

GAO

Report to the Chairman, Subcommittee  
on Oversight and Investigations,  
Committee on Energy and Commerce,  
House of Representatives

September 1992

# AIR POLLUTION

## Unresolved Issues May Hamper Success of EPA's Proposed Emissions Program



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**Resources, Community, and  
Economic Development Division**

B-248220

September 25, 1992

The Honorable John D. Dingell  
Chairman, Subcommittee on  
Oversight and Investigations  
Committee on Energy and Commerce  
House of Representatives

Dear Mr. Chairman:

Emissions from motor vehicles contribute significantly to urban ozone and carbon monoxide pollution. To help reduce motor vehicle emissions, the Environmental Protection Agency (EPA) in 1978 established a policy for state inspection and maintenance (I&M) programs pursuant to its authority under the Clean Air Act Amendments of 1977. Because emissions were not reduced to EPA-established levels, the Congress in the Clean Air Act Amendments of 1990 required the upgrading of inspection and maintenance programs in the most seriously polluted areas of the country. The 1990 amendments also required the EPA Administrator to issue guidance to states for these programs. In response to these requirements, EPA proposed a regulation in July 1992 that would significantly alter existing I&M programs in these seriously polluted areas. This proposal, which EPA estimates will have over a \$1 billion economic impact on the inspection and repair industries, includes an IM240 test—a more sophisticated means for measuring motor vehicle emissions.

In your February 19, 1992, letter and in our subsequent discussions with your office, you expressed particular concern about the potential impact of EPA's proposed I&M regulation on the states and the public. Specifically, you requested that GAO provide information on whether (1) EPA's proposal is the most effective approach for identifying and repairing vehicles that exceed emission standards and (2) EPA has studied alternative test procedures to reduce emissions from motor vehicles.

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**Results in Brief**

EPA states that it chose the IM240 test procedure because it more accurately identifies vehicles in need of repair than existing procedures and provides additional diagnostic data to facilitate that repair. However, there are drawbacks to the IM240 test procedure for both the identification and repair of out-of-compliance vehicles that could hamper the test procedure's effectiveness. Our review of EPA data found that over 25 percent of the vehicles that EPA tested using the IM240 test procedure

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failed an initial emissions test but passed a second emissions test, even though no repairs were made to the vehicles. These results raise questions about whether the IM240 test procedure is reliable in identifying out-of-compliance vehicles and whether inaccurate identification of emission problems could result in unnecessary repairs.

Vehicles that fail an IM240 test may also be more difficult to repair because of trouble in diagnosing the cause of emission problems, mechanics' not being trained in emission repairs for high-technology vehicles, and the inability of repair shops to afford IM240 equipment to replicate emission tests and determine if repairs were effective. These drawbacks could cause frustration for motorists who could be required to make repeated trips to have their vehicles tested, repaired, and retested, with the possibility of higher costs because of additional or unnecessary repairs.

Because of the many unresolved issues, we question why EPA did not study the effectiveness of an alternative test procedure before issuing the proposed I&M regulation. EPA, in its proposed regulation, has suggested to states that they could use an alternative to IM240 if the alternative is an effective substitute. Many states, however, have been reluctant to evaluate another option because they do not have the expertise and/or resources. Studies conducted by various groups indicate that another test option may be able to produce results similar to the IM240 test but at a lower cost and possibly less inconvenience to the public.

Although EPA has just begun to study this other test option, it is unclear when the study results will be available to the states. Some state officials believe EPA's proposed I&M regulation is ambiguous about when EPA is proposing to allow states with seriously polluted areas to make a commitment to a specific I&M test procedure. EPA told us that it intends to give these states until November 1993 to make a commitment. It is important for EPA to complete its study on whether an alternative to the IM240 test exists before November 1993. Otherwise, states will not have conclusive information and they may be forced to adopt a test procedure that may not represent the most cost-effective and most convenient approach for their motorists.

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## Background

Under the Clean Air Act, EPA is responsible for identifying pollutants that endanger the public health and for establishing levels of air quality to protect the public health through the National Ambient Air Quality

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Standards (NAAQS). The act also requires each state to submit to EPA an implementation plan for achieving the NAAQS within the state. An area that exceeds the NAAQS for a particular pollutant is classified as a nonattainment area for that pollutant.

The Clean Air Act Amendments of 1990 require states to categorize their nonattainment areas for ozone and carbon monoxide according to the severity of the pollution problem and to comply with ozone and carbon monoxide NAAQS within designated time periods. To achieve compliance, states are further required to revise their implementation plans to include pollution control measures established for each nonattainment category. Motor vehicle inspection and maintenance programs are one of the pollution control measures prescribed. Depending on the severity of the nonattainment area, these inspection and maintenance programs must be either basic or enhanced. Enhanced programs in ozone nonattainment areas must be designed to reduce vehicle emissions of hydrocarbons and nitrogen oxides, which combine in the presence of sunlight to create ozone. As of August 1992, 98 areas are required to implement basic programs, and 83 areas are required to implement enhanced I&M programs. Over 40 percent of the motoring public is located in either a basic or enhanced I&M area. A listing of these areas is provided in appendix I.

