impose controls on all "fermenters, especially vessels having a self-sterilizing capability," and all "high efficiency particulate filters." Fifty "precursor" compounds useful in making weapons may be regulated, as may a long list of living organisms, including the lowly *Salmonella* and *E. coli* bacteria. One clause extends licensing to "process control instrumentation or computer systems especially designed for use in highly automated facilities, for the purpose of remote plant operations...." The manufacturers claim that most new plants use sophisticated controls of this kind, so the rules would have a broad impact. Says Robert Stevenson, chairman of an advisory group on biological export controls and director of the American Type Culture Collection, "It's true that [items such as fine filters] are needed for the manufacture of biological weapons, but on the other hand, they are so readily available from so many sources that controlling them is a virtual impossibility."

It is not yet clear how the Administration will sort out the conflicting demands of the arms controllers and the business chiefs. But the present hiatus in trade with the Persian Gulf may provide a good opportunity for establishing a new system of export controls. For as Gary Milhollin says, the embargo against Iraq has "put everything on hold for the moment; once it ends, we will be back in the soup again."

■ ELIOT MARSHALL

U.S. Bio-Defenses Faulted by GAO

The Defense Department's program to develop vaccines and drugs to protect U.S. troops from biological weapons could get its first real test in the Persian Gulf this year, but it is already under attack on the domestic front. A General Accounting Office (GAO) report released on 28 January by Senator John Glenn (D–OH) says that the Pentagon may have paid for many less-than-critical projects, and it may be duplicating work already being done at civilian centers like the National Institutes of Health and the Centers for Disease Control.

Since 1984, the U.S. military has spent about $370 million preparing for biological warfare. The budget for these efforts has grown more than 120% in this time, leveling off at around $66 million last year. But GAO found that at least 20% of the expenditures ($47 million) went to projects directed at organisms that were "not validated" by intelligence authorities as true military threats. Another 20% went to projects for which not enough information is available to make a judgment, the GAO says. To Glenn, this is strong evidence of "mismanagement."

Moreover, Glenn argued, military researchers apparently did not make adequate plans to supply troops in the Persian Gulf with a vaccine against predictable threats such as anthrax, a bacterium that infects cattle and sheep and can kill humans in a matter of days. Iraq has reportedly investigated using it in weapons. The government placed "rush" orders for production of anthrax vaccine late last year, according to experts on chemical warfare outside the government, such as Elisa Harris of the Brookings Institution.

Officials in the Pentagon's press office and an assistant to the Army's surgeon general declined to comment, saying they had not had time to study the GAO report.

In the past, some members of Congress, including Representative Wayne Owens (D–UT), have proposed moving civilian aspects of this research out of the Pentagon and into the Public Health Service. Pentagon officials resisted the move, saying military-funded research is focused strictly on defense against weapons. In response to a question from the Glenn committee in 1989, Robert Barker, an assistant to the secretary of defense, wrote: "There are no 'non-military' portions of the [Biological Defense Research Program]. The biomedical research...is focused on militarily relevant problems, with the goal of developing products and information for use in medical defense of U.S. troops against biological warfare attack." If the GAO report is correct, however, military research was not so tightly focused.

When GAO's auditors asked military officials why they had not limited themselves to biological-warfare threats "validated" by the Armed Forces Medical Intelligence Center, they responded that they believed "the intelligence center's interpretation of threat agents was too narrow." GAO points out that unless military officials accept some well-defined limits, they will be able to justify doing research "on virtually all biological agents."

As for overlap with other agencies, GAO noted that the Pentagon's efforts included projects on dengue fever, which has been targeted by the Centers for Disease Control and NIH, and Venezuelan equine encephalitis, which is being studied by the Department of Agriculture. GAO comments that because the Army "does not coordinate its research with federal civilian agencies, [it] cannot ensure that its research is not unnecessarily duplicating" other agencies' investigation of the same organisms. ■ ELIOT MARSHALL

Methanol-Powered

With the war in the oil-rich Middle East raising new concerns about possible gasoline shortages, it may come as a welcome surprise that U.S. automobile makers are about to take a historic step: They are revving up for the first commercial production of cars designed to run on a fuel other than gasoline, in this case methanol. In October, the Environmental Protection Agency (EPA) gave General Motors permission to start making its methanol-powered model, a modified Chevrolet Lumina, the company will begin selling in California in the 1992 model year. Meanwhile, the Ford Motor Company is well along in developing methanol-powered versions of its compact Escort, mid-size Taurus, and full-size Crown Victoria. And Chrysler also has a methanol model in an advanced stage of development, as do most of the major foreign car manufacturers.

Gasoline conservation wasn't the main reason that the U.S. automobile companies began developing cars powered by alternate fuels, however. They were more concerned about meeting air pollution standards, and there methanol has an advantage over gasoline. It burns more cleanly than gasoline, releasing less of the smog-causing hydrocarbons and nitrogen oxides. That's why the first methanol-powered vehicles will be marketed in California, the state with the most stringent emission control standards in the country.

Methanol has other advantages as well. it has an octane rating of 100, compared with 93 to 97 for gasoline. That allows engines to run at higher compression and therefore more efficiently, says Roberta Nichols, who manages Ford's alternative fuels program. Methanol also helps vehicles perform more efficiently because it has a better "flame speed" than gasoline, which speeds burning in the cylinders. And methanol has a high heat of evaporation, which helps to pull heat away from the engine. So it may be possible to reduce the weight of methanol-powered cars by using air-cooling radiator systems, instead of the heavier water-cooling systems.

Aside from such practical benefits, methanol cars could have special appeal for drivers because they are lively. In acceleration tests conducted at the Ford Motor testing grounds near Dearborn, Michigan, the Crown Victorias were able to go from 0 to 60 miles per hour in 11 seconds, a half-second improvement over the gasoline-powered models, according to Ford. The smaller Ford Escort, when powered by methanol, picked up one second in similar trials. These results