163

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WORKSHOP ON MOTOR VEHICLE NOISE CONTROL

The Subcommittee on Noise of the Transportation Environmental Review Committee sponsored a workshop on motor vehicle noise control at the National Academy of Sciences on December 10 and 11, 1974.

The purpose of the workshop was to evaluate the possibilities of motor vehicle noise reduction and the resultant impact on highway traffic noise. The medium and heavy trucks and motorcycles that are the major sources of high-energy noise were the primary discussion topics.

The workshop addressed four topic areas:

1. Motor vehicle noise sources and noise-suppression possibilities;

2. Effects of motor vehicle noise reduction on overall traffic noise and a timetable for and obstacles to source control;

3. Accomplishing source control at federal, state, and local levels, including new-product versus in-use vehicles and assessing effectiveness of controls; and

4. Case studies of state and local regulations.

The chairmen, with the review of the noise subcommittee, drafted summaries of the workshop presentations and discussions, which are presented in this Circular. The full proceedings of the workshop will be published as a TRB Special Report.

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NATIONAL RESEARCH COUNCIL NATIONAL ACADEMY OF SCIENCES - NATIONAL ACADEMY OF ENGINEERING
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Session I - General Background

The purpose of the first session of the workshop on vehicle noise control was to define the problem of excessive on-the-road motor vehicle noise emissions. Once this had been done in terms of the nature of the problems involved together with possible alternate solutions available, it was possible to proceed to the other topics of the workshop, which deal with the results of noise source reduction efforts and noise source control regulations.

Problem Areas

The first session developed the problem statement by first establishing the extent to which motor vehicle noise contributes to environmental noise as a whole. Next, differentiation was made with regard to the different classifications of highway vehicles as a function of the nature of their noise emissions and the extent to which each vehicle classification is a participant in creating the overall noise which emanates from a roadway. Within each group of vehicles the background session explored the most important types of noise sources on the vehicle together with possible associated noise control alternatives. Finally, the manner in which vehicle noise control at the source fits into the total noise control program was illustrated by giving consideration to several possible combinations and trade-offs provided by using both noise control at the source and noise barrier controls to abate highway noise. The following discussion presents a summary of these major elements of the session.

In considering the extent to which highway noise is a problem, reference is made to three major urban noise studies that clearly show that highway noise is a cause of annoyance both in this country and abroad. The geographic areas studied were influenced by sources of noise other than highway vehicles and included aircraft in varying degrees. The degree of annoyance, however, for road noise sources was found to be significant compared to aircraft, even in aircraft-dominated areas. Noise developed as a result of on-the-road motor vehicles was uniformly found to be a matter of concern.

Sources of Motor Vehicle Noise

Turning to the nature of the highway vehicle noise source, both by inspection or by analysis, it is possible to divide the vehicular noise sources into at least three broad categories: autos, trucks, and motorcycles. The exposure of the public to

these vehicles must be expressed not only in terms of their relative vehicle populations but also in terms of annual rates of operation. Thus, while there are on the nation's highways some 84 million automobiles, 17 million trucks, and 2 million motorcycles, the fact that the typical truck travels four times as many miles per year as the average automobile significantly affects the degree to which a given automobile or truck contributes to highway noise.

With regard to the nature of the noise emitted by three categories of vehicles, survey results show that automobiles at speeds of less than 35 mph comprise the bulk of the vehicles in the quieter of those vehicle categories based on emission levels, that trucks operating at freeway speeds or in excess of 35 mph comprise the bulk of vehicles in the noisiest category, and that motorcycles at low and high speeds together with automobiles operating at speeds in excess of 35 mph and trucks operating at speeds below 35 mph comprise the middle category of vehicles. From the survey information it is also evident that noise levels generated by automobiles and trucks increase with speed, although not to the same extent, and that trucks produce A-weighted sound pressure levels that are 10 dB or more higher than those produced by automobiles. Thus, given the combination of total vehicle miles per vehicle per year together with the significantly higher noise levels of trucks as opposed to automobiles, one can conclude that the enhancement of the environment in areas adjacent to our roadways will by and large require the reduction of high truck noise levels because they are the dominant source of noise.

