

"Efficiency of the Connecticut Motor Vehicle Emission Testing Program"

Statement of Inquiry

The Legislative Program Review and Investigations Committee is seeking a scientific study of the efficacy of the Connecticut Motor Vehicle Emissions Testing Program. The Connecticut Academy of Science and Engineering conducted a similar review in 1986, titled Automobile Emissions Testing.

Given the advance of technology in factory-installed automobile emission control systems, the study is asked to focus on the changing nature of the fleet of vehicles using Connecticut highways and the impact an emissions testing program can have on air quality within the state.

Therefore, it is requested that the Academy examine certain technical aspects of the Connecticut vehicle emissions control program. In particular, the Academy is asked to perform the following tasks:

- a. Analyze the nature of the fleet in terms of age distribution, extent of manufacturer-installed antipollution devices, federal emissions standards required of the manufacturer, and ability to alter tailpipe emissions through repair/corrective action;
- b. Evaluate the probable effects of testing reliability of such variables as
 1. variation among manufacturers and models,
 2. variations in atmospheric conditions,
 3. the pass/fail rate over time;
- a. Evaluate the success of the program in effecting a reduction in atmospheric pollutants;
- b. Evaluate the predictive efficacy of the federal EPA mobile model in light of the Connecticut fleet composition;
- c. Track changes in ambient air quality since 1986, and;
- d. Propose cost effective alternatives or modifications to the program.

Summary of Response

The following summarizes the responses to each of the tasks requested by the Program Review and Investigations Committee and listed on p. v.

Task a: The age distribution of the inspected fleet has not changed significantly over the years from 1994 to 1998. Twenty percent of the fleet is three years or less in age and twenty percent is eleven years or older. However, nationally (Attachment: EPA420-F-99-017, May 1999) half the vehicles sold in the past few years are SUVs, which have greater emissions limits and achieve fewer miles per gallon of fuel than automobiles. The Federal Government has been tightening emissions limits for vehicles; the US Environmental Protection Agency (EPA) proposes new limits in the 2004 to 2009 time period. The old limits for nitrogen oxide and the proposed new limits for cars and light trucks, including minivans and SUVs, are listed in the tables in the Attachment. These are the requirements on the manufacturer.

Catalysts were introduced in automobiles in 1974. Closed loop computer systems were introduced in 1980. Electronic fuel injection and ignition were introduced in the middle 1980s, and improvements have continued in motor efficiency and control of emissions through the 1990s. On board diagnostic assessment of engine performance has been used in 1996 and later vehicles to check for performance and related emissions.

The ability to alter tailpipe emissions through tampering is severely limited in computer controlled engines. There is no reason to tamper because the engine will not operate as well. Repair/corrective action is effective in keeping these engines operating at peak efficiency and at reduced emissions.

Task b: The variation among manufacturers does not indicate that any automaker provides a superior product when it comes to meeting emissions standards. Data showing the failure rates over the past four years are shown in Section II.A. The variation for a single maker from year to year is generally greater than the variation between makers.

Variations in atmospheric conditions, specifically temperature, pressure and humidity, do not impact test results. Data and graphs in Section II.B. show some variability in failure rates across the atmospheric conditions measured during tests, but no consistent bias is evident.

The pass/fail rate over time, with the same emissions limits, does not appear to change. Overall, about six percent of the tested fleet fails the emissions test. Section II.C. contains a table and a graph provided by the Department of Motor Vehicles from their testing program. The clear change over time is the number of vehicles failing as they age. Current year cars fail at a rate of less than 0.1 percent, two-year-old cars at less than 0.4 percent and three-year-old cars at less than 0.7 percent while eight-year-old cars fail nearly 6.5 percent of the time. However, all of this is called into question for tests conducted in 1998 by the discovery that start-up problems have affected the failure rates in the last year, according to the Department of Motor Vehicles as presented to the Program Review and Investigations Committee on October 26, 1999 (see Section II.D., Figure 9).

Task c: It is not possible to separate the effect of the state's Inspection and Maintenance Program from the effect of vehicle emissions reduction mandated by the Federal Government. Air quality changes, discussed below, and emissions estimates generated by the Department of Environmental Protection demonstrate that emissions have been reduced and Connecticut air has become cleaner during the time the program has been in existence. However, that time period is the same as the period of mandated vehicle changes and the Study Committee is unable to separate the effects. Changes in air quality and effects of the vehicle emissions testing program are discussed in Section III.

Task d: Reviews on the ability of the MOBIL Model to reflect accurately real world emissions are mixed. An evaluation of Canadian tunnel tests states that the Model agrees with measured concentrations, while similar studies in the US find less agreement. Both agree that the age of vehicles in the test is important to the results. A new version of the Model is scheduled for release in February 2000. It should be tested in a similar manner.

Task e: Annual trends show the peak concentrations of ozone since 1986 decreasing regularly over the entire period of record. Section III is summarized from a final report submitted to the Department of Environmental Protection by a member of the Study Committee (Miller) and his colleagues.

Task f: Remote sensing is being proposed by the Department of Environmental Protection for the new State Implementation Plan and the Academy endorses this action. "Clean Screen" (a mail-in fee program) should be included with the remote-sensing program. Other recommended cost-effective changes are:

- Drop cars less than four years old from the inspection requirement.
- Prepare for On Board Diagnostic testing in the future.
- Mandate an external quality assurance function.
- Compare the results of failed inspections with second inspections to demonstrate how much reduction is achieved from repairing failed vehicles.

The report is followed (Section 6) by a cost/benefit analysis of the present Program, and an Addendum that addresses issues raised by recently released data.

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