

**Clean Air Act Advisory Committee  
Mobile Sources Technical Review Sub-committee  
Sheraton Hotel, Arlington, Virginia  
July 16, 1996**

## **INTRODUCTION**

The Mobile Sources Technical Review Sub-committee held its fifth meeting at the Sheraton Hotel in Arlington, Virginia. Mike Walsh opened the meeting by welcoming all attendees. Margo Oge, EPA, asked the Sub-committee and audience members to introduce themselves and then began the meeting.

## **WORKGROUP STATUS REPORTS**

Following is a report from each of the workgroups on the status of their work to date.

### **Modeling Workgroup (MWG)**

Lois Platte, EPA, presented for the workgroup. MOBILE6, the revised version of MOBILE5a, is scheduled for release in the summer of 1998. This time frame was decided upon after considering the schedules for the OTAG process, SIP development, and NAAQS. The MWG has developed several products that Ms. Platte described for the Sub-committee.

**Review Procedures** The MWG has developed draft review procedures and had previously submitted these to Sub-committee members for their review. These procedures were developed to ensure that revisions to MOBILE and other models are reviewed by a wide range of interested participants. The procedures include notification (*Federal Register*, e-mail, postal mail), improved documentation of model changes, model workshops, and a 60-day comment period.

**Validation Procedures** The MWG has developed and submitted to the Sub-committee a statement on validation that includes the following recommendations:

Field studies (air quality or laboratory) to validate all or parts of the model;

- Increased EPA involvement with outside efforts to validate the model and vice versa;
- Compare MOBILE to EMFAC (or other similar models such as a non-road model) when either model is significantly revised; and
- Compare PAMS to MOBILE.

**RSD Credits** The MWG has evaluated the information provided by EPA on remote sensing devices and has endorsed a statement supporting EPA's development of interim credits. EPA recently developed a document titled "*A User Guide and Description for Interim Remote Sensing Program Credits*" and a software utility. These have been provided to the MWG for their review. A subgroup of the MWG that includes representatives from LADCO, NYDEC, GM, and TNRCC has been the primary reviewer of RSD materials. This group has made several recommendations to EPA including:

Continue to review in-use RSD programs and the generated data (e.g., Arizona);

- Review data on HC and NQ channels;
- Develop criteria for multiple RSD readings; and
- Develop criteria for "clean screening" to identify the optimal number of readings and what percent might be exempted from other testing programs.

### ***Discussion***

Virginia McConnell, RFF, discussed the utility of RSD as a tool to help validate the models. She also noted that states need incentives to evaluate RSD programs. Bob Slott, Shell, suggested having credits that are temporary and disappear over time unless they are confirmed by validation procedures. For example, if a less accurate emission measurement method is used, then the source must be controlled to a greater standard. He noted that a similar process could be used in industry.

Margo Oge noted that ECOS and STAPPA are helping to identify mechanisms that states can use to evaluate their I/M programs in the next 18 months. This effort was established after provisions in the last Highway bill offered this opportunity to states. John Elston, ECOS, described this effort. He noted that states have made a claim for credit and they are required to evaluate the results against this claim. Dick Gibbs, New York, highlighted the difference between the validation effort “to true up the models” described by Ms. Platte and validation efforts to verify SIP credits. The two are linked but are not the same. He also noted that the “clean screen” suggested for RSD programs should be pollutant specific. For example, a vehicle that passes multiple RSD readings for CO should not be exempted from NO measurements.

Margo Oge suggested that at the next Sub-committee meeting EPA and ECOS should be prepared to make a presentation on ways to assist states with evaluating their I/M programs. She noted that a new workgroup may be required to focus on these evaluation issues directly.

Ms. Platte confirmed that the MWG will prepare a report that provides the history of the workgroup, summarizes the products provided to the Sub-committee, and incorporates the recommendations provided to the Sub-committee for recommendation to the full Clean Air Act Advisory Committee and EPA. This report will be available one month prior to the meeting in October.

**Other Modeling Issues** Ms. Platte discussed activities to coordinate modeling efforts with CARB. Several EPA staff members recently made a trip to California to meet with their CARB counterparts. They discussed the revised EMFAC model and the current proposals to revise MOBILE.

Mike Walsh asked if revisions will be made to the MOBILE model to account for particulates. Ms. Platte responded that none will be included in MOBILE6, and the PART5 model will not be updated because there are no new data. She noted that CRC and EPA are both examining particulate data but until those efforts are complete, no revisions to the models should be expected.