Truck Noise

With regard to noise from the truck, it has been established that the mechanisms for producing sound can be placed in two major categories, which are either independent of vehicle speed or related to vehicle speed. Of the speed-independent sources, the engine exhaust system, which include the exhaust pipe outlet, the vibrating exhaust piping, and possible system leaks, is often the major source of noise, especially when the vehicle speed is less than 45 mph. In addition, the air intake or induction system is an important source of truck noise. The cooling system of the truck is a source of noise, particularly with regard to fan-blade noise. Finally, engine and power train mechanical vibrations act as noise sources. These noise sources are relatively independent of vehicle speed but are related to engine speed, which, because of the usual presence of a large array of gears, is confined to a narrow range.

An important additional factor for consideration concerns the location of these sources above the ground. Exhaust noise is generally taken to originate at some 12 feet for a vertical exhaust stack, while engine and fan noise generally originates at about 4 or 5 feet.

Abatement Possibilities

The technical possibilities for abatement of all of these sources of noise on new vehicles, independent of cost considerations, are good, as technology is currently available to provide overall reductions of A-weighted noise levels due to these sources on the order of 10 to 15 dB. These noise level reductions are achieved by a combination of more effective muffler systems, clutched fan engine cooling systems, muffled air induction systems, and enclosing the engine and transmission of the truck. The use of the clutched fan in the engine cooling system allows the fan to operate only when required by the engine operating temperature (usually less than 10% of the engine time) and results in a savings of some 20 horsepower.

Tire Noise

The major component of noise related to vehicle speed is that due to the interaction of the vehicle tire with the road surface. For many practical situations where the number of tires on a single vehicle may be 18 or more, the tire noise may actually be the dominant noise at vehicle speeds above 45 mph. Increasing with vehicle speed, tire noise is related to tread design and condition as well as to road surface conditions. Tests have shown that crossbar tires (commonly found on the drive axles of trucks and trailer axles) are significantly more noisy than are rib-type tires (found on the front wheels of trucks) and usually on all four automobile wheels. Significant reductions of tire-generated noise levels have been shown to be possible when rib tires are used in place of crossbar tires. The selection of tires for use on vehicles for the purpose of noise control must, of course, primarily be subject to considerations of safety.

Available Technology for Reducing Truck Noise

Perhaps the most important aspect of truck noise is that the major sources of noise, both speed-dependent and speed-independent, contribute noise levels to the total that are of the same general order of magnitude at highway speeds. Hence, an overall systems approach to abating truck noise at the source is required that considers the abatement of all of the noise sources if an effective reduction in total truck noise levels is to be achieved.

Presently, technology without respect to costs exists to produce trucks whose noise levels at 50 feet due to exhaust, cooling, air intake, and mechanical noises are on the order of magnitude of 78 dBA. With current technology, tire noise is the limiting factor, especially at highway speeds where tire noise often will exceed all other noise levels. However, the reduction of the speed-independent noises, especially the exhaust noise, is an extremely important consideration. For example, the reduction of exhaust noise, which originates some 12 feet above the road surface, reduces the overall effective noise source height of the truck. Hence the truck noise that remains is more readily attenuated by the terrain or buildings adjacent to a roadway or through the use of sound barriers.

With regard to existing trucks in operation, the most effective and feasible alternatives for noise abatement include the installation of effective engine exhaust muffling systems and shielding, together with the use of quieter tires such as rib type. The feasibility of modifications such as engine enclosures or clutch type cooling fans varies with the individual vehicle. The reduction of noise on existing vehicles again can have substantial effects, especially as regards the lowering of the effective source height through the reduction of engine exhaust noise levels.