In response to the 1990 amendments, EPA is in the process of promulgating regulations for basic and enhanced I&M programs. EPA's basic program would require testing 1968 and newer cars using the existing "idle test" procedure. In an idle test, vehicle hydrocarbon and carbon monoxide emissions are measured while the vehicle is idling. EPA's proposed enhanced program will apply to more types of vehicles, both 1968 and newer cars as well as 1968 and newer light-duty trucks. In addition, the enhanced program will require increasingly sophisticated emissions tests, depending on the age of the vehicle. The most significant change involves 1986 and newer vehicles, which will be required to undergo a more stringent tailpipe exhaust emission test. The more stringent test is called an IM240 test.

The IM240 is an emissions test that measures a vehicle's tailpipe emissions during a 240-second driving cycle that includes acceleration, cruise, and deceleration. In addition to the IM240 test, EPA has developed two new tests—the purge and pressure tests to check the vehicle's evaporative emissions control system.<sup>1</sup> The purge test measures the excess gasoline

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<sup>1</sup>This system consists of a charcoal-based canister that traps and periodically purges excess gasoline vapors to the vehicle's engine, where they are used in the fuel combustion process.

vapors that flow from the vehicle's evaporative canister to the vehicle's engine. This test is performed during the IM240 test since the purging process does not occur while the vehicle is in idle. The pressure test checks the integrity of the connections, lines, fuel tank, and filler cap in the vehicle's fuel system. Failure to maintain a certain pressure during the test indicates leaks in the system and therefore excess emissions from the vehicle. EPA's proposed I&M program would require the pressure test on 1983 and newer cars and the purge test on 1986 and newer cars and light-duty trucks.

EPA estimates that areas adopting the enhanced program will experience a 28-percent reduction in hydrocarbons, a 31-percent reduction in carbon monoxide emissions, and a 9-percent reduction in nitrogen oxide emissions from motor vehicles by the year 2000, when compared to what the area would have experienced without an I&M program.

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## IM240 Test May Not Be as Effective as EPA Envisions

EPA claims that one of the most significant advantages of the IM240 test is that it will accurately identify vehicles that exceed emission standards. EPA believes that the IM240 test will be especially effective for newer, higher-technology vehicles, beginning with the 1986 model year. Most 1986 and newer vehicles have computer-controlled emission systems that adjust the flow of gasoline and air mixture to the engine as the vehicle's speed changes. This reduces the amount of unburned gasoline that escapes through the vehicle's tailpipe. As a result, emissions from these vehicles tend to be lower while the vehicle is idling or at a constant speed.

Current I&M test procedures, such as the two-speed procedure, are not effective in measuring emissions from these vehicles because they do not simulate actual driving conditions.<sup>2</sup>

According to EPA, the IM240 test is more representative of actual driving conditions because vehicles are tested on a treadmill-like device that allows the vehicle to simulate acceleration, cruise, and deceleration operating cycles while remaining stationary. This is important because emissions from vehicles can vary under different driving cycles.

EPA has asserted that a major key to an effective I&M program is the ability to accurately fail out-of-compliance vehicles and pass clean vehicles. EPA has also asserted that an advantage of the IM240 test is its accuracy in

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<sup>2</sup>The two-speed test procedure measures vehicle exhaust at the idle and 2,500-revolutions-per-minute (about 50-miles per-hour) speed cycles.

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identifying high-emitting vehicles. Therefore, we reviewed whether similar emission test results occurred when the same vehicle was tested at least twice. Getting consistent results is important for motorists because EPA's proposed regulations would require test and repair services to be performed separately in enhanced programs unless states can demonstrate that a combined test and repair program would be equally effective. Motorists in states that adopt EPA's enhanced program will get their vehicles tested at a test station and repaired at a separate facility. This means the motorists will have to return to the test location visited or an alternative test location after repairs are completed to receive their emissions certificate. If emission results vary from one test location to another, motorists may have to make additional trips between the test station and repair facility or they could have unnecessary repairs made to their vehicles.

We reviewed EPA data on vehicles that were initially tested at the Hammond, Indiana, testing site and subsequently tested at EPA's contractor laboratory facility in New Carlisle, Indiana. We found that test results can vary substantially from one location to the other. We identified 64 vehicles—1986 model year or newer—that failed the IM240 test at the Hammond testing site and were sent for further test and repair services at the contractor's laboratory. In each case the laboratory emission test results varied from lane test results for at least one pollutant. Eighteen of the 64 vehicles, or 28 percent, that initially failed an IM240 test at the Hammond testing site passed a second IM240 test at the laboratory in New Carlisle, even though no repairs were made to the 18 vehicles.<sup>3</sup>

The enhanced I&M standard for hydrocarbon emissions is .8 grams per mile. That is, vehicles with hydrocarbon emission levels that exceed this standard are out of compliance. One of the vehicles that exceeded the hydrocarbon standard at the Hammond testing site emitted 4.0 grams of emission per mile, or five times the standard. When this same vehicle was tested using similar IM240 equipment at the laboratory, it emitted .4 grams of hydrocarbons per mile, which is well under the standard and 10 times less than the initial test results.

