NOISE/NEWS INTERNATIONAL

A quarterly news magazine

Volume 5, Number 2
1997 June

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European Comission Green Paper

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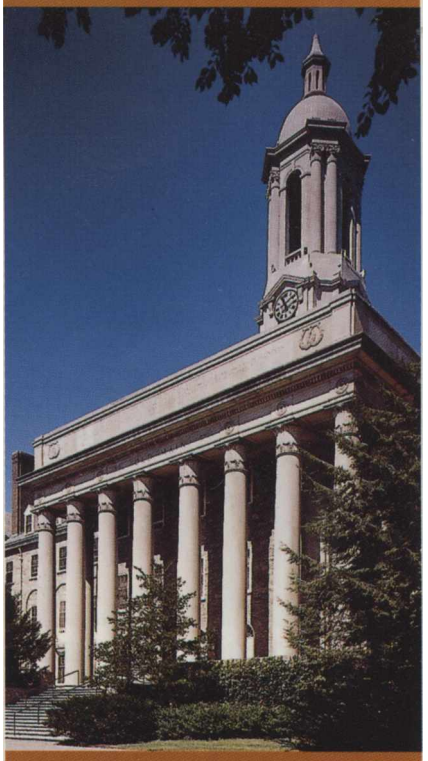

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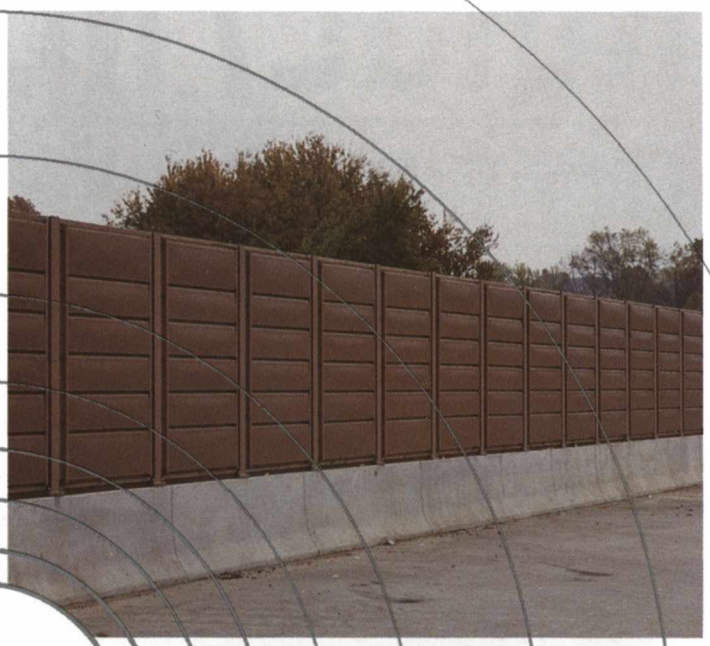

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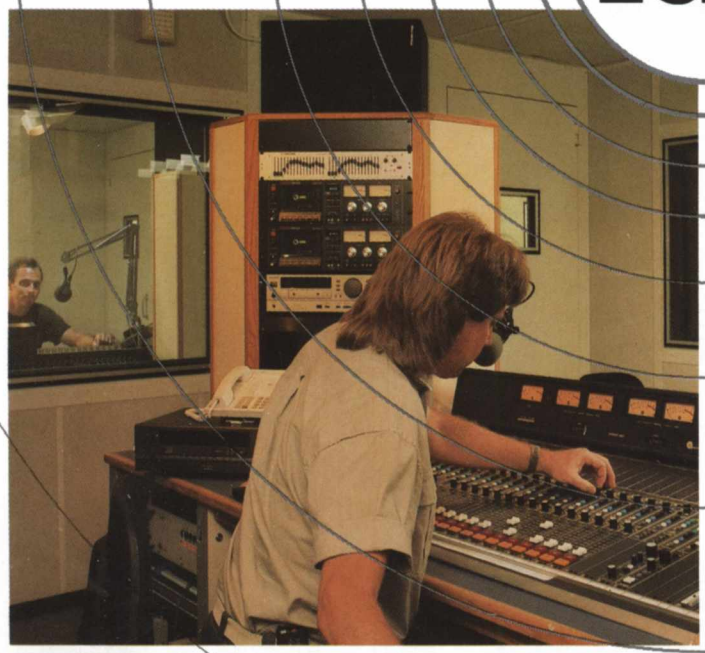

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Noise/News International (ISSN 1021-643X) is a quarterly news magazine published jointly by the International Institute of Noise Control Engineering and the Institute of Noise Control Engineering of the USA., Inc. Noise/News International is distributed to the Member Societies of International INCE and to the members of INCE/USA as a member benefit. Advertising services and production control are provided by the IEEE Periodicals-Magazines Department of the Institute of Electrical and Electronics Engineers, Inc. Editorial services are provided by Noise Control Foundation, Inc. Feature articles for Noise/News International are selected by the editors. Responsibility for the editorial content rests upon the authors and not upon International INCE, INCE/USA, the IEEE, Noise Control Foundation, the societies or their members. Product information is provided as a reader service and does not constitute endorsement by the societies or their members. SUBSCRIPTIONS: In the USA, the annual subscription rate is USD 50.00, postpaid, which is included in the dues of Members and Associates of INCE/USA. Nonmember subscription rates available upon request. Single copy price is USD 12.50. Address correspondence concerning subscriptions to INCE/USA, P.O. Box 3206, Arlington Branch, Poughkeepsie, NY 12603-0206. In all other countries, the annual subscription rate is CHF 80 via surface mail; airmail delivery subject to additional charge. Single copy price is CHF 20. Address correspondence concerning subscriptions to I-INCE General Secretariat, Celestijnenlaan 200 D, B-3001, Heverlee-Leuven, Belgium. EDITORIAL CORRESPONDENCE: Address to George C. Maling, Jr., Managing Editor, NNI, c/o Noise Control Foundation, P.O. Box 2469, Arlington Branch, Poughkeepsie, NY 12603, USA; telephone +1 914 462 4006 or FAX +1 914 463 0201. COPYRIGHT AND REPRINT PERMISSIONS: Copyright © 1997 by Institute of Noise Control Engineering of the USA, Inc. For all other copying, reprint, or republication permission, write to the Managing Editor at the address above. ADVERTISING: For information about advertising, contact Susan Schneiderman, Advertising Sales Manager, IEEE Magazines, 445 Hoes Lane, Piscataway, NJ 08855-1331, USA; telephone: +1 908 562 3946; FAX: +1 908 981 1855. Printed in the United States of America.

NOISE/NEWS INTERNATIONAL

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Volume 5, Number 2 - 1997 June

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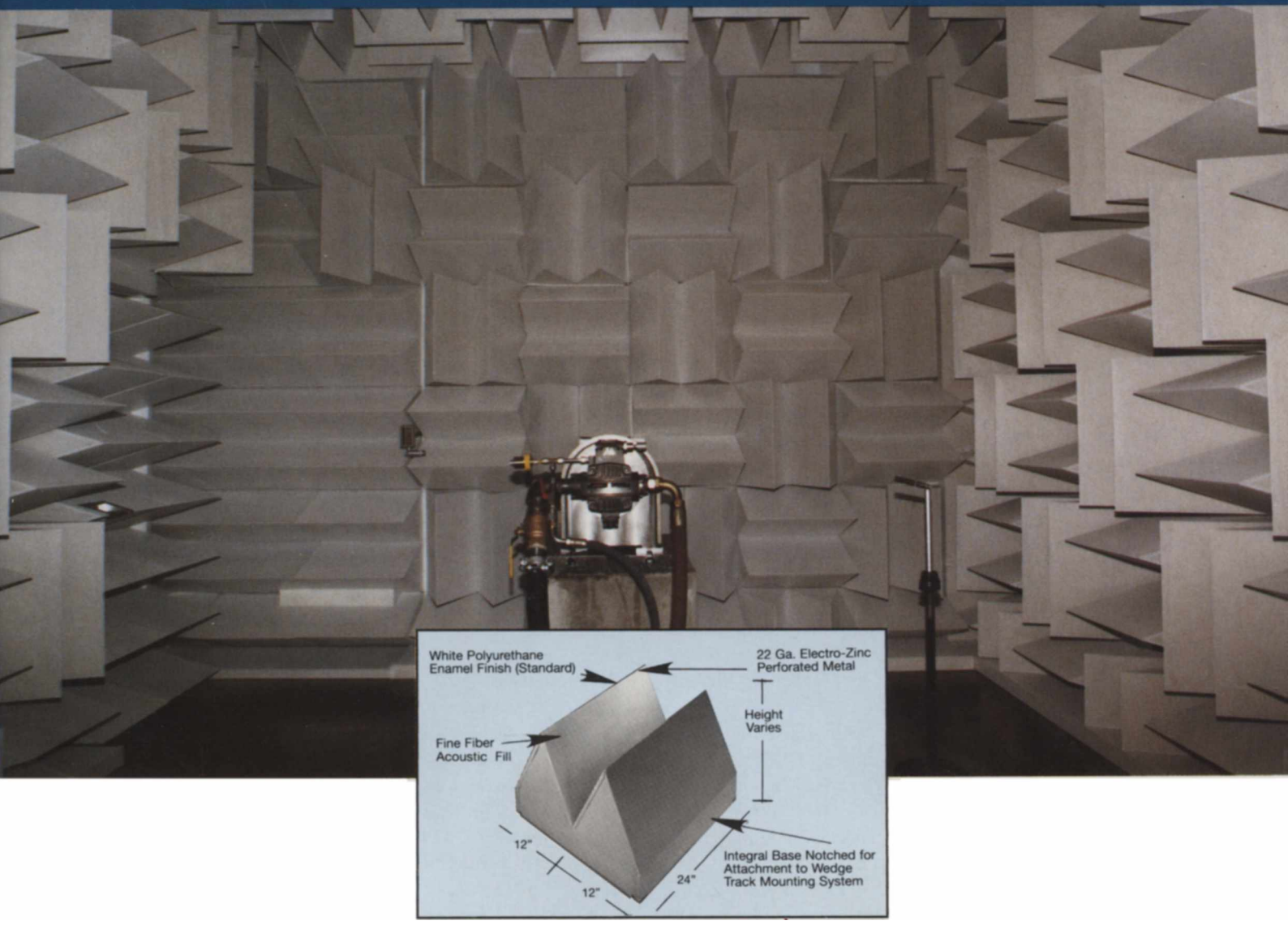

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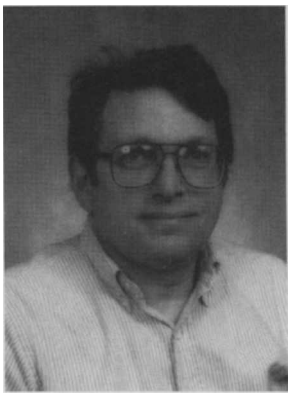
President's Column



Directions for 1997

It feels as if I have just begun my term as president of INCE/USA, and already I am a lame duck! In December, I will have a second opportunity to write this column—assuming no one decides to throw me out of office. But just in case, I want to present some of my thoughts on INCE/USA for consideration by the membership.