Automobile and Motorcycle Noise

With regard to noise generated by passenger cars, surveys show that, under the majority of operating conditions, well-maintained automobiles have noise emission levels measured on the A-scale some 10 to 15 dB lower than those of trucks. In addition, the noise levels generated by automobiles are dependent on the speed of the vehicle and consist mainly of tire noise, exhaust noise, and engine noise. At highway speeds, the tires are often the dominant source of noise. Again the technology for control of engine and exhaust noise is well in hand for normal operating conditions. The source of noise that presently limits the reduction of overall vehicle noise levels at highway speeds is often the tire.

Finally, although present in relatively small numbers, the motorcycle is a major source of noise in urban areas. The noise levels commonly developed by the motorcycle fall between the quieter automobile and the noisier truck and are speed-dependent. The major component sources of noise include the engine exhaust system, the air intake system, and engine mechanical vibrations. Because of the light loading and subsequent small road surface contact areas, tire noise is generally not a problem unless off-the-road tires are being used.

Perhaps the major problem with regard to motorcycle noise is related to the manner in which the machines are maintained and operated. The "love affair" with the sound of power provokes many operators to drive these vehicles in a manner that creates excessive noise. This is done by performing rapid, high-power accelerations and the like. In addition, the intentional modification of engine exhaust muffling systems by vehicle owners to enhance the sound of the exhaust accounts for a considerable amount of the loud and unnecessary noise generated by these machines.

From a noise-abatement standpoint, while certain unique problems exist in terms of enclosing the small air-cooled engines found on motorcycles for the purposes of noise control, motorcycle manufacturers generally agree that reductions in motorcycle noise emission levels as measured on the A-scale on the order of 15 dB can be achieved by 1983.

Conclusion

With the identification of the sources of vehicular noise along the roadways, together with the technical alternatives to controlling the noise at the source, it is possible to develop an understanding as to the regulatory requirements necessary to cause the available and economically feasible abatement techniques to be implemented. Because the family of motor vehicles operating on the highway is a mixture of new and older models, regulation, inspection, and enforcement programs are required for both new and existing vehicles if advantage is to be taken of the amount of noise abatement potential that is available through control of noise at the source. Recognizing that the vehicle types themselves are different and that within any given group certain aspects of the noise emission problem are more amenable to solution than others, programs for regulating the emission of vehicular noise at the source must also reflect these factors.

Finally, the identification of the vehicular noise source characteristics and their abatement possibilities provides the opportunity to evaluate the effects of certain noise reductions achieved through individual vehicle noise level reductions on the abatement of noise from highways by other means. The reduction, for example, of truck engine exhaust A-weighted sound pressure levels by 10 or 15 dB through the use of improved muffling systems will have a significant effect on reducing roadside noise barrier height requirements and hence on reducing the cost of developing such barrier systems for noise control. This benefit arises even though the overall noise emission level of the truck might not be significantly reduced (possibly 3 or 4 dB).

As a result of the technical information developed in Session I on the nature of vehicular noise sources, the relative importance of the major noise source categories together with the technical possibilities that exist for noise abatement have been defined. As a result, it is possible to proceed to the remaining sessions of this workshop. In these sessions the technical aspects of vehicular noise and its control at the source, especially as concerns the truck, are explored in terms of the overall effectiveness for highway traffic noise reduction, obstacles to source control, and the feasibility and effectiveness of source control by regulation.

Session II - Source Reduction Results

An objective of Session II was to explore the extent to which it may be possible to clearly quantify

1. The effect on overall traffic noise levels of noise reductions in specific categories of motor vehicles; and
2. The specific timetable that can be expected for the reduction of motor vehicle noise levels.

The session revealed that, while firm quantification of a specific timetable may not be possible at this time, methods are available for computing the effect on traffic noise reduction of reductions in noise levels in specific categories of vehicles. This does not mean that the session failed to produce useful information. To the contrary, it brought out much pertinent information that should be of interest to those involved in the various aspects of motor vehicle noise control.