Another vehicle failed the enhanced carbon monoxide I&M standard of 15 grams per mile at the Hammond site with an emission level of 22.2 grams per mile. In a subsequent IM240 test at the contractor's facility, the same vehicle emitted just under 2.9 grams per mile, or well under the standard

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<sup>3</sup>EPA contractors test vehicles at the New Carlisle laboratory with owners' fuel in the gasoline tank to ensure that comparative results are obtained.

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and about eight times less than the initial test results. The remaining 16 vehicles that failed at the Hammond site and subsequently passed at the New Carlisle laboratory had less dramatic differences in emission test results. However, these differences affected the compliance status of the vehicles and raised questions about the reliability of the IM240 test results. Actual emission test results for the 18 vehicles are included in appendix II.

In August 1992 testimony,<sup>4</sup> the Motor Vehicle Manufacturers Association reported a problem with variances in vehicle emission test results for vehicles initially tested at the Hammond testing site and subsequently tested at EPA's contractor laboratory. The Association found that 11 percent of the vehicles showed discrepancies. However, because of the time necessary to formally request access to the Association's data, as the Association had asked, we were unable to determine whether the Association's analysis was comparable to ours.

EPA officials told us that they were working on a procedure that would allow two ways for vehicles to pass the IM240 test. This procedure involves considering both the total 240 seconds and the last 150 seconds of the IM240 test cycle to determine whether the vehicle meets the emission standards. If the vehicle meets the standards with either reading, then it would be considered a passing vehicle. EPA believes this procedure will help to address the variability problem with some marginally failing vehicles. However, we assessed the procedure for 11 vehicles that had complete data available and found that for 6 of the 11 vehicles, the procedure would not have made a difference in the vehicle's failing and subsequently passing an IM240 test. As a result, on the basis of this limited analysis, it appears that EPA's two ways to meet criteria could help address the variability problem for some vehicles but not for others.

According to the EPA contractor official responsible for the Hammond study, the variance in test results from one location to another is due to changes in both the vehicle and ambient conditions. Changes in vehicle engine temperature can affect the emission levels because the vehicle's catalytic converter, which reduces emissions, does not engage until the vehicle reaches high temperatures. Likewise, ambient conditions, such as hot weather, can heat up the fuel in the vehicle's gasoline tank, causing increased gasoline evaporation, which increases vehicle emissions. EPA requires that vehicles that fail the initial IM240 test at the Hammond site be preconditioned with a 3-mile drive prior to the subsequent test at the

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<sup>4</sup>EPA Hearing on Proposed I&M Regulation, sponsored by EPA at the Hyatt Regency Hotel, Washington, D.C., Aug. 12-13, 1992.

laboratory site. EPA assumes that the vehicle's emission system was engaged and operating at the time of the initial test. By preconditioning the vehicle prior to testing at the laboratory facility, EPA is making an effort to simulate the condition of the vehicle at the time of its initial test. However, our findings indicate that this measure has not been sufficient to address the problem of variability in emission test results.

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### Vehicles May Be More Difficult to Repair Under an Im240 Program

EPA predicts that a larger percentage of vehicles will fail the IM240 test than fail current I&M tests, thus increasing emission benefits to an area. This will occur only if the out-of-compliance vehicles are properly repaired. We found that several problems could complicate the repair of vehicles that fail the IM240 test. These problems include (1) difficulty in diagnosing problems and repairing vehicles that only marginally exceed the emission standards or that fail only under certain driving cycles; (2) lack of adequately trained mechanics in emission system diagnostics for new, higher-technology vehicles; and (3) inability of repair shops to afford IM240 equipment to confirm that their repairs were effective. Collectively, these problems will make it more difficult to properly diagnose and repair vehicles that fail the IM240 test and could reduce the effectiveness of an I&M program. In addition, motorists could be sent back and forth between test sites and repair shops, increasing their frustration and inconvenience. If this occurs, it could erode public confidence and acceptance of I&M programs, which ultimately could further reduce their effectiveness.

According to EPA, repairs to pass the IM240 test procedure may require repair technicians to have greater diagnostic proficiency than they generally need to repair vehicles that fail current I&M test procedures. Officials from the Automotive Service Association, which represents repair technicians from independent automotive repair shops, told us that newer vehicles that only fail under certain driving cycles can indicate worn or faulty computer components. These components do not always register as malfunctioning. As a result, a mechanic may not know what the specific emissions problem is and may use a trial-by-error approach until the vehicle is brought back into compliance. EPA maintains that only a small number of vehicles will fall into this category. However, EPA does not have any data on commercial repair experience with vehicles that fail the IM240 test.

Repair technicians need more training in emission system diagnostics to help ensure that they can properly repair vehicles that fail the IM240 test, according to the executive director of the National Institute of Automotive

Service Excellence. The National Institute of Automotive Service Excellence is a leading automotive repair testing organization. Repair technicians can be certified in eight categories of automotive repair. The engine diagnostic category includes a component on vehicle emission system operations. According to the Institute, about 140,000 repair technicians across the country are certified in engine diagnostics. Although the executive director sees the lack of training for mechanics as a problem, he could not say how much additional training will be required, in part because EPA has not had any vehicles repaired by commercial repair shops and therefore has not developed trend data on the commercial repair of vehicles that fail the IM240 test.

