a rock-bottom minimum. Unless reserves are to be allowed to shrink further, the production rate will have to be keyed to the discovery of new oil, and that means reversing a 19-year slump in discoveries.

The possibility of an undersea Saudi Arabia off the Atlantic Coast, looms large according to the Survey. But almost no drilling has been done along the Atlantic shelf and the little that has occurred has been sorely disappointing. In the past 5 years half a dozen oil companies have spent upward of $200 million to drill 65 holes off the presumably oil-rich coast of Newfoundland. All but three of these were dry, and those contained too little oil to justify building a pipeline to shore.

In the meantime, the Geological Survey is working on a computerized model of fossil fuel resources that will take account of geologic conditions as they vary from one sedimentary basin to the next. But the new model and its more refined estimates probably won't be of much use to the Federal Energy Administration in drawing up its "blueprint" for Project Independence. The FEA's deadline is November.

Almost certainly the blueprint will call for a sharp increase in domestic oil production by 1980. But any expectation that the increase can come from newly discovered oil will be based on only the haziest assurance that the necessary oil really exists. It seems fair to say that a careful review of conflicting resource estimates is long overdue.

— ROBERT GILLETTE

Beagles: Army under Attack for Research at Edgewood

In response to a continuing simmer of public outrage over the military use of beagles for testing toxic substances, the Army has suspended procurement of beagles pending an "intensive review by appropriate offices and agencies of the DOD."

That is the latest development in a controversy that began last summer when Representative Les Aspin (D–Wisc.) revealed that beagles were being used at Wright-Patterson Air Force Base in Ohio to test the toxicity of new fuels and chemicals being used for routine Air Force operations. The fuss was subsequently intensified when Aspin revealed in September that beagles were also being used for research at Edgewood Arsenal in Maryland, the Army's major facility for chemical warfare research.

By the end of last October, the Pentagon had gotten more than 30,000 angry letters—more mail than has been generated by any single issue since President Truman fired General Douglas MacArthur in 1951. Antivivisectionists filed a lawsuit against the DOD (it was dismissed), and conducted nationwide newspaper campaigns against the use of beagles in military research. Little children wrote in pleading that their pets not be carted away to die in agony in government gas chambers.

The furor has mainly been the work of antivivisectionists, the small but exceedingly vocal portion of the animal-loving community that believes no research is justified that causes any pain or discomfort to animals. But the fusion of two touchy subjects—distrust of the military, and people's passionate attachments to their pets—has made this issue a hard one to defuse. It has given an unprecedented boost to the antivivisection movement, and two legislators, Aspin and Senator Hubert H. Humphrey (D–Minn.) have taken advantage of the momentum to introduce measures that would prohibit the military from using dogs in research related to chemical warfare. Antivivisectionists object to research causing injury to animals regardless of whether it is for military or civilian purposes. The two lawmakers are concerned with asserting more legislative control over the military and, in particular, with curbing chemical warfare research. Thus has a bizarre coalition emerged that has stimulated an unusual public uproar, caused considerable annoyance in the Pentagon, and aroused fears among medical researchers that antivivisectionists are getting a foot in the door that will enable them to press passage of "antiscience" measures inhibiting some animal research.

It all started in June 1973 when an Aspin staffer noted that the Army's Aerospace Medical Research Laboratory at Wright-Patterson was seeking 200 "debarked" beagles for use in its Toxicology Research Program. Aspin, who has made a career of picking on the military for any activities that he considers wasteful, useless, destructive, or downright stupid, promptly publicized the matter.

The Air Force became so irritated at the ensuing outcry that it asked the National Academy of Sciences, through a committee of the Advisory Center on Toxicology of the National Research Council, to investigate its $1.2 million program. That report, released on 12 June, concluded that the Wright-Patterson experiments, which involve testing toxicity of new jet fuel, rocket propellants, fire extinguishants, and environmental pollutants, were by and large admirable and necessary. The NAS said beagles were appropriate for the work, that the animals were well-treated, and "there should be no pain" from the experiments.

Since nothing there involves chemical warfare, Aspin has proclaimed himself satisfied by the report. (Humphrey still contends that any research bearing on human health should be done by civilian agencies because "I know the Defense Department and their tricks.") To antivivisectionists, of course, the report is irrelevant.

The academy report poured oil on troubled water, but the Edgewood issue had already begun to come alive again when on 15 May a member of Aspin's staff discovered a notice in *Commerce Business Daily* in which the Army advertised for 450 purebred beagles for use in research at Edgewood.

The Aspin office promptly shot off a press release decrying the use of beagles in war research, and on 31 May Aspin introduced a bill in the House prohibiting the use of dogs for research involving "any biological or chemical warfare agent."

A few days later Humphrey introduced an amendment to the military procurement authorization act that

would prohibit use of dogs for any military research testing "poisonous gases, radioactive material, poisonous chemicals, germ warfare agents, and nerve gas. . . ."