The Effect of Noise Reduction on a Traffic Stream

The question of the effect on the noise of a traffic stream when the noise levels of the individual vehicles comprising that stream have been reduced was addressed in this session. Rather than assuming some hypothetical individual vehicle noise reductions and then using those reduced levels to determine stream levels, measured data from California and certain other states were used to determine the traffic stream noise level effects. On the basis of the analysis of these real-world data the following conclusions were reached:

1. The regulation of new vehicle noise levels will not have an immediate effect on reducing traffic stream noise because it will only affect part of the vehicle population, i.e., the 10% of the population that represents new vehicles in any given year.

2. The most immediately effective of the regulation methods available establishes noise standards to apply to the entire existing vehicle population--the so-called operational regulation. The most significant drops in traffic stream noise level will occur on highways with a high percentage of large commercial vehicles.

3. Existing operational regulations have reduced the number of excessively noisy vehicles with relative ease. Further reductions, however, will be progressively more difficult because of higher cost and available technology considerations.

4. Assessing the relative effectiveness of highway design versus vehicle noise reduction measures will require study of the economic and technologic feasibility of each. However, vital as it may be, source control alone will not entirely solve the traffic stream noise problem in this century.

The Problem as it Exists Today

It was pointed out, and later talks seemed to confirm, that the vehicle problem as it exists today is primarily a heavy truck problem. The noise levels of properly maintained automobiles (in motion) rest on a base of tire noise. That is, further significant reductions in automobile noise are dependent on, and must await, further reductions in the noise radiating from the tire-roadway interface.

The motorcycle, as it is being used today in this country, is primarily an urban problem in that it can easily penetrate into residential areas normally off-limits to large, noisy trucks. It is also a problem because the typical motorcycle exhaust system is so easily modified by the most inexperienced operators to produce the loud, attention-getting noise so psychologically satisfying to some elements of our society.

Timetable and Obstacles for Source Control

Noise control efforts aimed at the automobile and motorcycle are certainly in order. The principal highway noise problem, however, remains the heavy truck and it is to that vehicle that present efforts should be directed.

Addressing the session's second topic entailed considerably more conflict of opinion and findings and therefore is more difficult to summarize. That topic, Timetable and Obstacles for Source Control, was explored by experts from the City of Chicago, State of California, General Motors Corporation, Society of Automotive Engineers, and the U.S. Environmental Protection Agency.

These engineer-administrators attempted to assist in what proved to be a currently impossible task: to predict the time schedule under which specific vehicle noise levels will be achieved in the future.

The first schedule of decreasing allowable noise levels to be enacted into law was that begun in California in 1968, followed by Chicago in 1971, and with many other states and municipalities adopting similar reduction schedules since that time. The federal government and other state and local governments are adopting similar schedules. Whether these schedules will be met remains to be seen. Their early successes are predictable in that the earliest scheduled reductions could be achieved by certain relatively easy changes on new vehicles and primarily by muffler maintenance on older vehicles. But now that those early reductions are accomplished fact, the later scheduled reductions are encountering obstacles. This would appear to be the pattern that can be expected with any vehicle noise reduction schedules--early success, then the encountering of increasingly difficult obstacles in attempting to achieve further reductions. Moreover, federal motor vehicle noise regulations will also influence local schedules, thus increasing the probability of meeting those schedules.

Obstacles to Vehicle Noise Control

The principal obstacles to vehicle noise control, as discussed, include the economic costs, the availability of technology, the apparent tire noise floor, the lack of nationwide uniformity and coordination in regulation, the long lead times required for success in noise abatement through regulation, the difficulties and nonuniformity of enforcement, and the absence of a cost-benefit measure to indicate the advantages of the source control approach.

It would appear, with due recognition to necessary lead times and production engineering, that technology is now available to achieve significant decreases in the noise levels of new vehicles and in those already in the traffic stream. The cost of implementing or not implementing such technology is, however, still under debate. The problem requires weighing the effects of nonimplementation on the public's purse and on health and welfare versus the economic costs to industry and the public if technological improvements are incorporated.