According to EPA Office of Mobile Source officials who are responsible for compiling and analyzing data on the IM240 test, vehicles that failed the IM240 test were repaired by EPA contractor mechanics. This occurred primarily because the contract was awarded for several emission testing programs, not just the I&M program. According to one of EPA's project managers, repair data from commercial repair shops on out-of-compliance motor vehicles that failed the IM240 test would have given EPA a better indication of how successful mechanics will be on repairing these vehicles. Many commercial mechanics may not have the level of experience that EPA contractor mechanics have. The three contractor mechanics who repaired vehicles that failed the IM240 test at the Hammond test lane had formal automotive repair training and several years of experience with dealerships or other repair shops.

Interestingly, some current I&M programs are experiencing problems fixing out-of-compliance vehicles, even though the test procedures are not as sophisticated as the IM240 test. Some of these programs have retest failure rates (that is, vehicles continue to exceed standards after repairs) that are quite high. For example, in one state program, considered to be one of the nation's best programs by EPA, the retest failure rate for 1991 was nearly 40 percent. This means that 4 out of 10 vehicles that initially failed their I&M test in 1991 continued to fail after repairs were made. Associations that represent repair technicians agreed that the repair situation could be worse under an IM240-based program if technicians do not receive additional training.<sup>5</sup>

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<sup>5</sup>We discussed several repair issues, including training and equipment needs, that could affect the success of an IM240 test with the Automotive Service Association, California Service Station and Automotive Repair Association, New York State Association of Service Stations, Southern California Service Association, and the National Institute for Automotive Service Excellence.

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EPA agrees that training and certification of repair technicians is essential to reducing motorists' frustration and inconvenience that may result from improperly repaired vehicles. In its July 1992 proposal, EPA recommended that states with I&M programs establish a certification program that includes testing and training of repair technicians in I&M repairs. A repair association representative we spoke with questioned whether an adequate number of technicians can be trained and certified by July 1994—the date by which most states have to at least begin to phase in their enhanced I&M programs.

The cost of IM240 equipment may prohibit independent repair shops from investing in it. EPA estimates that IM240 equipment will cost, at a minimum, \$140,000 per test lane versus between \$15,000 and \$40,000 for current I&M test equipment. As a result, repair shops may not buy the IM240 equipment and thus would not be able to replicate the test to ensure that repairs brought vehicles back into compliance. This could inconvenience motorists when repair technicians are not able to fix noncomplying vehicles in one service appointment. Motorists living in states that currently have test and repair services together will likely incur the greater inconvenience because they are used to going to one location to have their vehicles tested, repaired, and certified. At a minimum, if a vehicle fails the initial test, three trips will be required to have the vehicle certified. First, a motorist would have to drive to the test station. Upon failing the initial test, the motorist would have to make a second trip to take the vehicle to the repair facility and a third trip back to a testing site for a retest and a certificate of conformity. If the vehicle continues to fail after the initial repair, the motorist would have to make two more trips—one to the repair facility and a second back to a testing site—for a total of five trips.

The agency is currently developing less expensive diagnostic equipment that it hopes will allow the repair industry to confirm repairs to vehicles that fail the IM240 test, according to EPA officials. To date, however, this equipment has not been fully tested in a commercial setting, and EPA officials acknowledge that it may not be sufficient for all vehicles that fail the IM240 test.

As mentioned earlier, EPA has acknowledged that more vehicles will fail the IM240 test and that some of these vehicles will have problems that will be more difficult for mechanics to diagnose and repair. EPA claims, however, that the additional diagnostic information from the IM240 test and other provisions in EPA's proposal, such as hotline assistance, which will allow mechanics to call repair centers that have trend data for

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diagnostic and repair tips, will help to ensure that out-of-compliance vehicles are properly repaired. Repair association officials we spoke to agreed that these measures would be helpful in building a knowledge base on out-of-compliance vehicles but not sufficient to help ensure proper repairs.

EPA did not test many vehicles to assess the repair effectiveness on vehicles that failed the IM240 test. We were able to identify only 20 1986 model year and newer vehicles that EPA had complete data on and that were specifically tested to determine the repair effectiveness. Of these 20 vehicles, EPA contractor mechanics could not fix 7, or 35 percent, of the vehicles in their first repair attempt. After subsequent repairs, four of the vehicles were brought back into compliance with emission standards. According to EPA officials, the remaining three vehicles were not fixed because they either were too costly to repair or required too much time to repair. Because they had IM240 equipment on the premises, contractor mechanics were able to measure the benefit of their repairs on noncomplying vehicles to assess whether those repairs brought the vehicles back into compliance. Even with this equipment, mechanics had difficulty repairing some vehicles.

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### EPA Proposes Two Options to Reduce Inconvenience

Recognizing the importance of public acceptance of the I&M program, EPA is requesting comments on two possible options to address the issue of motorist inconvenience. Under the first option, motorists who take their failing vehicles to a certified mechanic for repair will receive a certificate stating that they have complied with the state I&M program, regardless of whether the vehicle passes or fails the retest.<sup>6</sup> While this would help reduce motorist inconvenience and frustration, it would also allow vehicles that failed the retest to operate while producing excess emissions until the next test cycle. This test cycle could be 2 years because EPA's proposed regulation strongly recommends that states adopting the IM240 test conduct a biennial testing program. As currently outlined by EPA, this option would cover owners only for the first cycle in a program's existence.