Being a strong advocate of an effective quality management system, I hope to nudge INCE into this direction in a formal sense. For those members not working on organizational matters, and even for some of us who are, the workings of INCE can be confusing. The duties of the officers, meeting planning, financial matters, and a myriad of other issues often are incomprehensible to anyone other than the person doing the work. To alleviate this, INCE is modifying its *President's Handbook* to become a *Policies and Procedures Manual (PPI)* that will clearly state who does what and when. While an easy concept, this will take time given the amount of volunteer effort that has to go into the project.

Along with a *PPI* are the ongoing roles of evaluation or auditing. Recently, we asked for views of INCE from the membership. The INCE Board of Directors is acting on many of the comments presented. We also need internal audits to assure we are doing our job. I have asked the BoD to develop an evaluation committee to perform a quality review of the overall organization.

I have recommended that the one-year term limit of the President be extended. From my past experience and the experience of others, the position often cannot be effective with a one-year term. This is partially because the position-holder requires some time to establish himself or herself, because the numbers of meetings are few in his or her term, and because there is virtually no way for a person to establish, and complete a set of long-term priorities.

Clearly, if you look at the make-up of our meetings and conferences, you can see we need to do better to attract minorities and women as members. We need to make INCE a truly forward thinking and representative organization. The first step is to make sure INCE is a comfortable place for *all* professionals—and I think it is—but the next step, the outreach, can further enrich the organization.

The Institute excels in the professional aspects needed in an organization including conferences, seminars, networking and publications. Increased member benefits is an area that can make INCE an even more attractive group. INCE has recently added some other benefits including Internet access and the CD ROM project. In addition, I have asked the Institute to look into other benefits such as a universal e-mail address, and discounts for services, etc.

There is a lot of duplication of effort and money in the many noise-related organizations in the United States. I am suggesting INCE/USA take the lead role in organizing a meeting with other like-minded professional societies to consider innovative ways to ameliorate this. A concerted effort by INCE to work with other organizations in creating fewer meetings, reducing the overlap in effort from meeting travel, preparation, and costs could save us all time, effort, and money

Agree or disagree? We welcome your views on this editorial or on any facet on the operation of INCE. We will address and respond to all comments.

—Richard J. Peppin
1997 President, INCE/USA

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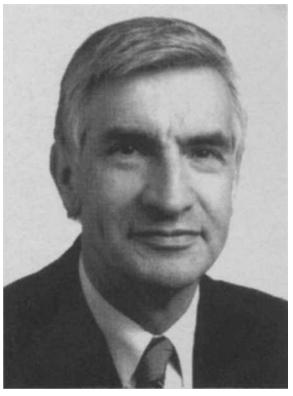
Editor's View



The EU Green Paper

Last year, the European Union (EU) issued a *Green Paper* on noise which provides an excellent summary of actions to date to contain both environmental noise and noise in industry, and a proposal as to how noise is to be controlled in the future. The *Green Paper* is not a plan for exactly what the Union will do, but rather a document intended to stimulate a discussion of noise policy among all of those concerned—including scientists, engineers, manufacturers, public policy makers, and the public. This group, a group with, in many cases, divergent viewpoints, will, in the end, have to agree on the steps to be taken if Europeans are to make progress in the control of noise.

The *Green Paper* itself, as readers will quickly learn from reading the (slightly) edited version that begins on page 77 of this issue, is a complex document that contains a wealth of information on past progress in Europe and a possible view of the future.

All of the conclusions based on past experience are helpful, but four items seem to be very important.

- The large number of ways in which noise data are collected make it hard to compare results of various studies, and make it difficult to establish noise policy based on "hard" facts.The sound level reductions from cars and trucks determined using standard methods for determination of noise emission do not translate well into reductions in environmental noise for several reasons, among them, problems with emission standards, the increasing volume of traffic, and problems with tire noise as a major noise source at high speeds.
- The significant reduction in noise emission from aircraft has, in many cases, produced a very significant decrease in the area within a given noise contour. Nevertheless, the projected growth in air traffic means that additional measures have to be taken if communities near airports are going to have relief from environmental noise.
- The strategy of writing detailed specifications for specific types of machinery must be changed. New approaches are needed.

A new noise policy for the European Commission will have to take these conclusions into account. Research into methods of noise assessment and methods of presentation of data that ensure compatibility between studies appears to be of particular interest. Methods for the reduction of tire noise, partly through improvement in the acoustical characteristics and costs of porous road surfaces, have a high priority. Noise emission standards for road vehicles have to be examined and perhaps changed to reflect more realistic operating conditions. New approaches are needed for reduction of community noise produced by aircraft. A strategy has to be developed to control machinery noise emissions without the time-consuming and expensive development of emission standards by the EU. An optimal mix of approaches on the international, regional (e.g., European), and local levels is needed to satisfy the public.

I urge all readers of *NNI* to study the text of the *Green Paper* that begins on page 77 of this issue, and to submit written comments.

Together, we have an opportunity to influence European noise policy, and I hope that readers will seize the opportunity to have some influence.

— André Cops
European Editor

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Member Society Profile

The Acoustical Commission of the Hungarian Academy of Sciences

There are two Member Societies of International INCE in Hungary, the Acoustical Commission of the Hungarian Academy of Sciences and the Scientific Society for Optics, Acoustics, Motion Pictures, and Theater Technology (OPAKFI).

The Member Society Profile for this issue is the Acoustical Commission of the Hungarian Academy of Sciences; the profile for OPAKFI appeared in the March issue.

The former has been a Member Society of International INCE since 1978, and the latter since 1989.

The Hungarian Academy of Sciences was founded as the highest scientific body in the Hungarian Republic. The task of the H.A.S. is to study all branches of science. This means providing leadership and coordination of research in fundamental, theoretical, and experimental investigations within the scope of applied science.

The tasks in scientific fields that belong to the H.A.S. are implemented through Sections and Committees. The Sections of the H.A.S. are the following:

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III. Section of Mathematics and Physical Sciences
IV. Section of Agricultural Sciences
V. Section of Medical Sciences
VI. Section of Technical Sciences
VII. Section of Chemical Sciences
VIII. Section of Biological Sciences
IX. Section of Economics and Law
X. Section of Geo- and Mining Sciences

This is the eighteenth in a series of articles on the history and activities of the Member Societies of International INCE.—Ed.

In addition to the above Sections, the H.A.S. Presidium may organize committees for the study of certain branches of science within the Sections. The Presidium defines their duties, and appoints a head of each committee. A committee within this structure works in the specific branch of science as a scientific Section; its tasks are defined by the Presidium.

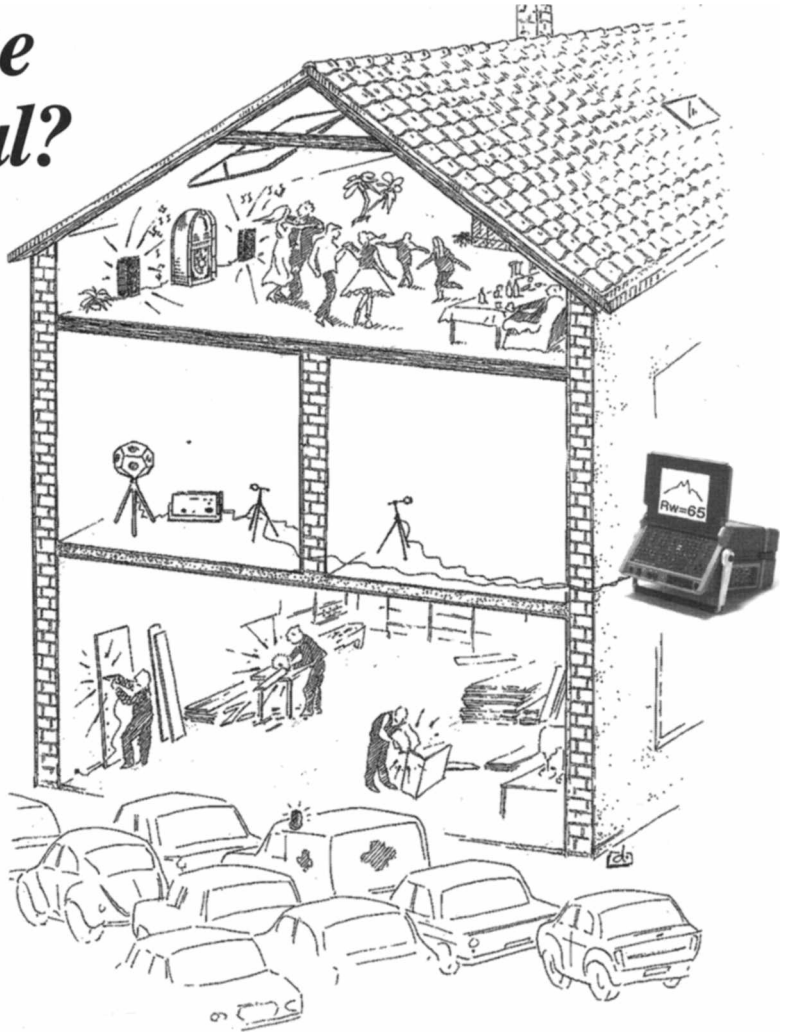
The H.A.S. is a major resource in the fields of natural and technical sciences in Hungary. Many famous scientists are now or were members of the H.A.S. The Nobel Laureate George BJkJsy became an ordinary member of the H.A.S. in 1942. The *Acoustics Committee* is the highest scientific forum in acoustics, and has been in existence as a working panel of Scientific Section III of the H.A.S. since 1961. This committee organized the 7th International Congress on Acoustics in Budapest in 1971. More than 1400 participants attended this meeting which was a great success.

In 1981, the membership of the committee was increased by scientists coming from Sections I, V, VI, and VIII. Since that time, the official name of this committee is the *Complex Acoustics Committee of the H.A.S.* Professor Tam<s Tarn\czy was the Committee president for 31 years. The current chairman is Dr. Gordos GJza. There are 26 members of the Committee; the Working Panels of the Committee cover the following specific areas:

- Audiology and Hearing
- Building Acoustics
- Electroacoustics
- Linguistics, Acoustics, and Speech Technology
- Noise and Vibration Control
- Machine Acoustics

The address for further information is given in the *NNI Directory*, which appears on page 116 of this issue.

More noise than signal?



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SOME OF THE FEATURES LISTED ARE OPTIONAL, CONTACT THE FACTORY FOR DETAILS

Reader Service Number 31

The EC Green Paper on Future Noise Policy - A Need for Change?

Colin Grimwood, MIOA & Matthew Ling, MIOA

This article on the EC Green Paper (see the following feature) was published in the Acoustics Bulletin, *pages 5-8, 1997 January - February, of the Institute of Acoustics in the United Kingdom. Reprinted by permission. - Ed.*

Introduction

A need for changes in the overall approach to national and European noise abatement policy is discussed in an EC Green Paper [1] issued during November 1996. This article discusses the Green Paper and looks at the impact it could have on UK noise abatement measures.