### **In-Use Deterioration Workgroup - Data Analysis Team**

Bob Slott, Shell, made the presentation on behalf of the Data Analysis Team of the In-use workgroup. He began with a refresher on the challenges of analyzing the in-use deterioration emissions problem. The data analysis problem is difficult because only a few vehicles are responsible for most of the emissions. What this means from a data analysis perspective is that thousands of randomly sampled vehicles need to be tested in order to understand emissions in any one year. To understand emission deterioration, the problem is compounded because a multi-year database is necessary. Furthermore, a high-emitting CO vehicle may not be a high NO emitter.

No vehicle emission database that exists today is ideal from a data analysis perspective. Most of the team's discussions have focused on exhaust emissions because much less data are available on evaporative emissions. There are large I/M idle test databases that exist, especially from centralized programs, and there are a few multi-year remote sensing databases. These are the only multi-year databases that exist with a sufficient amount of data to analyze. The workgroup has not spent a lot of time discussing evaporative data in a quantitative sense but they have addressed these data qualitatively.

The work group has been reviewing the data that currently exist. These data tells us some things:

1986 and later vehicles appear to be deteriorating more slowly as a result of the changeover from carburetion to fuel injection and the improvements in catalyst technology, especially in the

- washcoat.
- Early FTP data from the auto manufacturers indicate that 1991 and later vehicles may be deteriorating even more slowly, although these vehicles have not been in use over sufficient time to make a firm conclusion.
  - The workgroup believes that OBDII could lead to more vehicle design improvements by manufacturers and better maintenance behavior by owners, which could slow deterioration in most 1996 and later vehicles that are equipped with OBDII.

What the workgroup cannot tell is the impact of the improved vehicle designs in terms of vehicle life. The deterioration problem is a relative rate process that depends on the rate of deterioration of the emission control systems with the deterioration of the vehicle itself. Currently, most exhaust emissions come from vehicles that are eight to ten years old. If vehicles last longer in the future, high emitters may occur primarily in the 10 to 14 year-old group.

As the vehicle fleet becomes cleaner, the team can imagine a scenario where many fewer vehicles contribute a larger percentage of total emissions. As the number of high-emitting vehicles decreases, testing all vehicles may not be the most effective strategy for controlling vehicle emissions. In the future, an entirely different kind of inspection and maintenance program (with a different name) may be needed to identify high emitters.

The workgroup is reluctant to base in-use deterioration emissions judgments on the analysis of idle test data due to the shortcomings of these tests. There are only a limited number of remote sensing databases available, and remote sensing is recognized to be limited to the identification of some high CO and HC exhaust emitters. What the group would like to have is multi-year I/M data from loaded mode tests as well as multi-year remote sensing data. States that run central I/M programs and/or use remote sensing monitoring are in the best position to compile these data at low marginal cost. The group will make recommendations to states and EPA about data collection and archiving to enable future data analysis of this problem possible.

### ***Discussion***

The report to the Sub-committee will include a summary of the data analysis that the workgroup has seen, some indication of future data analysis that may be available, and recommendations for compiling data from state programs and remote sensing monitoring for future data analysis.

The next workgroup meeting will be September 11 in the Detroit area. The major issues that will be addressed at the meeting relate to the future vehicle technology area rather than to data analysis. The team plans to write a report and circulate it by fax to each member for review. It is too soon now to tell how early a report can be submitted to the Sub-committee co-chairs.

### **In-Use Deterioration Workgroup - New Technology/Solutions Team**

Tom Cackette, CARB, began the team report. The team's recommendations are based upon the results of the data analysis team and will focus on technological and other solutions that will reduce in-use deterioration emissions in the future from existing cars in the fleet. Thus, the group is looking at ideas that would improve in-use compliance with emission standards. The team sees substantial progress in the in-use compliance rate. They believe that the current situation - where 30 to 50 percent of the vehicles have excess emissions that could be repaired if they were properly identified - will improve to where 5 to 10 percent (arbitrary numbers) could have in-use emission problems that are identifiable. This means that the concept of testing all vehicles is unattractive because many resources are being spent to find fewer vehicles. Strategies that identify the few high-emitting vehicles should be pursued.

The team has come up with approximately ten recommendations. They are still being refined at this point, so Mr. Cackette did not discuss each one. The recommendations fall into two groups. The

first group is based on the premise that OBDII will effectively identify virtually all causes of excess in-use emissions, with the exception of liquid fuel leaks and defective PCV valves. Regarding the latter, a proposal currently exists in California to address this problem. The recommendations go sequentially from ensuring that OBDII inspections of the malfunction indicator lamp occur in an effective way in current I/M tests, to replacing the idle test in basic I/M tests with OBDII, to using the OBDII system in a non-periodic way, such as utilizing transponder technology.