To support and facilitate regulation, research is needed to better define the interaction of vehicle tires and roadway surfaces. For vehicles traveling above some minimal speed, perhaps around 35 mph, the tire-roadway interface is the most prevalent noise source and at the same time the least understood. This tire noise floor, however, should not be a basis for any slackening of vehicle noise-abatement efforts. It is certainly a factor at higher speed

urban, suburban, or rural highway sites; but the bulk of the highway vehicle noise impact in this country occurs in relatively low-speed, high-population-density urban areas.

The discussions during this session identified two very important needs that state and local governments should address:

1. The source control efforts of the federal government will not have a lasting effect without complementary state and local government regulations and enforcements. The quiet vehicles that should result from new vehicle regulation will quickly deteriorate without operational regulations. The interstate motor carrier regulations will monitor only a fraction of motor vehicle population. State and local regulation is the only apparent means of controlling the remainder.

2. As the noise emission levels for new vehicles are reduced, state and local government operational regulations need to be comparably reduced (for corresponding vehicle model years) so that advances made in new vehicle manufacture are not lost through lax vehicle maintenance or deliberate vehicle modification.

There are valid and compelling reasons for seeking nationwide uniformity in traffic noise regulations and coordinated, uniform effort in enforcement of those regulations. A great variety of standards would place a heavy burden on the vehicle operator and the manufacturer and add confusion and uncertainty to enforcement operations. At the same time, there is a desire on the part of some state and local government officials that federal regulations should permit flexibility to meet unique state and local conditions.

The importance of acquiring uniformity of standards and regulation must not be a cause for undue delay in obtaining such standards and enforcement. Accomplishing significant vehicle noise abatement is a long-term undertaking, for reasons discussed earlier, and therefore should be initiated as soon as reasonably possible.

Conclusion

The summary of the Session II discussions comprises mainly a tabulation of the many obstacles confronting those who would establish effective vehicle noise standards and regulations. That tenor is appropriate and accurate because that was the nature and direction of the discussions. Such a result tells us, with certainty, that we are probing into an area of seriously unresolved problems.

Session III - How to Accomplish Source Control

The purpose of Session III was to identify and analyze the critical elements needed to accomplish an effective source control program. Speakers during this session provided specific information in the following four areas:

1. Enforcement program consideration;
2. Federal, state, and local program integration;
3. Assessment of in-use and new-product source control strategies; and
4. Methods for measuring community benefit from source noise control.

Discussion following the main presentations centered on the enforcement aspects of noise source control programs.

Enforcement

The enforcement strategy of a noise emission control program is a critical element and should be oriented toward minimizing the practical problems that may arise during field application. The Bureau of Motor Carrier Safety (BMCS), for example, in carrying out its responsibilities to enforce the federal noise emission standards for interstate motor carriers, will be utilizing the stationary test procedure defined in the standard. This approach fits in well with BMCS's current safety inspection program conducted at highway weighing stations and optimizes the utilization of their 123 inspectors in carrying out their added noise measurement responsibilities. As a result, noise enforcement at the federal level beyond the weight station will be extremely limited, which emphasizes the important enforcement role that states will need to play if the program is to be effective nationally.

An information and education program that explains to the vehicle user and the public how, when, and why noise control enforcement will take place is another important element of an enforcement program. This can be accomplished through posters, public presentations, training meetings, courtesy measurement programs, and preliminary warning ticket programs, to name a few.

In some cases an enforcement program may also include suggestions to potential violators for quieting their vehicles. An example of this is BMCS's simplified noise problem identification procedure, which has been developed using a standard sound level meter fitted with an inexpensive plastic funnel to directionally locate noise sources inside truck cabs. This procedure is demonstrated in a slide presentation package that is shown to truck operators on request.

Analysis of In-Use and New-Product Strategies

Assessing the effectiveness of in-use versus new-product regulations over time leads directly to the need to understand truck population dynamics. This is particularly important in estimating the time lag for new products manufactured after a set time to begin to dominate numerically the total in-use population of products. Such a model has been developed using medium and heavy-duty trucks and was presented in detail at the session. The principal conclusion from this analysis indicates that the population of trucks in existence when a new truck regulation is promulgated will dominate the total truck population for up to 20 years.