The Green Paper would be better titled *Future Environmental Noise Policy* as its brief excludes consideration of workplace noise exposure and noise in dwellings. It does, however, seek to give noise abatement a higher priority and to promote discussion on all areas of environmental noise policy with a clearly stated desire to see a harmonisation of assessment and measurement methods across the Member States.

For over 25 years EC noise 'policy' has essentially consisted of legislation fixing maximum sound levels for vehicles, aeroplanes and machines with a single market aim. However, the Green Paper notes that this has not led to significant improvements in exposure of people to environmental noise, particularly from road traffic. Concern is expressed on a number of issues:

- noise levels in 'black areas'* have been reduced but the number of people living in 'grey areas' has increased
- continued traffic growth coupled with urbanisation is resulting in a higher level of noise exposure
- leisure and tourism activities have created additional noise sources
- the spread of noise spatially (to affect rural and suburban areas) and over time

Additionally, there are problems associated with unifying assessment of noise exposure because of the different perception and acceptability of noise levels/exposure across the EU.

Environmental Impact of Noise

Section 2 of the Green Paper examines the impact of noise and relates it to eight general categories of noise sources; road, rail, air, industry, civil engineering, building site activities, recreational activities and outdoor equipment. The latter category includes gardening equipment. Many of these sources are already covered by existing UK legislation, codes of practice and BS or ISO standards.

Road traffic is singled out as the most important noise source, said to account for 90% of the EU exposure to levels greater than 65 dB(A) (80 million people), for whom a significant effect on human health can be expected. The grey category, where people are seriously annoyed, is said to affect 170 million EU citizens. It should be of no surprise therefore to expect recommendations to concentrate on this source.

Overall the trends which cause concern in the future are the predicted doubling of road freight by 2010, a forecast 180% increase in airline traffic and the development of high speed rail links.

Currently there is much interest across Europe in the polluter pays principle and the use of green taxes, but attaching a cost to noise exposure is a controversial procedure. Because of the difficulties a number of factors are identified in the Green Paper which may enable an economic assessment to be made:

- willingness to pay (for less noise exposure)
- change of market value of properties
- cost of abatement measures
- cost of avoidance or prevention
- cost of medical care and production losses

Cost estimates vary according to the method used but are typically found to be 0.2 – 2% of GDP. This annual cost to society (over 12 billion ECU) provides the EC with a significant argument for improved noise control measures.

Efficacy of Existing Policies in EU and Member States

Section 3 examines existing EC policies and the effectiveness of their implementation. These are summarised in Table 1.

What Levels Are Acceptable?

The Green Paper quotes OECD thresholds and WHO guideline values as the starting point for a discussion of acceptable levels in the EU, leading on to a restating of the night time L_{Aeq} targets contained in the Fifth Environmental Action Plan (to be achieved by the year 2000):

- to phase out exposure above 65 dB(A)
- reduction in proportion of population exposed to levels between 55 and 65 dB(A)
- exposure in quiet areas should not increase beyond 55 dB(A)
- a level of 85 dB(A) should never be exceeded

Most countries have already adopted legislation and guidance which broadly agrees with these figures eg PPG24 [2], and in fact criticism of these figures was made by some countries whose noise climates were already below target levels [3].

A New Noise Framework

The EC wishes to see member states working towards the common goal of a successful noise abatement policy. The EC suggests action in a number of generic areas to

**OECD, 1991, Fighting Noise in the 1990s, suggests that 'black areas' are those with daytime L_{Aeq} > 65 dB, and 'grey areas' have a daytime L_{Aeq} between 55–65 dB.*

Noise Source and relevant EC directives	*Developments*	*Comments*
Road transport 70/157 (as amended), 78/1015 (as amended)	8 dB(A) reduction for individual cars, 11 dB(A) reduction for individual heavy lorries	Resulting in only 1-2 dB(A) reduction in road traffic noise exposure because of increased traffic volume
Rail transport (no directives)	Proposed emission limits withdrawn in 1993	Legislation currently on an individual country basis
Air transport 80/51, 89/629, 92/14	Limit values introduced for take off and landing, noise certificated aircraft, phase out of chapter 2 aircraft by 2002	Improvements likely in short to medium term, concern over longer term deterioration
Construction plant & equipment, lawnmowers 79/113, 84/533, 84/534, 84/535, 84/536, 84/537, 84/538, 84/662, 86/594, 86/662	Approx. 1-5 dB(A) reduction from specified items; policy has a single market aim	No guarantee that current approach secures any environmental improvement; proposed new framework directive
Industrial noise 75/442 (as amended), 96/61	New area of EC activity	Control of some industrial noise emissions through a permit system

Table 1 Summary of EC Directives

achieve this:

- common noise exposure index to be used throughout Europe (L_{Aeq}) to enable comparability of noise data
- development of harmonised prediction methods for environmental noise sources
- development of harmonised measurement methods for environmental noise sources
- exchange of comparable information on noise exposure between member states, possibly collected and made available by the European Environment Agency (EEA)
- a framework for the assessment of environmental noise exposure
- provision of information on noise exposure to the public
- possible agreement on a limited number of minimum noise quality target values
- an obligation to take action to meet these target values

Achieving the Aims

At present it is unclear exactly how these aims will be achieved – after all this is a discussion paper – but we can draw some conclusions as to where effort may well be targeted.

Mapping to assess noise climate and noise exposure

The EC believes that noise mapping has the potential to be an effective and relatively inexpensive tool. Noise mapping combines noise level data with a conventional map, representing the noise levels as coloured bands or contours. This is not a new idea and bands have been suggested in ISO 1996 [4], but the real opportunity is to incorporate other data sources such as census information to assess population noise exposure. Noise data can be originated from model prediction or measurements.

Road transport noise reduction

A number of suggestions are given:

- reduction of tyre/road noise
- active promotion and funding of low noise surfaces
- use of vehicle taxation
- in-use noise testing of vehicles
- revision of test procedures (eg ISO R362) to make them more realistic
- consideration of new emission limit values
- support of relevant research

Railway noise reduction

Concern here surrounds the problems associated with high speed rail and freight transport. Apart from the joint bodies representing these sectors suggesting noise emission limits, the green paper highlights a combination of:

- economic instruments (eg track charges related to emission levels)
- agreements on targets for noise reduction and maintenance of equipment in use
- harmonised methods for assessment and prediction of railway noise

Aircraft

For aircraft noise a re-classification of aircraft types is suggested based upon actual operational noise rather than the current certification method. Greater stringency in emission values, the use of economic instruments and the role of land use planning are also discussed.

Outdoor machinery

The emphasis here is on a proposed directive for 1997 which will include noise limit values for some equipment and introduce noise labelling of machinery as diverse as construction plant, garden equipment and equipment used on refuse collection vehicles. This is seen as part of

the drive to improve eco-labelling of products. The OECD have reported that such an approach may create a market for low noise products.

General Actions

The final section of the green paper is concerned with those activities which promote exchange of ideas, technology and experience across the EU.

Some examples such as the LIFE programme to improve and inform land use development and planning already involve UK local authorities, whilst others such as the Telematics Applications Programme have been used to improve environmental information systems. It is expected that increased use will be made of these sorts of programmes to enhance noise reduction activities in the EU.

This possibility of financial support from the EC may be of interest to local authorities who are considering a more pro-active approach to environmental noise policy.

Concluding Remarks

This is the first attempt by the EC to significantly influence environmental noise policy across Europe. The EC also seem a little unclear as to whether they should initiate a greater involvement in this area of environmental activity. For example, compare this quote from the executive summary of the Green Paper: *The local nature of noise problems does not mean that all action is best taken at local level* with *The local impact of noise means that proposing and implementing solutions are essentially local responsibilities* taken from section 4.1.

As professionals working on a daily basis with noise problems we are all too aware of the influence and effects that noise exposure has upon local communities. We should welcome the opportunity to contribute to the debate and at long last give noise policy the attention it deserves.

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PSQ '97

The Institute of Noise Control Engineering, the Acoustical Society of America and the RH Lyon Corp are cooperating in the organization of Product Sound Quality '97 (**PSQ '97**) on Cape Cod in Massachusetts, USA on 1997 September 21-23

PSQ '97 will be an important meeting for those in industry concerned with product sound. The Organizing Committee for the meeting is Richard H. Lyon, RH Lyon Corp, Chair, Imdad Iman, GE R&D Center, Bennett Brooks, Brooks Acoustics Corporation, and Robert J. Bernhard, Ray W. Herrick Labs, Purdue University.

PSQ '97 will be concerned with four main issues in product sound:

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FUTURE NOISE POLICY

European Commission Green Paper

prepared by the Commission of the European Communities

This is an edited version of document, COM(96)540 (final) *which was issued by the Commission of the European Communities, Brussels, Belgium on 1996 November 04. It is being published to inform readers of NNI of past and future activities related to noise control in Europe, and for comments. The full text can be found on the Internet at http://europa.eu.int/en/record/green/gp9611.noise.htm. The text in 10 languages is available on the Internet.—Ed.*

Executive Summary

Environmental noise, caused by traffic, industrial and recreational activities is one of the main local

In 1996, the European Union issued a *Green Paper* on future noise policy for comments. The version that begins on this page has been edited for style, puctuation, and grammar.

There is a wide variety of acronyms used in the *Green Paper.* The information below should help to clarify some of the terms used. In addition, information on Internet addresses is given, where available, that will provide further insight into the workings of the European Union.

The European Community (EC) resulted from a merger of several organizations in 1967. The Treaty on the European Union (EU) in 1992 created a new official title for the organization, the European Economic Community (EEC). The Commission is the administrative arm of the EC, and the Council is the executive branch of the EC representing the Member States.—Ed.

Acronyms used in this article include:

ACI	Airports Council International
EEA	European Economic Association
ECAC	European Civil Aviation Conference
EEC	European Economic Commission
ECU	European Currency Unit. A "basket" of European currencies determine the value of the ECU. At present, 1 ECU is about 1.17 USD.
CAEP	Committee on Aviation Environmental Protection
CEN	European Committee for Standardization
CEST	Centre for the Exploitation of Science and Technology (UK)
GDP	Gross Domestic Product
ICAO	International Civil Aviation Organization. See "Chicago Convention" below. (http://www.cam.org/%7Eicao)
INFRAS	Consultants for Environmental Economics and Policies (Switzerland)
INRETS	Institut National de Recherche sur les Transports et leur Sécurité (http://www.inrets.fr) (France)
IPPC	An EU term, Integrated Pollution Prevention and Control
LIFE	A financial instrument for providing funds for environmental activities (1992)
OECD	Organization for Economic Cooperation and Development (http://www.oecd.org)
OJ	Official Journal of the European Community
UIC	Union International des Chemins de Fer. A Paris-based union of about 100 railways worldwide (about 40 in Europe)
UNIFE	An international railway industry organization
WHO	World Health Organization (http://www.who.ch).
5EAP	5th Environmental Action Program (http://www.ecotopia.be/EPE/sourcebook/1.8.html) (Other information on EC/EU environmental programs can be found at the same address except 1.9.html. EC/EU environmental directives can be found at the same address except 1.10.html)

The "Chicago Convention" is a convention on International Civil Aviation signed in Chicago on 1944 December 07 and amended by the ICAO Assembly.