The second set of recommendations deals with OBDII and non-OBD cars and addresses other potential ways of improving the effectiveness and the cost effectiveness of inspection programs. They include ideas on how to screen out clean cars using data or other evidence, investigating the benefits of a mandatory oxygen sensor replacement program for certain vehicles, and looking at the kinds of repairs being done under the new enhanced I/M program to make recommendations. The group has discussed various forms of transponder technology as one of the recommendations.

The recommendations will give EPA a sense of what the Team thinks the future holds and what the key issues are. The next meeting is on September 11, so the group will be able to get a report to the Sub-committee chairs after this date.

Gene Tierney, EPA, added that most of the recommendations involve actions that EPA needs to take in terms of investigating and evaluating various issues. This is primarily because we don't have a lot of data on many of these issues. He also added that state involvement is going to be a key part of what happens with these recommendations. Therefore, how the Sub-committee communicates these recommendations and issues is important.

### ***Discussion***

Some of the Sub-committee members expressed concern about transponders and the privacy and data security issues associated with this technology. Tom Cackette recognized that this is an issue. Some initial thoughts are that a transponder signal may be activated by the vehicle driver. John Kowalczyk, Oregon DEQ, discussed a trial questionnaire he has developed to determine attitudes and perceptions about transponder issues. He hopes to have some initial questionnaire results by the September In-use Workgroup meeting. Steve Gerritson, LADCO, urged the Sub-committee to be careful about how they discuss the transponder issue and any recommendations that may be made regarding transponders. He stated that there is a significant minority of the public that views this type of technology with a high level of suspicion. It is possible to blow this issue entirely out of proportion and make a mockery of the beneficial things that policy-makers do. He feels that from a policy standpoint, if the group decides to pursue transponder technology, they should also take a larger role in educating the public to reduce VMT and learn better driving habits. These types of programs may have a larger effect on reducing emissions. Bob Slott, Shell, emphasized that the workgroup is taking a cautious approach to this issue. They are trying to think about a new paradigm for understanding a vehicle's emission control system other than I/M, and there are several gradations of options regarding transponder technology. Tom Cackette also emphasized that the cost benefits of such technology are large, and that if properly sold, there is a potential for this technology to be successful.

### **Heavy Duty Engine/Fuel NO<sub>x</sub> Workgroup (HDWG)**

Tom Bond, BP Oil, presented for the workgroup. The HDWG has developed a mission statement that summarizes its goals to examine the proposed 2004 NO<sub>x</sub> standard and the potential effect from fuel changes that could assist in meeting that standard. The HDWG plans to perform several experiments that look at the effects of engine technologies and fuel changes (e.g., cetane number and aromatics) and also evaluate existing data that are relevant to these questions. The proposed experiment has three phases.

**Phase I.** The initial phase is proposed to "validate" a Caterpillar 3176 engine located at Southwest Research Institute (SWRI) in San Antonio, TX. This engine has 1994 standard technology

that can be upgraded to approximate 1998 requirements (e.g., 2.5 - 2.8 g/bhp-hr combined NO<sub>x</sub> and HC standard). Three test fuels (baseline, clean diesel and cetane-enhanced) will be tested on this engine to identify whether the engine responds significantly to fuel changes and in the appropriate direction. Engine manufacturers will test these same three fuels on at least one of their research engines that are configured to meet a <3g/bhp-hr standard. The fuel matrix is described in the table below.

<i>FUEL MATRIX</i>	<i>Cetane Number</i>	<i>Aromatics (by FIA)</i>	<i>Sulfur</i>	<i>Specific Gravity</i>	<i>T90</i>
Baseline	45	32%	300 ppm	.857	600
Clean Diesel	60	15%	200 ppm	.809	563
Cetane-enhanced	57	32%	300 ppm	.857	600

SWRI has proposed running the AVL 8-mode steady-state test for the baseline, clean diesel, cetane-enhanced, and again with the baseline fuels. Each engine manufacturer will run three transient tests and one AVL 8-mode steady-state test for the baseline, clean diesel, cetane-enhanced, and again with the baseline fuels. The transient test will measure particulates, while the 8-mode will not. The fuels will also be analyzed by seven different laboratories.