EPA's second option to address the problem of continual testing and repair is to allow certified mechanics in enhanced programs to test and repair

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<sup>6</sup>EPA has recognized that this option may conflict with the requirement in the 1990 Clean Air Act Amendments that motorists must spend a minimum of \$450 on repairs that produce emission reductions before state programs can waive further repairs. EPA has requested comment on this issue.

vehicles using steady-state test equipment rather than IM240 equipment.<sup>7</sup> This approach would be virtually the same as found in current programs that combine test and repair services. Because EPA officials are concerned about the ability of a steady-state test to accurately measure vehicle exhaust and evaporative emissions, they believe that this approach would not achieve the emission reductions required by the proposed enhanced I&M program.

In the short term, both options could be helpful in reducing motorists' inconvenience. However, if adopted by states, both options could diminish the emission reductions called for in the 1990 Clean Air Act Amendments.

## EPA Has Not Determined If an Alternative to IM240 Testing Exists

In its notice of proposed rulemaking, EPA provides that states may seek approval of alternative tests, contingent upon the states' demonstrating to EPA that such alternatives are as effective as EPA's recommended IM240 test. However, EPA itself is promoting the IM240 test as part of its enhanced program, even though it has yet to complete a study on an alternative to the IM240 test procedure. EPA also states that if it concludes that the alternative procedure is as effective as the IM240 test procedure, the final rule will approve its use as a substitute. Although EPA planned to study an alternative test procedure beginning in July 1992, its study did not begin until September 1992. EPA told us that despite the delay in starting the study, it believes that sufficient data will be available before states have to make a decision on what test procedure to implement. However, EPA could not provide us with specific time frames for completing the study.

According to inspection and maintenance officials from several states who are responsible for implementing the enhanced I&M program, they would be very interested in any test data on EPA's Phoenix study. These data could influence their decision on the type of test procedure to implement. Many of these officials said they did not have the funds or expertise to properly evaluate alternative test procedures on their own. For instance, one official said that the state did not have the expertise to compare the emissions benefits of the IM240 test with an optional test procedure.

State officials vary in their interpretations of language contained in EPA's proposed regulation requiring the states to make a commitment to the adoption of a program meeting the requirements of the regulation by

<sup>7</sup>The steady-state test procedure requires a simpler, less sophisticated dynamometer than IM240 and involves simulating a constant vehicle speed to test vehicle emissions.

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November 1992. The proposed rule provides that by November 1992 states must submit revisions to their state implementation plans. These revisions include a formal commitment from the governor to the adoption and implementation of an I&M program meeting all the requirements of the proposed rule and a schedule for implementing the program. However, the proposed rule would allow states an additional year, until November 1993, to submit their complete implementation plan revisions.

Under the Clean Air Act Amendments of 1990, states that are required to establish enhanced I&M programs must submit revisions to their state implementation plans providing for the enhanced program by November 1992. The amendments further require that the states' enhanced programs shall comply in all respects with guidance issued by EPA. The law required EPA to issue its guidance by November 15, 1991, but EPA did not do so. EPA is currently under court order to issue its final I&M regulation by November 6, 1992.<sup>8</sup> Because states will not have EPA's final regulation until 9 days before their state implementation plan revisions are due, EPA is proposing to allow states until November 15, 1993, to submit their complete implementation plan revisions.

Some state officials interpret the language contained in the proposed rule to mean that they have to make a commitment to a specific test procedure, such as the IM240 test procedure, by November 1992. Other state officials believe EPA is proposing to allow them until November 1993 to make a commitment to a specific test procedure. EPA's Office of General Counsel told us that the language contained in the proposed rule means that the states must make a commitment to an I&M program that meets all the requirements of the rule in November 1992 but that states do not have to make a commitment to a specific test procedure until November 1993. As a result, some states that thought they had to make a commitment to a specific test procedure by November 1992 will have until November 1993 under EPA's current proposal.

Although EPA has not yet determined if an alternative procedure to the IM240 test is available, other groups either have studied or are in the process of studying whether another test procedure may be a viable alternative on the basis of cost and/or effectiveness. These groups include Resources for the Future, ARCO Products Company, and the California Air Resources Board. One procedure, the steady-state loaded mode, involves a dynamometer-based test similar to the IM240 test. It differs, however, from

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<sup>8</sup>Natural Resources Defense Council, Inc. v. United States Environmental Protection Agency, No. CV-92-1494 (E.D.N.Y. July 1, 1992).

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the IM240 test advocated by EPA because it is not a transient test and does not require a sophisticated dynamometer. The steady-state loaded mode procedure being studied is a variation from the current steady-state test in use because it can measure nitrogen oxides and evaporative emissions. Our discussions with the groups studying this procedure suggest that the steady-state loaded mode test procedure may be a viable alternative to the IM240 test because it may be as effective in reducing motor vehicle emissions and the equipment to conduct the test may cost less.