A glossary of EC/EU acronyms, initiatives, institutions, policies, programs, and terms can be found at http://www.abdn.ac.uk/%7Epol028/sources/europe.htm.

environmental problems in Europe and the source of an increasing number of complaints from the public. Generally, however, action to reduce environmental noise has had a lower priority than that taken to address other environmental problems such as air and water pollution.

The 1993 Fifth Environmental Action Programme started to remedy this and included a number of basic targets for noise exposure to be reached by the year 2000, while the recent proposal on the review of the Fifth Action Programme (COM(95)647) announces the development of a noise abatement programme for action to meet these targets.

This *Green Paper* is the first step in the development of such a programme and aims to stimulate public discussion on the future approach to noise policy. It reviews the overall noise situation and Community and national action taken to date. The review is followed by the outline of a framework for action covering the improvement of information and its comparability as well as future options for the reduction of noise from different sources.

The Noise Situation in the European Union

The data available on noise exposure is generally poor in comparison to that collected to measure other environmental problems and is often difficult to compare because of the different measurement and assessment methods. However, it has been estimated that around 20 percent of the Union's population—or close to 80 million people—suffer from noise levels that scientists and health experts consider to be unacceptable—where most people become annoyed, where sleep is disturbed, and where adverse health effects are to be feared. An additional 170 million citizens are living in so-called *grey areas* where the noise levels are such as to cause serious annoyance during the daytime.

A wide variety of studies have examined the question of the external costs of noise to society especially transport noise. The estimates range from 0.2% to 2% of GDP. The Commission's Green Paper, *Fair and Efficient Pricing in Transport,* used the lower estimate of 0.2% of GDP which represents an annual cost to society of over 12 billion ECU.

Analysis of Existing Noise Abatement Actions in the European Union

For more than twenty years, Community environmental noise policy has essentially consisted of legislation fixing maximum sound levels for vehicles, aeroplanes and machines with a single market objective (or to implement international agreements in the case of aircraft—linked to certification procedures), to ensure that new vehicles and equipment do, at the time of manufacture, comply with the noise limits laid down in directives.

Thanks to this legislation and technological progress, significant reductions of noise from individual sources have been achieved. For example, the noise from individual cars has been reduced by 85% since 1970, and the noise from lorries by 90%. Likewise for aircraft, the noise footprint around an airport made by a modern jet has been reduced by a factor of 9 compared to an aircraft with 1970s technology.

However, data covering the past 15 years do not show significant improvements in exposure to environmental noise, especially road traffic noise. The growth and spread of traffic in space and time and the development of leisure activities and tourism have partly offset the technological improvements. Road and air traffic growth and the expansion of high speed rail exacerbate the noise problem. In the case of motor vehicles, other factors are also important—such as the dominance of tyre noise above quite low speeds (50 km/h), and the absence of regular noise inspection and maintenance procedures.

For some sources, such as railways and a wide range of noisy equipment used outdoors, there are no Community or international standards that set emission limits. A number of Member States are planning national legislation for these products—which could cause problems for the functioning of the single market.

Most Member States have adopted legislation or recommendations setting immission limits for noise exposure in sensitive areas. These are often integrated into national abatement laws and used in land use plans—especially for new infrastructure developments. A survey done for the Commission has shown a considerable degree of convergence between Member States in the establishment of such quality criteria for road, rail, and industrial noise. The situation for aircraft noise indices and exposure levels is more divergent.

A New Framework for Noise Policy

In the light of the poor state of data on noise exposure and the shortcomings identified in the analysis of existing policy measures, the Commission believes that changes in the overall approach are required if a noise abatement policy is to be successful. This requires a framework based on shared responsibility involving target setting, monitoring of progress, and measures to improve the accuracy and standardisation of data to help improve the coherency of different actions.

The local nature of noise problems does not mean that all action is best taken at the local level, as, for example, the sources of environmental noise are generally not of local origin. However, effective ac-

tion is very dependent on strong local and national policies, and these need to be more closely related to the measures to be decided at the Community level. In this context, there is scope for cooperation across the Community to improve the data situation and the comparability of information. In addition, the Community could assist in the exchange of experience in noise abatement between Member States. The primary area for Community involvement will remain linked to the reduction of noise from products. Here, the Commission will be looking to broaden the range of policy instruments to be applied, paying particular attention to the potential of economic policy instruments whose use to date is not widespread in noise abatement.

The proposed new framework outlines options for future action :

1. A proposal for a directive providing for the harmonization of *methods of assessment of noise exposure* and the mutual exchange of information. The proposal could include recommendations on noise mapping and the provision of information on noise exposure to the public. In a second stage, consideration could be given to the establishment of target values and the obligation to take action to reach the targets.
2. The next phase of action to reduce *road traffic noise* will address tyre noise and look at the possibilities of integrating noise costs into fiscal instruments, amending Community legislation on road-worthiness tests to include noise, and to promote low noise surfaces through Community funding.
3. More attention needs to be paid to *rail noise* where some Member States are planning national legislation, and where there is considerable opposition to the expansion of rail capacity due to excessive noise. In addition to supporting research in this field, the Commission will investigate the feasibility of introducing legislation setting emission limit values, negotiated agreements with the rail industry on targets for emission values, and economic policy instruments such as a variable track charge.
4. In *air transport,* the Commission is also looking at a combination of instruments. These would include greater stringency in emission values and the use of economic policy instruments to encourage the development and use of lower noise aircraft, as well the contribution local measures such as land use planning could make. A consultation paper on stringency in emission values is to be presented in the near future.
5. The Commission plans to simplify the existing legislation setting emission limits for a limited range of *outdoor equipment*, and will propose a framework directive covering a wider range of equipment—including construction machinery, garden equipment and other equipment, and incorporate the existing seven directives. The principal feature of the new legislation will be the requirement to label all equipment with a guaranteed noise level. Limit values will only be proposed for equipment for which there is already noise legislation, and a limited range of very noisy equipment.

Conclusion

One of the main goals of this paper is to help to give noise abatement a higher priority in policy making. It is focusing on the areas where Community action in cooperation with Member States and local authorities can be of added value. The options for action on measurement methods and exchange of information cover important steps for the establishment of an overall framework for action. More work is required to assess the best combination of policy instruments to be applied to the different modes of transport.

1. Introduction

Many Europeans consider environmental noise, caused by traffic, industrial and recreational activities, to be their main local environmental problem, especially in urban areas. It has been estimated that around 20 percent of the inhabitants in western Europe suffer from noise levels that scientists and health experts consider to be unacceptable, where most people become annoyed, sleep is seriously disturbed, and even adverse effects on the cardiovascular and psychophysiological systems may be encountered. The increasing number of complaints from the public about noise is evidence of the growing concern of citizens. For example, the 1995 Eurobarometer environment survey showed that noise was the fifth most important area of complaint about the local environment (after traffic, air pollution, landscape, and waste), but was the *only* issue about which the public's complaints had increased since 1992. The same survey showed a significant rise in the public's willingness to take action to reduce noise. A number of recent publications on the problem—such as those by WHO, EEA, and the Nordic Council—show that greater attention is being paid to noise issues at the international level.

European Community measures to address environmental noise problems have been in existence for over twenty-five years, and have essentially consisted of legislation fixing maximum sound levels

for vehicles, aeroplanes and machines, and, as such, have not been conceived as part of an overall environmental noise abatement programme. The Member States have enacted a multitude of supplementary regulations and other measures to reduce environmental noise problems, and, although there is some evidence to show that noise levels in the worst *black spots* have been reduced, recent data show that the overall noise problem is worsening and the number of people living in so-called *grey areas* has increased. In particular, the continuing growth in traffic volume in all modes coupled with suburban development have caused high levels of noise exposure to be spread ever wider over both space and time and are part of the reason for this worsening. In addition, over the past two decades leisure activities and tourism have created new *black spots* and new sources of noise. As a result of these developments, the impact of the policy measures implemented to date to address the noise problem is being offset.

Generally, action by the Community and the Member States on environmental noise has had a lower priority than that taken to solve other problems—such as air and water pollution—despite the fact that opinion polls show that noise is considered one of the main causes of the declining quality of life. Some of the reasons may be that decision makers are not aware of the problems or familiar with the effects of noise, which are unspectacular: noise is insidious, not catastrophic. As far as the Community is concerned, the lower priority accorded to noise has, in part, been due to the fact that noise is very much a local problem, with varied perceptions in different parts of the Community as to the acceptability of the problem. However, the sources of many of the causes of environmental noise are not of local origin. In addition, despite the local aspect of the environmental noise problems, there is a general international consensus on the levels of unacceptable noise to which the public should not be exposed in order to protect health and the quality of life.

In 1993, the European Community announced the beginnings of a change to environmental noise policy in line with the major changes to Community environmental policy included in the Fifth Environmental Action Programme. For noise, the Programme established as a basic objective the situation where no person should be exposed to noise levels which endanger health and the quality of life. It puts forward a number of targets for noise exposure levels to be reached by the year 2000 (see Annex 1).

In order to meet these targets, the Fifth Action Programme lists a number of measures for implementation by the different actors in the Community, depending on their responsibilities and competencies, covering information, technological planning, and economic and educational issues. There is a clear recognition, as in other areas of environmental policy, that, if progress is to be made in protecting people from increasing noise exposure, the Community needs to broaden the range of policy instruments to be applied, rather than rely solely on legislation to control emissions at the source.

The recent progress report on the Fifth Action Programme (COM(95)624) called for more intensified efforts. Following on from the progress report, the proposal on the review of the Programme (COM(95)647) announced that particular attention will be given to the development of a noise abatement programme which will address comprehensively the provision of information to the public, common noise exposure indices, targets for noise quality, and noise emissions from products.

To this end, the Commission's 1996 work-programme announced the first step in the development of such a programme through this *Green Paper* which has been prepared to stimulate public discussion on future noise policy. It focuses on the areas where the Commission believes the Community's involvement in cooperation with Member States and local authorities can bring added value, and be of particular benefit to the public at large.

This *Green Paper* includes in Part 2 some basic information on the problem of environmental noise and its effects, followed by a brief review of the noise situation in the Community, and estimates of external costs to society of noise pollution. Part 3 analyses the approach taken to noise abatement to date in the Member States and the Community. Part 4 outlines options for action covering a framework for the assessment and reduction of noise exposure and future action to reduce noise from different sources.