Federal, State, and Local Program Integration

Technical assistance to state and local programs is available through several programs. These include

1. Model noise control legislation that was recently developed jointly by the Council of State Governments and EPA;

2. Regional workshops sponsored by EPA to provide training and assistance in establishing and operating state or local noise control programs; and

3. Cooperative noise-reduction programs jointly sponsored by BMCS and EPA to assist in the implementation of the Federal Motor Carrier Noise Control Regulation.

Also under way at EPA is an extensive nationwide nonoccupational noise survey, the results of which may be useful to state and local jurisdictions interested in noise control programs.

Assessment of Community Benefit From Source Control

A method for assessing the effect of a change in environmental noise on public health and welfare was summarized. In addition, as an example of the application of this method, a first approximation to quantify the impact of the federal interstate motor carrier regulation and proposed new truck regulation was presented. Results indicate that regulations being promulgated to date will greatly reduce the traffic noise impact on the national population. If community noise levels identified by EPA's levels document are to be achieved, further reduction of automobile and light-truck noise levels should be required, although this might not be sufficient.

Discussion and General Findings

Workshop discussion centered primarily on enforcement program consideration. Among these were

1. The need for education of the court system on noise enforcement to reduce the number of court-rejected noise cases; and
2. The importance on noninstrument enforcement through visual inspection and issuance of equipment correction citations. It was noted that 97% of California's citations are of this type.

A major finding of the session was the need to investigate ways of providing monetary incentives to state and local jurisdictions for noise source control programs. Since noise source control programs appear to be more cost-effective than barrier programs in many cases, one possibility would be to make such funds available in support of noise source control programs.

Session IV - State and Local Regulations

In the previous three sessions, we gained knowledge on source levels and source control technology and accumulated ingredients for a timetable of vehicle noise reduction. These timetable ingredients include technological constraints, a large list of "foreseeable" obstacles (especially those pertaining to enforcement), and the necessary cost-benefit balance. We still, however, have no "road map" for a state program to control vehicle noise. Missing is the administrative framework. A state agency knows where it is, here and now, in its own state efforts. It can see the goal at the end of the trip. And it has some tools for the trip, in rough form: a timetable of limits and the technical enforcement procedures. But it is missing the administrative road map. And on this map there will be many routes to the goal--many forks in the road, each requiring a decision tailored to each state's uniqueness. State agencies need guidelines for deciding their direction at each fork.

In this session, we suggested such a road map of administrative decisions and presented three case histories to illustrate three different routes toward the goal of vehicle noise control. Our case histories include the noise control programs of Florida, the New Jersey Turnpike, and Maryland. We believe these are three programs of success-in-the-making. When combined with the successful histories of California and Chicago, the five programs illustrate the diversity of routes towards our goal--the different decisions, each tailored to the uniqueness of each individual jurisdiction.

Administrative Decisions

The administrative plan and the resulting enforcement program must be workable (enforceable), feasible (technologically and economically), and effective in reducing community noise.

One area that concerned this session is the administrative decisions required. Briefly, these decisions concern (a) enabling legislation, especially the amount of detail required and the balance between administrative and legislative decision-making; (b) balance among state agency roles in the program as affected by agency desires, staff skills, budgets, and existing administrative habits; (c) enforcement thoroughness on certification of sites, inspectors, and instruments; (d) enforcement balances such as operational versus new-product enforcement noise limits for all vehicles versus limits for heavy trucks only, enforcement along freeways versus enforcement in urban areas also, moving tests versus stationary tests, and disposition by trial versus disposition through administrative procedures; and (e) coordination with local and federal jurisdictions, with the state legislature, and with programs to build roadside noise barriers.