According to an Army spokesman, there are four components to the beagle experiments at Edgewood: detection of toxicity in the residues of demilitarized, outdated chemical munitions, such as mustard gas; detecting toxicity in normal munitions that have been damaged by fire; testing for toxicity of new riot control agents; and, what the man termed the "catchiest" project—testing of vaccines to be used to inoculate America's fighting men against enemy nerve gas. While scientific procedures would seem to require that animals be exposed to the nerve agents to see if the vaccines work, the Army has said "the dogs will not be exposed to nerve gas." As with the Wright-Patterson experiments, all dogs are later injected with barbiturates and then autopsied. Aspin has two major objections to the Edgewood project. First, he believes the Army has no business doing research with riot-control agents, which he maintains are properly in the domain of civilian police forces. Furthermore, the reluctance of the United States to agree to banning use of riot-control agents and herbicides has for years supplied the chief obstacle to this country's signing of the Geneva Protocol outlawing chemical and biological warfare. Until the Protocol is ratified by the Senate, Aspin thinks research with riot agents, for which longer-lasting and severer varieties continue to be developed, should stop. As for the vaccines, Aspin says that they would not protect civilian populations and that the idea is about as silly as the 1950's craze for building bomb shelters. Biologist Matthew Meselson of Harvard concurs. He says gas masks and suits are better than developing "agent-by-agent" immunological defenses, particularly since enemies could develop nerve agents unknown to U.S. scientists.

An Aspin staffer says the office dropped the beagle research issues last fall when the Army spokesmen gave vague indications that the experiments would be reassessed and that the Army would look into alternatives such as computer modeling and the use of nonpets. The news that experiments were still going on revived their concern.

Antivivisectionists have found the controversy to be a fruitful one for their cause, particularly now that they perceive that they have in Aspin a

Beagle puppy portrayed in antivivisectionist ad.

friend in Congress, and they are doing their best to keep the issue alive. According to the American Anti-Vivisection Society in Philadelphia, this is the biggest issue in the history of that 90-year-old organization. They have spent $100,000 in newspaper ads over the last 10 months, and new members are coming in hand over fist. Hundreds of letters have poured into Aspin's office in response to his dog measure—one correspondent went so far as to say: "I have lived 88 years and in all my years, I have not ever had anything stir me so deeply as this hair brain idea of using our poor little doggies. . . . We have plenty of men in our prisons that would answer your purpose. . . ."

Other animal protection societies, namely the American Association for the Prevention of Cruelty to Animals and the Humane Society of the United States, have expressed concern over the experiments. But the only thing that seems to bother them is the "debarking" of beagles by the Air Force, which they say renders the animals mute. But according to the NRC report, debarking involves the removal, under anesthesia, of part of the vocal flap, a small piece of cartilage on the vocal cords. This does not deprive the animal of means of self-expression but merely reduces the volume of the notoriously penetrating beagle holler. The Air Force says this is sometimes necessary when large numbers of animals are housed indoors to protect their ears and the ears of the experimenters from being exposed to a decibel level exceeding that allowed by the Occupational Safety and Health Act.

Although few members of Congress have any idea what the Edgewood experiments are really about, it seems possible that Edgewood might be compelled to give up its beagles. Humphrey's amendment, preceded by some sentimental talk on the Senate floor ("No matter how bad the day and its problems are, a dog seems to understand," volunteered one member), contained sweeping injunctions against military use of dogs for testing poisonous chemicals and radioactive materials as well as chemical warfare materials—yet it passed the Senate 76–12. (Humphrey later privately assured an alarmed scientist that he would accept a narrowing of the amendment to apply to warfare chemicals.) Aspin's bill has a snowball's chance in hell in the House Armed Services Committee, but a staff member believes the same measure introduced as a floor amendment to the military appropriations bill might well pass. A vote against beagles is a vote against apple pie. And the DOD is unlikely to fight hard to retain in its present form a program involving only a few million dollars.

The Army may be forced to find alternative means of pursuing its research, such as using unsentimental animals, computer modeling, and tissue and organ research. But that would be inconvenient because the beagle has a long history as a standard laboratory animal. Beagles bred for research, like mice, have a consistent and well-understood anatomy, which obviates the need to establish new baseline data. Their pulmonary systems, cardiovascular systems and eyes closely resemble those of man, which makes them particularly appropriate for inhalation experiments (masses of beagles were used a few years ago for cigarette smoking experiments). They have docile personalities and they are relatively cheap ($80 apiece) because they are multiparous and easy to breed. They are big enough but not too big.

None of this cuts any ice with your standard beagle-lover. The military is, as one Army spokesman said, in a "no-win" position. Spokesmen point out resentfully that the military is being unfairly harassed, considering the fact it uses only 1 percent of all beagles used for medical research. (In FY 1974, says the Army, it used 420 of the 65,000 beagles used for research).

The beagle issue is hardly a momentous one, but it has supplied a public baffled, bored, and benumbed with the complexities of Watergate and the national economy with an outwardly simple and straightforward example of a wrong that needs righting.

—CONSTANCE HOLDEN