This paper addresses noise as an environmental problem, and therefore does not directly deal with the issue of noise control in workplaces—for which legislation has been in place since 1986 (Directive 86/188/EEC); revision is pending at the Council level. Furthermore, it does not deal with neighbourhood noise. Here, the provisions of the Construction Products Directive (89/106/EEC) can be of relevance as far as technical solutions are concerned. A large part of the solution for such "social" noise, however, is educational and these problems are generally regulated locally.

2. The Environmental Impact of Noise and the Noise Situation in the European Union

Noise is often defined as *unwanted sound,* or *sound that is loud, unpleasant or unexpected.* Its origins are in human activities, and it is especially associ-

ated with the process of urbanization and the development of transport and industry. Although primarily an urban problem, due to topographic conditions it can also be a source of annoyance in rural areas.

Annex 2 describes the main indices used in this paper for the measurement of noise, namely the decibel (dB), the most commonly-used unit to express noise exposure, the A-weighted sound pressure level, and the method of averaging results over time—the so-called equivalent continuous sound pressure level, L_{Aeq}. *(Annex 2 has been edited for the purposes of this publication.—Ed.)*

The Sources of Environmental Noise

All of the Member States have similar classifications of the sources of environmental noise related to different human activities: road traffic, rail traffic, air traffic, industry, civil engineering and building site activities, recreational activities, and outdoor equipment (such as gardening equipment). These classes differ from a phenomenological point of view and, as the public's attitudes to noise from the different sources vary, are perceived differently. (Annex 3 describes the nature of noise in more detail).

Effects of Noise

The effects of noise are difficult to quantify because of people's tolerance to noise levels, and different types of noise vary considerably. However, there is a large amount of scientific literature analysing and assessing the effects of noise on human beings. The most recent and most comprehensive is the WHO report (soon to be published) *Community Noise—Environmental Health Criteria* which points out that environmental noise may have a number of direct adverse effects on exposed people, including disturbance of sleep, auditory and non-auditory physiological—basically cardiovascular—effects, interference with communication, and general annoyance (more details are included in Annex 4). Environmental noise exposure does not normally cause noise induced hearing loss except where exposure is exceptionally high over a long period of time.

Magnitude of the Environmental Noise Problem

Exposure

Generally, data on the overall exposure of the population in European countries is patchy, and is often difficult to compare because of the use of different methods of obtaining the data and different descriptors. The most comprehensive data on exposure to noise in Europe was collated by the OECD in 1993, and includes data from 14 European countries.

A variety of studies carried out recently estimate that between 17% and 22% (close to 80 million people) in the Union's population are exposed to continuous daytime outdoor noise levels caused by transport above that which generally considered to be acceptable - more than 65 dB(A) (INRETS 1994, von Meier 1994, INFRAS/IWW 1994). An additional 170 million citizens are exposed to noise levels between 55-65 dB(A), which is the level at which people become seriously annoyed during the daytime.

Road transport noise is the dominant source, accounting for nine tenths of the proportion of the Union's population exposed to levels of noise over 65 dB(A). As for rail, 1.7% of the population, and, for air transport, a further 1% of the population are exposed to these high levels.

Annoyance

Data for expressed annoyance are even more insufficient. National surveys do not always use the same wordings of questions to enable assessment of the way in which noise is perceived (disturbed, annoyed, or affected). Comparable data are available only for four countries—Germany, France, Netherlands, and the United Kingdom. This shows that road traffic seems to annoy between 20% and 25% of the population and railway noise between 2% and 4%. Data from a number of countries indicates that people have a greater tolerance of rail noise than road noise, and in some countries this is taken into consideration in the setting of standards, guidelines or recommendations which are set around 5 dB(A) higher for rail than for roads.

Recently, investigations have started looking at the effect-dose relation, whereby a certain percentage of the annoyed population is related to a given noise exposure. The effect-dose relation will depend on the noise source causing the exposure, and should make it possible to compare the annoyance caused by different noise sources. Another objective of this research is to investigate the cumulative effects of exposure to different noise sources.

Trends

Data over the past 15 years do not show significant improvements in exposure to environmental noise, especially road traffic noise. Although exposure levels remained fairly stable at the beginning of the 1980s, and action on *black spots* over 70 dB(A) has been successful, as indicated above, the proportion of the population exposed to levels above 65 dB(A) remains high, and increases will have been experienced by the end of the decade in many western European countries in the range 55-65 dB(A), the so-called *grey zone*. This is apparently as a result of the fast-growing volume of road traffic (INRETS

1994). The data show that the numbers of those acutely exposed are decreasing, but the overall problem is getting worse. In many urban areas, traffic noise peaks are not increasing, but the period of high noise exposure is increasing. Whereas in the past, the daytime period between 0800 and 1800 was the noisiest time, the night-time period is now also becoming more and more noisy (CEST 1993).

In the case of air traffic, there is some evidence of improvements in exposure to aircraft noise since the 1970s. This is due largely to the introduction of stricter noise certification standards, but also due to other non-technical measures (restrictions on night time movements, controlled take-off and landing flight paths, and air traffic control procedures). For example, the population around Heathrow (United Kingdom) exposed to noise levels above 60 dB(A) has more than halved between 1975 and 1989, when there has been a significant growth in traffic over the same period. Large decreases have also been experienced at Copenhagen and Schipol (Amsterdam).

Noise emissions from individual trains have also decreased; this is associated with the changeover from diesel to electrically-powered passenger trains, the gradual introduction of welded rails to replace jointed rail, and the greater use of disc-braked rolling stock.

The development of high speed rail is an issue of particular importance as far as future railway noise is concerned, and is the main subject of complaint from the public when new lines are under discussion. Current practice is to include noise abatement measures in the planning and construction of such lines.

Available data on the current state and forecasts of the noise environment, which have serious shortcomings, show that in the absence of ambitious abatement policies, the noise environment risks remaining unsatisfactory or even deteriorating, especially with respect to exposure to road traffic noise. The main general trends influencing the current and future situation are:

- The increase in vehicles and vehicle mileage. The forecasts to 2010 indicate a near doubling of road freight transport (in tonne-kilometres) and an increase in aviation traffic by over 180%;
- The development of high speed rail;
- The spread of traffic noise spatially to affect rural and suburban areas;
- The spread of noise over time as the period of annoying levels of transport noise expands with 24 hour freight distribution.

Estimates of the External Costs of Noise

The economic costs of noise have been examined in numerous different ways; there are no benchmarks for the standardised evaluation of costs. Almost all of this research is limited to transportation noise. The most common methods used have been (INFRAS/IWW 1994):

- Willingness to pay based on surveys,
- Change of the market value of properties,
- Cost for abatement measures,
- Cost of avoidance or prevention, and
- Cost of medical care and production losses.

An overview of these studies produced in 1993 (Quinet 1993) found that the estimated costs of noise pollution vary between 0.2% and 2% of GDP. Generally, studies based on the avoidance cost approach give low values for noise costs—below 0.1% of GDP, while studies using the willingness to pay approach give higher values. All the studies on willingness to pay have been carried out in countries with a high per capita income. Willingness to pay is undoubtedly dependent on the ability to pay, and therefore noise would probably not be valued as highly in less rich countries.

In Germany, a number of studies has been based on the willingness to pay for a better noise environment approach, and show that, on average, an individual would be prepared to pay around 10 ECU per 1 dB(A) improvement per person per year if the noise levels exceed 43 dB(A). On this basis, the annual costs of traffic noise in Germany were estimated to be 7.8 - 9.6 billion ECU.

The study carried out for the UIC by IFRAS/IWW (1994) made an overall estimate for 17 European countries, based on the willingness to pay approach, which shows the total cost of transport noise to be 38 billion ECU per year or 0.65% of GDP. The cost figures for each country were adjusted to individual national situations using purchasing power parities.

These annual costs, related to transport volume, break down as follows:

- Passenger transport - cars. 4.5 ECU/1000 passenger kilometre compared to 4.2 ECU/1000 pkm for buses,
- 3.1 ECU/1000 pkm for rail and 3.0 ECU/1000 pkm for air transport.
- The figure calculated for two wheelers gave the highest cost coefficient of all modes of 60.3 ECU/1000 pkm.
- Freight transport—12.7 ECU/1000 tonne kilometre for road transport, and
- 4.7 ECU/1000 tkm for rail transport.

Studies of the decrease in housing value depending on noise exposure for a variety of countries over the past 25 years have shown that in the 1980s the average rate of depreciation can be estimated at approximately 1% per dB(A) if the noise exceeds 55 dB(A), whereas the studies covering the 1970s

show a depreciation rate of 0.3 to 0.8% per dB(A) (INRETS 1994). On the basis of these depreciation rates, global evaluations of total damage caused by road traffic noise have been undertaken for cities and countries. For France, this was estimated to be 800 million ECU per year, or an average of around 30 ECU per inhabitant exposed to over 55 dB(A).

Data on the noise costs caused by aviation noise often relate to the costs of insulation schemes in properties around airports. These costs vary widely depending on local labour and materials costs, the scope of the insulation scheme, the actual indoor noise level to be reached, and the technical measures used. This is illustrated by the following data: for Amsterdam, the average cost per apartment is around 23650 ECU, for Frankfurt around 3800 ECU, for Köln/Bonn 6600 ECU (for 3 bedrooms), and, for Manchester, 2300 ECU.

There is little data on the actual damage costs of noise in terms of monetary estimates of health costs. Some work in Germany has estimated that the annual cost of noise on public health is of the order of 500 to 1900 million ECU per annum for road noise, and 100 million ECU for rail noise.

3. Existing Policies to Reduce Noise Exposure and their Application

3.1 Methods and Instruments for Reducing Noise Exposure

There are three basic approaches to reducing environmental noise exposure:

1. Reducing noise at the source—from machines, engines, tyres and road surfaces, reducing speeds, and reducing traffic volume and use of equipment.
2. Limiting the transmission of noise by placing barriers between the source and people affected.
3. Reducing noise at the receiver point, such as through noise insulation of buildings.

The policy instruments developed to implement these methods include: emission standards for individual sources generally laid down in legislation, immission standards based on noise quality criteria, land use planning, infrastructure measures, economic instruments, operational procedures, research and development, and education and information actions. Annex 5 contains a more detailed outline of the different policy instruments.

Analysis of Existing Noise Abatement Actions in the European Union

The following sections of this chapter discuss the use of these policy instruments in the European Union, and briefly assess the impact their application has had on the noise situation. Most of these instruments have been developed and implemented at the national and local level. International involvement in the European Community has essentially been in the establishment of emission standards to control noise from individual sources, although there is increasing cooperation at the Community and at the international level in research into the effects of noise, noise abatement methods, and in the determination of noise exposure levels.

3.2 Legislation on Emission Standards

For more than twenty years, Community environmental noise policy, with a single market goal, has essentially consisted of legislation fixing maximum sound levels for vehicles, aeroplanes and machines. The policy has had a single market objective—linked to third party certification procedures—to ensure that new vehicles and equipment do, at the time of manufacture, comply with the noise limits laid down in directives. The evolution of the emission limits over time is shown in tables in Annex 6.