Case History I: Florida. Florida's program on vehicle noise control is administered through the Florida Department of Pollution Control, operating on a very low budget. Warnings are now issued; full enforcement will begin on July 1, 1975. After a brief administrative history of Florida's noise control efforts, state constraints and how they affected Florida's administrative decisions were discussed. Florida efforts were supported by a very low budget, and the state extensively borrowed experience and research from other jurisdictions and solicited the help of various local universities. The program incorporated a thorough training program and an extensive public awareness campaign, including participation of the Motor Vehicle Manufacturers Association. The administrative framework will allow an effective source-path-receiver balance toward community noise reduction on a cost-effective basis.

Case History II: New Jersey Turnpike. The administrative experience of the New Jersey Turnpike Authority in vehicle noise control, especially experience of common interest to state jurisdictions, was presented in this case study. Full enforcement was begun on the Turnpike on October 1, 1974. The Turnpike had a full program of information dissemination, including the enforcement training of State Police and Division of Motor Vehicle personnel. The Turnpike received timely certification advice from legal counsel on sites and microphone placement and advice on choice of instrumentation.

Case History III: Maryland. Maryland's program was developed by the State Department of Transportation and is administered under the Department of Health. Because of budget limits, enforcement will not begin until early 1976. Key ingredients to success are proper timing and the interaction with other state agencies and key state legislators. In Maryland, interagency coordination was stressed both in planning and in the program operation, especially since parallel planning efforts existed in other state agencies and these efforts were thought insufficient by the state DOT. Preparation was thorough and was valuable in defending the administrative plan against changes proposed by legislative committees.

These three case histories, when read in full, give the strong message that carbon-copy efforts toward vehicle noise control will fall short. Flexibility and adaptation to individual state situations is essential.

Following these three presentations, several aspects of state enforcement programs were discussed by all participants of the workshop.

Enforcement Programs

Several states have noise limits for vehicles in operation that are more stringent than the limits these same vehicles had to meet when new. Is this reasonable? Or feasible? On the one hand, some off-the-shelf equipment now exists for retrofitting older trucks, and some believe the retrofit trend will continue. With this retrofit equipment, vehicles may be quieted below their new-product noise emission levels. On the other hand, motor vehicle industry representatives strongly believe the economic cost precludes this.

Is a non-tampering provision feasible for vehicles manufactured before noise certification, as some states imply by their regulations? In other words, if we do not know the noise output when the vehicle is new, how can we legislate against the operator increasing the noise output by tampering with the original equipment? California has had success on two fronts. They can often tell, by visual inspection, if equipment has been modified. Especially for motorcycles, this inspection alone enforces against tampering. California officers also collect data on many vehicles that are nominally identical and determine a distribution of source levels for such vehicles. They can then suspect tampering when a vehicle passes that is far noisier than the norm. For vehicles that are noise-certified, all participants seem to agree that the tampering provisions can be straightforwardly enforced.

Role of the Judiciary

A question was raised about cooperation from the judiciary. In California, most judges have insufficient time for noise concerns. The California Highway Patrol has asked the judges how they wish citations written to ease the judicial process; cooperation was thereby increased. Low fines seem to help. In addition, a large number of violations are now considered misdemeanors, which are not tried by jury. In Chicago, the judges rotate, the traffic courts are jammed, and the judicial response is highly variable. Improvement is slowly occurring. In Florida, training of enforcement officers included a full-day session on court preparation. The same educational process is planned for the future for state and local enforcement officers. All state attorneys were subsequently contacted, and full support is expected. The New Jersey Turnpike invited municipal judges for a day's briefing, with dismal response. The prosecutors will be chosen from Turnpike staff, specially deputized, because of budget cutbacks in the State Attorney General's Office. In Maryland, liaison is planned with judges and prosecuting attorneys.

A1F02 - COMMITTEE ON TRANSPORTATION ENVIRONMENTAL REVIEW PROCESS

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Workshop Chairmen and Speakers

Session I - General Background

Chairman: Stanley E. Dunn, Florida Atlantic University

John E. Wesler and Harry Close, U.S. Department of Transportation

Session II - Source Reduction Results

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