Resources for the Future, a Washington, D.C.-based policy research organization, compared, among other things, the emission reduction benefits and cost-effectiveness of testing being proposed by EPA with that of a two-speed idle test procedure.<sup>9</sup> In this comparison, Resources for the Future used EPA data from a February 1992 draft EPA document entitled I&M Costs, Benefits, and Impact Analysis and included these data in its own vehicle emissions model and cost model. The organization found that the purge and pressure tests, which are separate from the IM240 tailpipe test, are very cost-effective for identifying hydrocarbon emissions and that the emissions reduction benefit from these tests should not be combined with that of the IM240 tailpipe test for purposes of assessing IM240's effectiveness. The emission reduction benefit of adding the IM240 tailpipe test, however, yields only marginal hydrocarbon emission reductions over a two-speed idle procedure, but at a much higher cost. For example, Resources for the Future found that the IM240 tailpipe test only reduced an additional .4 tons of hydrocarbon emissions at a cost of \$12,000 per ton. This figure is considerably higher than EPA's estimate of \$880 per ton of hydrocarbon emissions reduced. EPA's cost figure is much lower because it represents an average figure that includes both the purge and pressure tests along with the tailpipe test.

According to Resources for the Future, the cost estimate cited by EPA does not provide the best indication of the cost-effectiveness of the IM240 test because it includes the purge and pressure tests, which are much more cost-effective than the IM240 tailpipe test component. Resources for the Future therefore concluded that EPA might be well advised to allow more flexibility in the type of test procedure used rather than virtually mandate the IM240 test nationwide. The group further concluded that other test procedures may be as or more cost-effective than the IM240 test and that EPA should not rush to judge the IM240 test as the most effective test procedure.

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<sup>9</sup>This procedure measures vehicle emissions while the vehicle is idling and at 2,500 revolutions per minute. The emission reduction benefit (for hydrocarbon emissions) of this procedure, coupled with the purge and pressure test components, was compared to EPA's IM240 procedure.

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ARCO Products Company, a subsidiary of Atlantic Richfield Company, conducted a limited study on the steady-state loaded mode test. According to ARCO Products, the study demonstrated that a steady-state loaded mode test is as effective in passing and failing cars as the IM240 test for both exhaust and evaporative emissions. ARCO acknowledged, however, that to fully define an enhanced program using the steady-state loaded mode test procedure, more study is needed.

The California Air Resources Board is also studying a steady-state loaded test procedure in conjunction with its assessment of the effectiveness of California's I&M program. The Board anticipates having a preliminary report on the results by the end of the year. As of August 1992, no preliminary data on the testing were available.

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## Conclusions

EPA's proposed I&M regulation, which is to be made final by November 6, 1992, will cost over \$1 billion and will affect a large percentage of the motoring public. The regulation, when implemented, could have a major impact on reducing air pollution from motor vehicles well into the twenty-first century. However, in our view, considering the cost and impact of this regulation, there are too many issues that have yet to be resolved. These issues include whether (1) emission failures are being properly identified by the IM240 test, (2) emission failures can be properly repaired, (3) motorists will be unnecessarily inconvenienced and frustrated, and (4) alternative procedures exist that are less costly but could provide similar emissions benefit. We believe that unless these issues are resolved, they could erode public confidence and reduce motorists' acceptance of the I&M program. This, in turn, could threaten the success of the program, thereby threatening the emission reductions envisioned by EPA and called for in the 1990 Clean Air Act Amendments.

EPA informed us that it is proposing to allow states until November 1993 to make a commitment to a specific I&M test procedure. This time frame is not clearly stated in EPA's proposed regulation, and some states believe they have to decide by November 1992. It is also unclear whether the results of EPA's study of an alternative to the IM240 test procedure will be available to states before November 1993. Information gathered from the study could help states with seriously polluted areas decide on the most effective I&M test procedure.

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## Recommendations

To ensure that states have a clear understanding of when EPA is requiring them to make a commitment to a specific test procedure, we recommend that the Administrator of EPA clarify in the final regulation that the agency intends to allow states until November 1993 to make a commitment to a specific test procedure. Also, to help ensure the long-term acceptance and success of the emissions reduction program, we recommend that the Administrator of EPA expedite the agency's study of an alternative test procedure to the IM240 test so that EPA can provide specific guidance to the states on whether a viable alternative to the IM240 test exists prior to November 1993, which is when EPA is proposing to allow states to submit a final determination on their I&M program. In addition, as EPA works towards implementing a more stringent I&M program, we recommend that the Administrator of EPA direct the agency to work closely with the states and the repair industry to resolve the issues related to the identification and repair of out-of-compliance vehicles discussed in this report.

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## Agency Comments

We discussed the facts contained in this report with EPA officials, including the Director, Office of Mobile Sources. On the basis of the agency's comments, we updated some initiatives by EPA, including its efforts to address emission test variability and its study on an alternative to the IM240 test procedure. We also clarified other data contained in this report. As requested, however, we did not obtain written agency comments.