Transport Sources

Road Transport

Motor Vehicles: The original legislation governing sound levels for motor vehicles (cars, lorries and buses) was adopted in 1970 (directive 70/157/EEC), and has since been amended nine times. The latest amendment by directive 92/97/EEC came into force in 1996. The type approval test for this directive seeks to limit noise produced in a typical urban traffic situation. All vehicles must meet the limits, and therefore production models need to be designed to -1 dB(A) below the limits to allow for production tolerances. As the limits have fallen, tyre noise has become more significant, and, with the new limits, will be the main source at speeds above 50 km/h. The point has now been reached where, without action to address tyre/road noise, a further lowering of the limits would not be effective. The 1992 amendment therefore calls on the Commission to present a proposal to address the problem of tyre/road noise.

Two and Three Wheelers: Legislation setting limits for the permissible sound level of motorcycles has been in existence since 1978 (78/1015/EEC), and has since been amended on several occasions in order to introduce lower limit values, the latest being in 1989 (89/235/EEC). In 1993, the Commission proposed a draft amendment to the directive as part of an overall proposal concerning type approval of two and three wheel vehicles (COM(93)449). This makes the optional, second-stage, limit values set out in the 1989 amendment mandatory as of 1997

January 01, and also introduces provisions concerning anti-tampering of silencers. The Council reached a common position on this proposal in 1995 November.

Assessment of the Impact of the Legislation
Following implementation of the latest amendment, the legislation will have resulted in a reduction of noise of 85% for individual cars (8 dB(A)), and over 90% for individual heavy lorries (11 dB(A)). However, studies have shown that the reduction in actual road traffic noise levels, thanks to this legislation, has been much less: only 1-2 dB(A). The reasons for this low level of effectiveness have been identified as: relaxed limits in the early years, a slow replacement of older noisier vehicles, significant growth in traffic and a lower threshold to achievable noise reductions caused by the interaction of tyre and road surface (Sandberg 1993). In addition, the test procedure (ISO R 362) doesn't reflect realistic driving conditions and, without a regular inspection procedure to ensure maintenance of the acoustical design features, the noise levels of the vehicle may increase over time. For example, tampering with the exhaust silencers on motorcycles can increase noise levels by 10 dB(A).

Directive 77/143/EEC sets out the basic provisions for roadworthiness tests and includes noise as one of the items to be part of the test. However, this is generally only a subjective check to ensure that the exhaust silencers are intact, and there is no specific legislation as there is for air pollution. Some countries outside the European Union have had success with roadworthiness testing for noise. In Japan, for example, there are periodic noise inspections for in-use vehicles in the street, while, in some Australian states, vehicles are subject to on-road spotting and subsequent testing (OECD 1991). In New South Wales, thousands of vehicles are tested each year, and average reductions of emission of 9 dB(A) have been achieved at a relatively low cost.

Rail Transport
In 1983, the Commission proposed a directive relating to maximum permitted noise emission levels of rail-mounted vehicles. This proposal, although approved by the European Parliament, was withdrawn by the Commission in 1993. The withdrawal was partly due to unresolved technical issues, but mainly related to the unrestricted access of third-country rail vehicles, which would not have been subject to the European Community emission levels.

In the meantime, a number of Member States has started to consider introducing their own controls on railway noise emissions. In 1993, Austria enacted legislation on the admittance of rail cars for use by Austrian railways which required, as of 1995, a noise reduction of 5 dB(A) for freight cars.

Air Transport
Directive 92/14/EEC, which came into force in 1995 April, is the latest in a series of legislative measures begun in 1979 (Directives 80/51/EEC and 89/629/EEC) aimed at the limitation of aircraft noise. These directives, like broadly similar legislation in other "noise restrictive states" (most of non-EU Europe, Japan, Australia, New Zealand, and the USA), use the benchmark standards specified by the International Civil Aviation Organisation (ICAO) in the Environmental Protection Annex (Annex 16, Volume I) to the Chicago Convention, to which most countries in the world adhere. The limit values for individual aircraft types during take-off and landing are specified in terms of Effective Perceived Noise Levels (EPNL) in dB(A), and depend on the aircraft weight and number of engines. The oldest, noisiest jet transport aircraft are "non noise certificated" (NNC); the second generation's characteristics are reflected in Chapter 2 of Annex 16; and the most modern, quietest aircraft meet Chapter 3 standards.

Subsonic non noise certificated (NNC) aircraft have been excluded from airports for several years and, under the terms of Directive 92/14 Chapter 2, aircraft over 25 years old have been banned from European Community airports since 1995 April unless granted exemptions designed to avoid unreasonable economic hardship to the airlines of developing nations, for instance. Chapter 2 aircraft are being systematically phased out over the 1995 to 2002 period, and as of 2002 April 01, only Chapter 3 aircraft will be allowed to use Community airports. Meanwhile, increased stringency is being considered in international fora such as ICAO's Committee on Aviation Environmental Protection (CAEP) and the European Civil Aviation Conference (ECAC).

Assessment of the Impact of the Legislation
Like individual motor vehicles, individual aircraft, when comparing those of the same size, have become much quieter over the past twenty years. The noise footprint area around an airport made by a modern jet aircraft has been reduced by a factor of 9 compared to an aircraft with 1970s technology. In the turboprop segment, the noise footprint has been reduced by a factor of 4.5 over the past twenty five years. In Europe, the changeover to an all Chapter 3 fleet has advanced steadily, but, at the same time, the average size of individual aircraft is increasing. These developments, coupled with the high growth in the past, and projected high growth for the future, may mean that only short to medium term benefit

will be gained from the phase-out of chapter 2 aircraft, and that, after 2002, the overall noise emissions, and consequently the overall noise footprints, may not be contained within the reduced boundaries expected to be achieved by that date.

Construction Plant and Equipment, Lawnmowers

The Community's policy towards the control of noise from a limited number of types of equipment used outdoors has consisted of directives relating to permissible noise emission values, noise test codes, and the labelling of equipment with its guaranteed noise emission values. Most noise emission values have been reduced in a second step, and, since entry into force of the various pieces of legislation, noise emission levels of the types of machine covered have been reduced by 1 to 5 dB(A).

This approach has resulted in 6 directives relating to noise of individual types of construction plant and equipment (compressors; tower cranes; welding generators; power generators; hand-held concrete breakers and picks; hydraulic excavators, rope-operated excavators, dozers, loaders and excavator-loaders), and one relating to noise from lawn mowers.

Directive 89/392/EEC, commonly known as the Machinery Directive, lays down provisions on health and safety concerning the design and construction of machinery, including noise emissions. It requires that machinery be designed and constructed so that risks resulting from the emission of airborne noise are reduced to the lowest level taking account of technical progress and the means available to reduce noise, in particular at the source. As the emphasis is on the workplace, it does not deal directly with environmental noise.

Assessment of the Impact of the Legislation

These directives cover only a fraction of noisy outdoor equipment. In recent years, there have been calls from several Member States to extend the legislation to cover other products, in particular to ensure that national legislation developed on noise emissions from outdoor equipment does not lead to restrictions on trade and cause problems for the functioning of the single market. For example, there is legislation in France controlling the noise of construction machines, in Germany governing concrete pumps and mixers, and in the Netherlands, controls on motor chain saws.

In order to address the noise problem of outdoor equipment in an integrated manner, the Commission, assisted by experts from the Member States, has been developing a new framework directive to bring together the machinery already covered by EC noise legislation and a wide range of other products. The outline of the new proposal is presented in chapter 4.

Industrial Noise

There is no Community legislation laying down noise emission limits from industrial installations. However, the proposed directive on Integrated Pollution Prevention and Control (IPPC), on which the Council reached a common position in 1995, is relevant for noise reduction. It provides for the control of emissions, including noise, by means of a permit, taking into account local circumstances. The permit application must include a description of the likely effects; both the application and the final permit are subject to public scrutiny. In issuing the permit, the competent authority ensures that any relevant environmental quality standards are observed. Thus, the IPPC will form a framework in which the emissions of noise from industry can be controlled if the local circumstances require such control. It also provides that the Council shall adopt emission limits at the European level if the need arises.

3.3 Immission Standards and Planning Procedures: Noise Quality Criteria

International Work on Noise Quality Criteria

As mentioned in the introduction, a large degree of international consensus has emerged over the years as to what constitutes unacceptable levels of noise exposure, and what should be the maximum levels of exposure for certain specific situations. At the international level, the World Health Organization, together with the OECD, are the main bodies that have collected data and developed their own assessments on the effects of exposure to environmental noise. On the basis of these assessments, guideline values for different time periods and situations have been suggested.

In the mid 1980s, the OECD (OECD 1986) reported the thresholds for noise nuisance as follows (in daytime L_{Aeq}):

- at 55 - 60 dB(A), noise creates annoyance;
- at 60 - 65 dB(A), annoyance increases considerably;
- above 65 dB(A), constrained behaviour patterns, symptomatic of serious damage caused by noise, arise.

The World Health Organization has suggested a standard *guideline value* for average outdoor noise levels of 55 dB(A), applied during normal daytime in order to prevent significant interference with the normal activities of local communities. Additional guideline values are suggested for specific environments (WHO 1996):

All limits are in L_{Aeq}.

	Daytime		Nighttime	
	Inside	*Outside*	*Inside*	*Outside*
Dwellings	50 dB(A)	55 dB(A)		
Bedrooms			30 dB(A)[1] 45 dB L_{Amax}	45 dB(A)[1]
Schools	35 dB(A)	55 dB(A)		
Hospitals *general* *wards*	 35 dB(A) 30 dB(A)		 35 dB(A) 30 dB(A)	 45 dB(A)max 40 dB(A)max
Concert halls	100 dB(A) for a 4-hour period		100 dB(A) for a 4-hour period	
Discotheques	90 dB(A) for a 4-hour period		90 dB(A) for a 4-hour period	

[1] even lower sound pressure levels may disturb sleep depending on the noise source and the overall noise situation.

The Fifth Environmental Action Programme established a number of broad targets on which to base action up to the year 2000 in nighttime L_{Aeq}:

- to phase out average exposures above 65 dB(A);
- to ensure that, at no point in time, a level of 85 dB(A) should be exceeded, coupled with the goal of ensuring that the fraction of the population exposed to average levels between 55 and 65 dB(A) should not increase;
- exposures in quiet areas should not increase beyond 55 dB(A).

Noise Quality Criteria Applied in the Member States

A survey of the situation in Community countries has shown that most Member States have adopted legislation or recommendations aiming for immission limits in noise-sensitive areas similar to these guideline values (INRETS 1994). The national regulations were initially developed in the 1970s and 1980s in northern Member States, and somewhat later in southern Member States. Generally, the limits prescribed are more detailed and specific about the noise sources, the current noise situation, and the kind of living area than are the WHO guideline values.

Increasingly, these regulations are being integrated into national abatement laws, and are used in land use plans. Noise immission standards for new developments are normally set by local authorities as part of planning policy, and are used as a reference in environmental impact assessments. They serve as a means of ensuring that appropriate measures are taken to minimize the noise impact of a site. Where an acceptable level of noise cannot be achieved, planning permission may be refused or action may be required to improve isolation from the noise sources.