Phase I is expected to be completed by October of 1996. SWRI data will be available in their raw form; EMA will “massage” the engine manufacturer data and report only the percent change of the clean diesel or cetane-enhanced fuels from the baseline.

**Data Analysis.** The HDWG has also established a subgroup to collect and review experiment data on fuel effects. However, the group has run into several problems in their efforts to compare the data. These problems include:

- The R49 cycle is difficult to convert to the US cycle;
- Different program objectives;
- Different test procedures;
- Different definition of aromatics; and
- Not enough bridging connections between independent studies.

The subgroup will make their best effort to consolidate the data and identify data gaps that can be filled with Phase II data. Phase II will occur if Phase I is successful. Phase II will use a broader fuel matrix to test fuel effects on the SWRI and engine manufacturer research engines.

**NPRM.** Glenn Passavant, EPA, made a short presentation on the recent NPRM. A public meeting will be held in Ypsilanti, MI on August 12 at 10 am. The proposal includes the Statement of Principles agreed to by engine manufacturers and addresses a proposed 2004 standard for gasoline and diesel HD engines that effectively creates a 50 percent reduction in NO<sub>x</sub> emissions. This standard is aimed at mitigating ozone and particulate pollution problems. The proposed standard pushes the limit of current engine technology, but Mr. Passavant noted that one engine manufacturer claims to have an engine that will meet the proposed standard. The NPRM also changes the durability program by revising the useful life of heavy-duty engines to 435,000 miles and makes changes to the allowable emission related maintenance. EPA is currently codifying the current practices of the engine rebuilding industry to ensure that catalysts and EGR equipment are evaluated.

### *Discussion*

Mike Walsh asked whether the HDWG is examining durability issues. Tom Bond responded that the main goal is to get the Phase I results. No other efforts are planned until that effort is complete. Bob Sawyer recommended that the existing fleet and the extent of turnover should be examined at some point. Margo Oge recommended that EPA make a presentation at the next meeting on the current understanding of in-use performance of HD diesel and gasoline trucks for existing technology.

## Compliance Workgroup

Jane Armstrong, EPA, reported on the activities of the Compliance Workgroup. The workgroup is responsible for developing recommendations on reengineering of the vehicle compliance process. The process was originally set up to look at streamlining of certification, but the focus grew to encompass the larger compliance process. The workgroup has made progress since the last sub-committee meeting in six different areas, covering issues from both the information side of compliance and methods of demonstrating compliance. Ms. Armstrong stated that she hopes to have a report to the sub-committee by September 15.

Ms. Armstrong briefly reported on a successful effort recently undertaken by government and industry to harmonize the test procedures for evaporative emissions that were different between California and the rest of the states. EPA plans to issue a direct final rule next year to put this effort into effect soon. Dave Kulp, Ford, discussed more details of this effort. Industry previously had difficulty running this test and required a great deal of time to obtain results. The new rule will streamline and simplify the process.

Ms. Armstrong stated that the workgroup has approved their mission statement and believes they are close to consensus on a framework for reengineering the compliance process. Mr. Kulp next discussed the results of the workgroup's effort to reengineer the compliance process in each of the six task groups that make up the Compliance workgroup. The task groups meet approximately once per week to address the issue that each is focusing on. The status of each task group is as follows:

**Transition Process:** This task group is to address the impacts and issues that affect when and how the parties can transition from the existing program to the new streamlined program. They are currently interacting with all of the other task groups and have established deadlines for each group to follow.

**Application Information:** This task group is to make the certification application and generation of the emissions approvals efficient through EPA/CARB harmonization of requirements. They have completed analysis of submission and timing needs, drafted a simplified running change process, and drafted a harmonized EPA and CARB summary sheet.

**Certification Groupings/Durability Protocols:** This group is to develop criteria for (1) new certification groupings based on expected emissions deterioration, (2) acceptable pre-production durability demonstrations, and (3) emission data vehicle selections. They have proposed combining "engine families" into larger "family groupings" based on emission control technology, which will reduce the number of required durability demonstrations and expand in-use performance feedback. They are also analyzing several proposals for emission data vehicle selection criteria that would be common for EPA and CARB, which will allow more resources for in-use validation.

**Fuel Economy/Confirmatory Testing:** This group is to review potential changes to the current emissions confirmation process and the fuel economy program that would improve their efficiency while maintaining the stringency and accuracy of the fuel economy values. They have developed three proposals. One would eliminate one category of fuel economy testing that is redundant. Another proposal contains a recommendation to EPA to revise the confirmatory test process by allowing the manufacturer to perform some test evaluations, reducing confirmatory testing at the EPA lab, and reduce EPA random audit testing by 50 to 75 percent. The last proposal contains recommendations to NHTSA and EPA for changes to simplify and expedite the CAFE reporting process.