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## Scope and Methodology

We conducted our review from March to September 1992 in accordance with generally accepted government auditing standards. To obtain information on the issues you raised, we reviewed EPA vehicle emission data for vehicles tested on IM240 equipment as well as studies by various research groups. We also interviewed EPA and state I&M officials, EPA contractors and repair association representatives, and independent repair shop owners. Additionally, we reviewed EPA's proposed regulation and supporting documentation as well as correspondence relating to I&M issues from EPA and other interested parties.

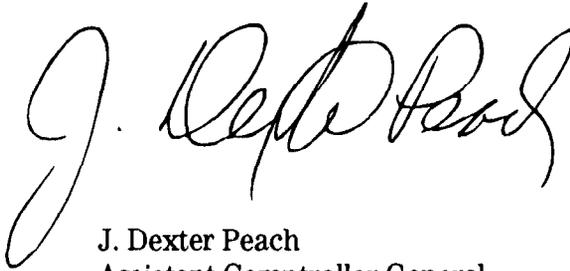
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As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At that time we will send copies to the Administrator of EPA; the Director, Office of Management and Budget; and other interested parties. We will also make copies available on request.

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This work was performed under the direction of Richard L. Hembra, Director, Environmental Protection Issues, who may be reached at (202) 275-6111. Other major contributors to this report are listed in appendix III.

Sincerely yours,



J. Dexter Peach  
Assistant Comptroller General



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## Abbreviations

CO	carbon monoxide
EPA	Environmental Protection Agency
GAO	General Accounting Office
HC	hydrocarbons
I&M	inspection and maintenance
NAAQS	National Ambient Air Quality Standards
NOx	nitrogen oxides



# Listing of Basic and Enhanced Areas

Table I.1 lists the 98 basic areas and table I.2 lists the 83 enhanced areas.

**Table I.1: Basic I&M Areas**

<b>State</b>	<b>Area</b>
Alaska	Anchorage
	Fairbanks
Arizona	Phoenix
	Tucson
California	Antioch-Pittsburgh
	Chico
	Davis
	Fairfield
	Hemet-San Jacinto
	Indio-Coachella
	Lancaster-Palmdale
	Hesperia-Apple Valley- Victorville
	Lodi
	Lompoc
	Merced
	Modesto
	Napa
	Palm Springs
	Salinas
	San Francisco-Oakland
	San Jose
	San Luis Obispo
	Santa Barbara
	Santa Cruz
Santa Maria	
Santa Rosa	
Seaside-Monterey	
Simi Valley	
Stockton	
Vacalia	
Visalia	
Watsonville	
Colorado	Boulder
	Colorado Springs
	Fort Collins
	Greeley

(continued)

**Appendix I**  
**Listing of Basic and Enhanced Areas**

<b>State</b>	<b>Area</b>
Connecticut	Bristol
Florida	Fort Lauderdale-Hollywood- Pompano Beach
	Jacksonville
	Miami-Hialeah
	Tampa-St. Petersburg-Clearwater
	West Palm Beach-Boca Raton- Delray Beach
Idaho	Boise
Illinois	Aurora
	Elgin
	Joliet
	Round Lake Beach
Kentucky-Indiana	Louisville
Maine	Lewiston-Auburn
Michigan	Ann Arbor
	Detroit
	Grand Rapids
	Holland
	Muskegon
	Port Huron
Minnesota	Minneapolis-St. Paul
Missouri-Illinois	St. Louis
Nevada	Reno
New Mexico	Albuquerque
North Carolina	Charlotte
	Durham
	Gastonia
	Greensboro
	High Point
	Raleigh
	Winston-Salem
Ohio	Akron
	Cleveland
	Dayton
	Hamilton
	Lorain-Elyria
	Middletown
	Springfield
Ohio-Kentucky	Cincinnati
Ohio-Michigan	Toledo

(continued)

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**Appendix I**  
**Listing of Basic and Enhanced Areas**

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<b>State</b>	<b>Area</b>
Oregon	Medford
Oregon-Washington	Portland-Vancouver
Rhode Island	Newport
Tennessee	Nashville
Tennessee-Arkansas- Mississippi	Memphis
Texas	Beaumont
	Dallas-Fort Worth
	Denton
	Galveston
	Lewisville
	Port Arthur
	Texas City
Utah	Ogden
	Provo-Orem
	Salt Lake City
Virginia	Petersburg
	Richmond
West Virginia	Charleston
West Virginia-Kentucky- Ohio	Huntington-Ashland
West Virginia-Ohio	Parkerburg
Wisconsin	Kenosha
	Racine
	Sheboygan

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**Appendix I**  
**Listing of Basic and Enhanced Areas**