As far as *road traffic noise* is concerned, the limits generally apply to new roads and major modifications to existing roads in national road networks. Communal and urban roads are rarely covered by limit values, the decision being left up to the local authority to apply the limit or not. Only a few countries have adopted measures to improve existing critical noise problems along existing roads. The problem of funding for these actions has limited their adoption. On a technical level, the L_{Aeq} (equivalent noise level) index has been almost universally adopted for road noise assessment.

The immission limits are generally applied to daytime and nighttime periods, although the definitions of day and night vary. The most common definition is 6-22h for daytime and 22-6h for nighttime. Sometimes, the evening is added as a third period, as it is an extremely sensitive period for local residents. The Nordic countries use a single 24-hour period, the nighttime values being raised by 10 dB(A) in order to calculate the daily average. Apart from the daytime period, noise immission limits depend on the sensitivity of the areas where they apply: hospitals, schools, residential areas, industrial areas, and commercial areas as well as the development phase of infrastructure and buildings. Differences of 10 to 15 dB(A) are frequently found in the limits between the most and least sensitive areas. The situations in the different Member States are diverse and difficult to compare. However, the survey of the situation in the Community done for the Commission showed that the 58 to 62 dB(A) limit measured in L_{Aeq} by

day at the facades of buildings and 48 to 55 at night seem to be ranges of the levels in zones bordering new roads in residential areas. Differences of 5 to 10 dB(A) are also commonly observed between the limits applied to new construction and those for the correction of existing situations.

The limits applied to *railway noise* are similar to those for road noise in that they are generally intended to protect people living near new lines, are applied for similar periods of the day, and are, by and large, based on the L_{Aeq} index. Some countries use L_{Amax}, particularly at night, to limit the effects of noise on sleep. Other countries, such as Germany, Austria and Switzerland, use a rating value L_r, calculated from L_{Aeq} by subtracting the so-called *railway bonus* given to railway noise on the basis of surveys showing that railways noise at a given L_{Aeq} is considered to be less annoying than road noise. Again the limits often depend on the sensitivity of the area affected. For new railway lines in residential areas, the limits are in the 62 to 69 dB(A) range for daytime and 53 to 62 dB(A) for nighttime.

Noise limits have been fixed for *aircraft noise* to ensure that rules are followed when building new dwellings and other noise sensitive installations close to existing airports, and to take into consideration airport capacity expansion. Zones are generally designed to separate land uses. This is done by mapping noise contours and relating permissible land use to ambient noise levels. Unlike road and rail noise, there is a wide variety of noise indices for such rules or guidelines. Two basic approaches are generally followed. One uses the L_{Aeq} as for road and rail, the other uses indices that consider the number of aircraft movements and the peak noise level of each movement with weightings for different periods of the day. In view of the diversity of the indices, it is difficult to compare immission limits.

Most Member States apply noise limits for noisy *industrial establishments* using the L_{Aeq} index. Sometimes "penalties" are added to take into account the particular character of the noise. As for road and rail noise, these apply to day and night time periods, and sometimes the evening period, and vary depending on the sensitivity of the zone. In residential areas, the limits range from 45 to 55 dB(A) by day and 35 to 45 dB(A) at night.

This survey, done for the Commission, and other similar surveys show a considerable degree of convergence between Member States in the establishment of quality criteria with immission limits related to sources and locations. While there are differences between the Member States in the levels of the limits applied, the ranges of the limits, especially those for road traffic and industrial noise for new developments, are relatively small. On a technical level, the virtually universal adoption of the L_{Aeq} index for road, rail, and industrial noise is an important element in convergence. There are, however, wide differences between Member States in the methods used to assess noise exposure, which greatly hampers making comparisons between the data.

3.4 Infrastructure Measures

Road Surfaces

Low-noise porous road surfaces have been the subject of much research. These porous road surfaces reduce both the generation and propagation of noise by several mechanisms—which can be related to the open structure of the surface layer. Results have shown that the emission noise levels can be reduced from levels generated on equivalent non-porous road surfaces by between 3 to 5 dB(A) on average; by optimising the surface design, larger noise reductions are feasible. At present, the cost of porous asphalt surfacing is higher than conventional surfaces, by around 4.5 ECU per m^2 (for resurfacing; for new roads, the increased cost is minimal), but may drop as contractors gain experience with porous surfaces. The material is also less durable. However, improvements are being made to durability and, in many countries, these materials are already being used as part of normal road construction in noise-sensitive areas (INRETS 1994).

The Commission has been involved in some of the research activities for low-noise surfaces and, at present, in cooperation with the Federation of European Road Research Laboratories, is undertaking research on road design and construction techniques which may form the basis of future standards. The CEN standardisation organisation is working on a standard for porous asphalt which will include a noise criterion.

3.5 Use of Economic Instruments

The use of economic instruments for noise abatement is not widespread in Europe. The OECD, in its report "Fighting noise in the 1990s" (OECD 1991), concluded that economic incentives for noise reduction have shown their effectiveness in relation to road vehicles in the few cases where they have been used, and argued for much more general use. Noise charges—except in the field of aircraft noise—have been used even less than incentives, and, where used, have generally been set too low to encourage noise reduction. Their main function has been to raise funds for noise control measures such as insulation of buildings.

Taxes and Charges

The inclusion of a noise charge component as part of the landing fee for aircraft is a widely used economic instrument. Their use was first introduced in Europe

in the 1970s and is growing. Recently, 29 out of 99 surveyed airports in Europe reported having noise related charges and some 27 more indicated that such charges were planned in the near future as an instrument to influence the use of quieter aircraft (ACI Europe 1995).

In most countries, the proceeds of the noise charge go to finance insulation programmes around the airport. The impact of these charges on reducing noise has been mixed, with the OECD's 1990 evaluation arguing that the efficacy had been low and has not influenced the airlines' choice of aircraft, while reports from Germany indicate that charges have helped accelerate the changeover to Chapter 3 aircraft (Umweltbundesamt 1996).

In 1996, Austria planned to introduce a road user charge that differentiates according to the noise and air pollution emissions of the vehicle.

Economic Incentives to Encourage Noise Reductions

Incentives in the form of grants to purchase low noise goods vehicles have previously been in operation in Germany and the Netherlands, but are currently not being used. In 1981 in the Netherlands, operators of heavy goods vehicles were offered a two tier subsidy if they purchased and used vehicles fitted with *hush kits* which resulted in specified lower noise levels. Subsidy levels were 7.5% and 5% for noise reductions of 6 dB(A) and 3 dB(A), respectively. The costs of the quieting measures were borne by the operators. In 1988, because of reduced availability of funds, only heavy vehicles (over 12 tonnes) with drive-by noise levels of 79 dB(A) or less were eligible, receiving a maximum subsidy of 4.5%. More than 60% of the lorries now in use in the Netherlands have noise levels 5 dB(A) below current standards.

3.6 Operational Procedures

Restrictions on the Use of Noisy Vehicles and Products

The most widely practised restriction of this type has been restrictions on lorries, especially at night, in numerous towns in Europe. The bans have been total or partial. Examples include the French quiet town scheme of the 1980s, a nighttime lorry ban with exemptions for low-noise vehicles in German spa towns, a lorry ban in Salzburg, again with exemptions for low noise vehicles, the Greater London nighttime and weekend lorry ban again associated with incentives, and a nighttime ban on lorries on the Tauern autobahn in Austria.

The OECD (OECD 1991) assessed a number of these schemes, and concluded that a number of conditions are necessary for a scheme to be successful:

- a legal framework which does not conflict with supranational legislation, including a definition of low-noise vehicles;
- clear delineation of the restricted zone and identifiable exempted vehicles;
- a means of policing and enforcing the bans, where the public is an important actor;
- cooperation from manufacturers and operators; and
- public awareness of the noise issue, which can help operators of low-noise vehicles perceive the benefits gained from enhanced public relations.

3.7 Community Support for Research into Noise Abatement

Through actions under the Community's 3rd and 4th Framework Programmes for Research and Technological Development, an increasing number of projects has been supported, aimed either at understanding fundamental concepts or developing solutions to technological problems relating to noise.

More specifically, the following research activities have been supported:

- measurements of noise and vibration in the Standards, Measurements and Testing programme;
- reduction of noise from equipment in the Industrial and Materials Technologies programme, especially noise from motor vehicles, railways and aircraft.
- research in the Telematics Applications Programme, testing the effects of advanced road traffic management strategies on noise levels, and supporting pilot projects providing environmental information on noise levels in urban areas.

Assessment of the Impact

Although there has been considerable Community input into noise research in the past, many of the actions were scattered across various specific programmes, and were not sufficiently geared to environmental policy objectives. However, under the 4th Framework Programme, efforts have been made to achieve better coordination between specific programmes. Task Forces gathering views from operators, legislators, and users have helped further identify R&D needs in areas of importance for industry. In particular, the Task Forces on the aircraft, trains, and railway systems of the future are giving research on noise reduction a high priority. A close coordination of Community research on noise abatement based on a clear noise policy can benefit European industry in generating momentum to exploit potentially large markets in quieter products, in-

strumentation, sensors, actuators and other materials. A shift in emphasis could permit a strong European leadership with mass production facilities, and with potential for job creation and export outside the EU.

3.8 Information and Education

Information and education programmes have long been an important instrument in the noise policies of Member States. In 1991, the OECD reported that experience in several countries showed that ongoing campaigns of a limited scope related to advances of noise abatement were more effective than major but occasional and short-lived national campaigns, unrelated to progress achieved, and also that awareness campaigns undertaken locally were more effective than national campaigns.

4. Towards a new Framework for EC Noise Policy

Based on the analysis of the noise situation and the implementation of current policies in the previous two chapters, the following section discusses the options for future policy measures. As a first step, however, it is important to set out clearly what the Commission sees as the Community's role in noise abatement.

4.1 The Future European Community Role

Perhaps to a greater extent than in any of the other environmental themes included in the Fifth Action Programme, *shared responsibility* is the key to an effective noise policy. The local impact of noise means that proposing and implementing solutions are essentially local responsibilities. The sources of the noise problems are, however, diverse, and often not of local origin. Therefore, there has been a long involvement of international organizations in product standard setting and, increasingly, in cooperation in R&D related to noise abatements for products and the effects of noise exposure.

However, to date this shared responsibility, which requires all actors to be working towards a common goal, has not functioned effectively. There is evidence of a lack of overall coherency in the multitude of actions developed to reduce noise. The work done at the Community level is hampered in this respect, as there is no overall noise abatement programme. Responsibilities for environmental noise actions are dispersed in the Commission and, in different instances, in the Council. The legislation on noise standards for cars, lorries, buses and motorcycles have been dealt with by the Economic Affairs/Internal Market Council; legislation on aircraft noise is decided by the Transport Council; while noise from construction machinery has been addressed in the Environment Council. In addition, the effectiveness of noise abatement measures has been reduced by a lack of reliable and comparable data on the overall noise situation against which progress can be monitored, and also by insufficient integration between action taken at the Community level and action taken at national and local levels.