**Small Volume Groupings/Manufacturers:** This group is to develop a proposal for modifying the current small volume EPA/CARB Certification procedures that would give manufacturers more responsibility and eliminate unnecessary workload. The proposal currently under development would establish a higher cutpoint for small-volume manufacturer participation in in-use verification programs. The group also proposed that EPA accept CARB OBDII approval as demonstration of EPA OBD

compliance for 1999 and later model year vehicles.

**In-Use Verification** This group is to develop proposals and define issues related to the in-use verification component (reality check) of compliance reform. The group has drafted several new concept proposals highlighting vehicle selection, vehicle procurement, vehicle age/mileage, vehicle testing, data reporting, test protocol, and required tests vs. production volume. Doug Berens, Ford, discussed a flowchart describing the industry proposal for an in-use testing program in which the vehicle manufacturer conducts low and high mileage testing using unscreened and as-received vehicles. The manufacturer submits the data to the regulatory agencies for review, while also conducting its own review. The manufacturer would conduct a voluntary recall if it determines that one is needed. Otherwise, the results are used to improve pre-production programs and designs. The agency reviewing the data also makes a determination as to whether recall testing is needed.

### *Discussion*

The Sub-committee discussed the bias that may exist in vehicle recruitment for emission testing purposes. The Data Analysis Team feels that low participation in vehicle recruitment efforts may lead to certain bias in the data. The auto manufacturers feel that a vehicle owner who is experiencing problems is more likely to respond to test recruitment efforts, thereby biasing test results towards dirtier vehicles. Margo Oge asked the manufacturers if they have demographic data or other information on the vehicle owners. Mr. Berens replied that the answer is generally no. Bob Slott stated that, ideally, the best way to eliminate the bias issue is to obtain a 100 percent acceptance rate on a random vehicle selection process. The auto manufacturers stated that the acceptance rate has always been low, even when incentives are offered to vehicle owners. The Sub-committee recognizes that the bias issue is a problem that they will not be able to solve. At the close of the discussion, Ms. Armstrong commended the industry members of each task group for the level of effort that they have put into the vehicle compliance process.

## **ECOS PROCESS ON I/M EVALUATIONS**

John Elston, Environmental Council of the States (ECOS), discussed the status of the ECOS process on I/M evaluations under the I/M provisions of the National Highway System Designation Act. Under this Act, which was passed in December 1995, states were offered the chance to develop and implement a decentralized I/M program and were given 18 months to demonstrate that it is effective. ECOS is coordinating the evaluation process that will be used to determine program effectiveness.

The states participating in this program are Arizona, California, Colorado, Connecticut, Delaware, Georgia, Indiana, Maryland, New Jersey, New York, Pennsylvania, Texas, Vermont, Virginia, and Wisconsin. The states are to develop proposals for a decentralized I/M program. These states will serve as a benchmark against which the other states would monitor their performance. Representatives from each state have met and have divided into sub-groups to address the evaluation of this program.

At this point, the ECOS/STAPPA workgroup has drafted a set of eleven evaluation factors to be considered when examining the I/M proposals. Each of the eleven factors are given a point value, ranging from one point to six points. All proposals submitted must contain at least one of the first four factors, and the points for all factors utilized must total at least eleven. Each of the states listed above would prepare a proposal asking for a specified I/M credit, up to 100 percent. The proposal would be sent to each of the other states. A session would be convened where the state applying would present its proposal. The other states would vote on whether the percent claim is substantiated by the proposal. If a majority of states vote in favor, the final recommendation is forwarded to EPA. This process is currently undergoing review by the ECOS committee.

## **INTERNATIONAL HARMONIZATION OF STANDARDS**

Kelly Brown, Ford, presented to the Sub-committee a report on recent activities in the area of

international trade and harmonization of regulatory standards. He began with a background on the Transatlantic Business Dialogue (TABD), which was started by former Commerce Secretary Ron Brown and one of the commissioners of the European Union. Under the TABD, over 100 business leaders from both the U.S. and Europe met in 1995 to identify ways to increase trade. One of the impediments to trade identified by the meeting participants is the difference in regulation that exists between the continents. A team was developed to work towards reducing barriers to trade. The Chairman of Ford Motor Company was elected to be the U.S. chairman for the TABD.