**Table I.2: Enhanced I&M Areas**

<b>State</b>	<b>Area</b>
California	Bakersfield
	Fresno
	Los Angeles
	Oxnard-Ventura
	Riverside-San Bernadino
	Sacramento
	San Diego
Colorado	Denver
Connecticut	Bridgeport-Milford
	Danbury
	Hartford
	New Britain
	New Haven-Meriden
	Norwalk
	Stamford
Waterbury	
Connecticut- Rhode Island	New London-Norwich
Delaware-New Jersey- Maryland	Wilmington
District of Columbia- Maryland-Virgina	District of Columbia
Georgia	Atlanta
Illinois-Indiana	Chicago-Northwest Indiana
Louisiana	Baton Rouge
Maine	Portland
Maryland	Baltimore
	Hagerstown
Massachusetts	Boston
	Brockton
	Fitchburg-Leominster
	New Bedford
	Salem-Gloucester
	Springfield
	Worcester
Massachusetts- New Hampshire	Lawrence-Haverhill
	Lowell
Massachusetts- Rhode Island	Fall River
Nevada	Las Vegas
New Hampshire	Manchester

(continued)

**Appendix I**  
**Listing of Basic and Enhanced Areas**

<b>State</b>	<b>Area</b>
	Nashua
New Hampshire- Maine	Portsmouth-Dover- Rochester
New Jersey	Atlantic City
	Bergen-Passaic
	Jersey City
	Middlesex-Somerset- Hunterdon
	Monmouth-Ocean
	Newark
	Trenton
	Vineland-Millville- Bridgeton
New York	Albany-Schenectady-Troy
	Binghamton
	Buffalo
	Glen Falls
	Jamestown-Dunkirk
	Nassau-Suffolk
	New York City
	Niagra Falls
	Orange County
	Poughkeepsie
	Rochester
	Syracuse
	Utica-Rome
Pennsylvania	Altoona
	Erie
	Harrisburg-Lebanon- Carlisle
	Johnstown
	Lancaster
	Pittsburgh
	Reading
	Scranton-Wilkes Barre
	Sharon
	State College
	Williamsport
	York
Pennsylvania-New Jersey	Allentown-Bethlehem
	Philadelphia
Rhode Island	Providence
Rhode Island- Massachusetts	Pawtucket-Woonsocket- Attleboro

(continued)

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**Appendix I**  
**Listing of Basic and Enhanced Areas**

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<b>State</b>	<b>Area</b>
Texas	Houston
Texas-New Mexico	El Paso
Vermont	Burlington
Washington	Seattle
	Spokane
	Tacoma
Wisconsin	Milwaukee

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# Vehicles That Failed the IM240 Lane Test but Passed the IM240 Laboratory Test

Vehicle number	Model year	Lane <sup>a</sup> HC <sup>b</sup>	Lab <sup>a</sup> HC <sup>b</sup>	Lane <sup>a</sup> CO <sup>b</sup>	Lab <sup>a</sup> CO <sup>b</sup>	Lane <sup>a</sup> NOx <sup>b</sup>	Lab <sup>a</sup> NOx <sup>b</sup>
732	1986	1.03 <sup>c</sup>	0.58	6.36	4.57	0.55	0.33
1568	1986	0.97 <sup>c</sup>	0.74	13.80	12.60	0.36	0.35
1616	1986	0.73	0.66	18.06 <sup>c</sup>	10.87	2.46 <sup>c</sup>	1.30
1648	1987	0.67	0.62	15.90 <sup>c</sup>	11.14	0.74	0.91
1662	1988	4.00 <sup>c</sup>	0.44	37.51 <sup>c</sup>	9.99	1.13	1.83
1692	1989	0.55	0.14	22.15 <sup>c</sup>	2.87	0.85	0.97
1694	1988	3.40 <sup>c</sup>	0.41	20.64 <sup>c</sup>	5.98	0.36	0.81
1696	1986	0.67	0.61	19.87 <sup>c</sup>	12.71	0.02	0.75
1702	1988	0.94 <sup>c</sup>	0.69	7.00	5.23	0.18	0.24
1703	1988	0.87 <sup>c</sup>	0.65	3.68	3.70	0.15	0.28
1810	1987	0.46	0.32	15.83 <sup>c</sup>	10.26	1.06	1.22
2551	1986	0.27	0.32	1.10	8.65	3.62 <sup>c</sup>	1.53
2575	1988	0.05	0.10	0.90 <sup>c</sup>	2.40	3.07 <sup>c</sup>	0.57
2654	1988	0.60	0.47	11.00	7.95	2.40 <sup>c</sup>	1.84
2614	1987	0.34	0.29	9.34	7.09	2.63 <sup>c</sup>	1.77
2620	1987	0.06	0.04	1.32	0.78	2.32 <sup>c</sup>	1.51
2631	1987	0.51	0.36	8.74	3.91	2.23 <sup>c</sup>	1.11
2637	1988	0.47	0.29	5.77	3.68	3.06 <sup>c</sup>	1.66

Note: All emission readings are reported in grams-per-mile.

<sup>a</sup>The lane data represent IM240 emission readings at the Hammond, Indiana, test facility. The laboratory data represent IM240 emission readings at the New Carlisle, Indiana, test facility.

<sup>b</sup>HC represents hydrocarbon emissions. The HC standard under IM240 is 0.8 grams-per-mile. CO represents carbon monoxide emissions. The CO standard under IM240 is 15.0 grams-per-mile. NOx represents nitrogen oxide emissions. The NOx standard under IM240 is 2.0 grams-per-mile.

<sup>c</sup>These cells represent those emission levels that resulted in vehicles being failed at the Hammond, Indiana, test facility.

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