The TABD was broken down into several groups, including an environment workgroup. The first meeting of this workgroup was held in April 1996, and meetings have been held since. The goals of the group are to remove the barriers to distribution of motor vehicles imposed by variations in regulations and test procedures, and to seek harmonization of test procedures in order to eliminate duplication of effort. The working group aims to pursue these goals while sustaining current levels of environmental protection.

The workgroup's action plan is to identify short-term actions and implement them, set medium-term actions and begin to address them, and identify long-term actions and areas of potential cooperation with respect to emerging markets. Mr. Brown emphasized that there are some tough issues to deal with.

Ken Feith, EPA, who represents the U.S. government at the United Nations Economic Commission for Europe, continued the presentation. He discussed Working Party #29, which is part of the Economic Commission and was organized in 1958 to address environmental issues. The U.S. sits at the table during Working Party #29, but currently does not vote on issues. The Working Party has been working towards harmonization of regulations over the past several years. The U.S. wrote a proposal to the Working Party on becoming a signatory to the process. The proposal contained provisions to ensure that the process would be more global and to ensure that the U.S. has an equal and strong voice in all matters. Also, under no circumstances would the U.S. participate in a harmonization process that results in a weakening of U.S. standards.

The U.S. has raised some issues with the European Union and is having discussions about them. Mr. Feith believes that the group can work toward an acceptable resolution of differences. By becoming a signatory to the process, state and local governments may be affected because in the long run, any regulations that are developed will be developed jointly with Europe and will require absolute interaction between the U.S. and the European rulemaking process. States and localities should consider how this may affect them and respond during upcoming comment periods.

## **MEETING WRAP-UP**

Bob Sawyer addressed the workgroup reports that will be developed. Mr. Sawyer and Mr. Walsh plan to collect the workgroup reports and prepare an executive summary report that will be approximately two to ten pages. The workgroup reports will be presented as appendices. They will distribute the summary report to the Sub-committee members in time for review before the October Sub-committee meeting. They hope to obtain consensus on the summary report before it is forwarded to the Clean Air Act Advisory Committee. The executive summary will also report areas in which disagreement or differences in opinion exist, so workgroup reports should highlight these issues.

The Heavy Duty workgroup is following a different timeframe due to the work they have undertaken. Therefore, their report to the sub-committee will primarily detail their status rather than specific findings or recommendations.

The next Mobile Source meeting is tentatively scheduled for October 9. The following Sub-committee meeting is tentatively scheduled for January 15, 1997.

Mike Walsh thanked the members for participating and then adjourned the meeting.

## **ACTION ITEMS**

EPA and ECOS will make a presentation at the next Sub-committee meeting on possible ways to assist states that are implementing trial I/M programs under the recent Highway bill in evaluating their I/M programs.

EPA will make a presentation at the next Sub-committee meeting on the current understanding of in-use performance of HD diesel and gasoline trucks for existing technology.

EPA was requested to make a follow-up presentation at the next Sub-committee meeting on the heavy duty engine that is being certified to meet the 2004 standards.

**Mobile Sources Technical Review Sub-committee  
List of Members or Member Alternates Attending  
July 16, 1996**

Bruce Bertelsen	Manufacturers of Emissions Controls	(202) 296-4797
Kelly Brown	Ford Motor Company	(313) 322-0033
Tom Cackette	California Air Resources Board	(916) 322-2892
Joe Colucci	General Motors	(810) 986-2526
Gregory Dana	Assoc. of International Automobile Manufacturers	(703) 525-7788
John Elston	ECOS	(202) 624-7864
Stephen Gerritson	Lake Michigan Air Directors Consortium	(708) 296-2181
Richard Gibbs	New York Dept. of Environmental Conservation	(518) 485-8913
Randall Guensler	Georgia Institute of Technology	(404) 894-0405
John Johnson	Michigan Technological University	(906) 487-2576
John Kowalczyk	Oregon Dept. of Environmental Quality	(503) 229-6459
Sam Leonard	General Motors	(313) 556-7710
Alan Lloyd	Desert Research Institute	(909) 396-3245
Virginia McConnell	Resources for the Future	(202) 328-5122
Margo Oge	EPA Office of Mobile Sources	(202) 260-7645
Patrick Rahe	Hogan and Hartson	(202) 637-5600
Robert Sawyer	UC-Berkeley	(510) 642-5573
Robert Slott	Shell	(713) 241-3413
Doug Teague	Chrysler	(810) 576-2923
Michael Walsh	Self	(703) 241-1297