The Commission believes that it is necessary to reassess the current approach to noise policy in order to increase its effectiveness by improving the coherency of the multitude of actions being undertaken for the different sources. Furthermore, greater integration and coordination is necessary to ensure that the actions proposed under Community policies, which can directly or indirectly influence the noise environment, will make a positive contribution to noise abatement. This reassessment and any changes in approach would not mean extending Community responsibilities to include actions best decided at national and local level. There are, however, a number of areas in noise abatement where a consensus is emerging across the Union on the need of a common approach in order to achieve more effective action. These include the establishment of common noise assessment methods and the determination of common exposure indices as necessary steps to improve the currently poor data situation on environmental noise and the exchange of information on noise exposure. Providing information to the public in order to raise awareness and involve citizens more closely in abatement actions is another potential area of cooperation. Over the medium term, there could also be agreement on a limited number of minimum noise quality target values.

The main area for Community involvement will continue to be action linked to the reduction of noise from different sources. Chapter 3 has shown some of the limitations of relying principally on legislation on emission limits and the potentials of some other options. The Commission will, therefore, look in detail at options for cost effective combinations of policy instruments consistent with the provisions of the Treaty and the principles of the Single Market to be applied to the different sources. The potential for using economic instruments to address noise problems from transport sources has been addressed in the Commission's 1995 Green Paper *Towards Fair and Efficient Pricing in Transport*. This paper suggested that, for road noise, incentive schemes based on annual taxes or road pricing could be a way forward, while for railways a modulation of track charges to take account of noise should be investigated. The paper also announced a Commission initiative on airport charges.

Another area where there is an opportunity for the Community to play a greater role is through en-

couraging exchanges of experiences in noise abatement which can assist Member States and local authorities in the implementation of actions.

The remainder of this chapter outlines the actions that are proposed for discussion. It is divided into three parts, the first covering options for an overall framework for the reduction of noise exposure, the second options for future action on the key priority noise sources, and the third, areas where the Community could assist Member States and local authorities in the implementation of policies.

4.2 A Framework for Noise Exposure Assessment

> *Compared to the measurements made and data available for some components of the environment which directly affect man, such as air or water, observation of the noise environment is still highly inadequate.*

This statement, which appeared in the OECD report *Fighting Noise in the 1990s* published in 1991, is still true five years later. The measurement of noise exposure levels and the exposure of populations remain far from comprehensive, and the data are infrequently updated—often using simplistic models. Without better information, it is impossible to measure to what extent progress is being made towards the overall targets such as those set out in the 5th Environmental Action Programme. This was made clear in the 1995 state of the environment report of the European Environment Agency. Moreover, without better information, choices concerning the most cost-effective instruments for future action are made much more difficult, i.e., whether to continue strengthening the Community-wide emission limits, or to rely more on local actions.

The Commission believes that improvements in noise data, its comparability and monitoring, and the provision of information to the public are the main priorities for short and medium term action and is considering proposing legislation in the form of a directive to establish a framework for such actions. The results could help overcome the shortcomings mentioned above, and can assist national and local authorities and the Community to take more informed decisions about the noise measures for which they are responsible. The Commission would, therefore, like to launch a debate on the scope of any legislation.

The types of measures that could be included in a proposed directive include:

- The establishment of a common EC noise exposure index to ensure that data on environmental noise exposure are made available using the same noise units.

The Commission believes that the A-weighted equivalent continuous sound pressure level $L_{Aeq,T}$ in dB(A) (as defined in Annex 2) should be the EC index. This is already the most commonly used exposure descriptor and is gaining world-wide acceptance as the scale for long term noise exposure.

- Provisions for the development and use of harmonized prediction and measurement methods for assessing environmental noise from different sources.

Cooperation on the development of common methods is already underway between a number of European countries and would need to be taken into account.

- Provisions for the exchange of comparable information on noise exposure between Member States.

The data could be collected and made available by the European Environment Agency.

- Assessment of environmental noise exposure by the competent authorities in the Member States, and provision of the information on exposure to the public.

The Commission believes that noise mapping has the potential to be an effective and relatively inexpensive method for the assessment of noise data, for its presentation to the public, and to serve as a basic planning tool. Such maps present ranges of noise exposure for a particular area in, for example, 5 dB(A) steps by the use of different colours. They make it easy to recognise the noise exposure and identify areas where action is required and other quiet areas where exposure should not increase.

These measures could be proposed together with data harmonization actions as part of a directive or presented separately in the form of recommendations to Member States.

Alternatively, the requirement to inform the public on noise exposure could form part of a second phase of action depending on an assessment of the outcome of the first phase. The second phase could also include the establishment of a limited number of minimum target values, and the obligation to take action at the most appropriate level to meet these targets.

4.3 Action on the Different Sources

The following section outlines briefly the options that the Commission is considering for the main priority noise sources for which there is already Community legislation. In assessing the options, the Commission will focus on broadening the range of instruments, cost effectiveness/cost benefit and the *polluter pays* principle. The framework for the improvement of data will assist in the identification of the best options.

1. Future options for road traffic noise

The setting of noise emission limit values for vehicles is the main area of EC involvement in environmental noise abatement to date due to the importance of road noise, with the limit values being revised every five or so years. Studies have estimated that the new 1996 limit values will lead to an average reduction of noise levels of road traffic in urban areas of 2 dB(A) compared to the previous 1988 limit values. Such reductions are dependent on the complete replacement of the vehicle base and therefore would take 10-15 years; the growth of vehicles over this time may therefore partly offset this reduction. There would be no reduction in rural areas and where speeds are over 60 km/h due to importance of tyre/road noise. The additional costs of vehicles associated with the introduction of these limits are estimated to be 3% for cars, 2% for buses and 4% for lorries.

Further reductions in limit values of 2 dB(A) are technically feasible, but likely to be costly. One estimate forecast that such limit values, which would require increased use of acoustic shields, could add 5% to the cost of cars, 4% to buses and 7% to lorries (Favre and Tyler 1987), which could represent an annual cost of the order of 5-6 billion ECU to industry. This could also have implications for the weight of vehicles and their fuel economy and CO_2 emissions.

The Commission has been asked to come forward with a proposal on tyre noise, and work is in progress on the preparation of such a proposal. In addition to focusing on tyre/road noise, which will have to take into account the balance between reducing tyre noise and maintaining wet adhesion, the Commission believes that future action to reduce vehicle noise requires a search for a cost-effective combination of policy instruments and, in particular, to address the weaknesses in the current approach identified in chapter 3.

To this end, for the next phase of action to reduce road traffic noise, the Commission will focus on cost-effectiveness assessments of a variety of options and, in addition to addressing tyre/road noise and whether any new emission limit values are appropriate, will consider:

- in the context of the current review of vehicle taxation, whether more differentiation in existing annual vehicle and fuel taxes to take account of noise costs could be an effective instrument;
- a technical revision of the test procedure (ISO R362) to make it better reflect realistic driving conditions;
- amending Community legislation on roadworthiness tests to include specific noise testing of in-use vehicles;
- actions to promote the use of low-noise surfacing. As indicated in chapter 3, the Community is supporting research in this area and CEN is working on surface standards. This work should be accelerated. In addition, the Community is an important source of financing for road building through the Structural and Cohesion Funds and the Trans-European Networks budget line, which should be built to the highest environmental and safety standards possible. The Commission will therefore promote the use of low-noise surfaces for road projects in noise sensitive areas receiving Community funding, where this is feasible and cost effective, and where such surfacing can offer the same level of safety and durability.

2. Options to reduce railway noise

A priority for Community transport policy is to achieve a better balance between different modes of transportation, which will mean achieving a greater role for rail. This, in turn, will require increasing capacity and more infrastructure in certain areas. However, as the public's main criticism of rail transport is the excessive noise level, which could be exacerbated with the growth of high speed rail, there is considerable opposition in many areas to the expansion of infrastructure or capacity. Therefore, increased noise abatement efforts are required if the expansion of traffic is to gain wider acceptance.

Two areas are of particular concern: high speed rail and freight cars.

The problem of noise from *high speed rail* is being addressed in Council Directive 96/48/EEC of 23.7.96 (OJ No. L 235) on interoperability on the high speed network. This Directive includes a specification that *operation of the trans-European high speed rail network must remain within the statutory noise nuisance limits*. It sets up a joint body representing infrastructure managers, the railway companies, and industry, whose task will be to propose noise emission limits to be met by trains on the high speed network—which will be decided upon by the committee of Member States set up by the Directive.

In the area of *rail freight cars*, less progress has been made compared to rail passenger cars. The international railway industry organisation (UNIFE) has established a medium term target of reducing noise emissions from freight cars by 8-10 dB(A), which it regards as feasible—although with significant cost implications. As mentioned in chapter 3, some Member States are considering national legislation to fix emission levels, and there have been calls from industry and railway operators for international action.

Noise abatement has long been an important subject of research supported by the railway industry and the Community which is making an increased

effort through the *Trains and Railway Systems of the Future* programme for both freight and passenger systems.

In addition to supporting the research efforts, the Commission, in cooperation with the interested parties and other international organisations, will investigate the possibilities of introducing other policy instruments. Among these possibilities are economic instruments, such as a variable track charge, which would enable the infrastructure fee for the use of track to be differentiated according to the noise levels of the cars, legislation on emission limits, a negotiated agreement between the railways industry and the Community on targets for noise reductions, and measures to ensure maintenance of in-use equipment. The assessment will look at the possibilities of using a mix of these policy instruments. Agreement on harmonised methods of assessment and prediction of railway noise would greatly facilitate the introduction of such policy instruments.

3. Future options to reduce aircraft noise

In air transport, as for the other modes of transportation, the Commission is looking to develop an integrated approach to noise reduction based on an assessment of a combination of policy instruments. The assessment will include greater stringency in emission values and the use of economic instruments to encourage the development and use of lower noise aircraft, as well the contribution local measures such as land use planning could make.

As for emission limits, greater stringency has been under study for several years at the international level by the Committee on Aviation Environmental Protection (CAEP), which has the task of making recommendations to the International Civil Aviation Council. The most recent session of CAEP, held at the end of 1995, failed to agree on a recommendation for increased noise stringency for aircraft, although there was a majority of countries on the Committee in favour of greater stringency. Following the failure of CAEP, the Commission intends to issue a consultation paper in the near future and to continue to work for agreement within international bodies on more stringent emission standards and harmonised measurement.

The consultation paper will also include consideration of the contribution land use planning around airports could make in line with the provision in the Common Transport Action Programme (COM(95)302)) for the development of a common framework for land use rules.

In the air transport sector, economic instruments in the form of airport charges are already widely used to promote environmental aims as well as for other purposes. An analysis of airport charging systems in airports in the Community by the Commission has shown that many of the existing systems do not ensure fair and equal treatment of users as required in the Single Market. Therefore, in the course of 1996, a specific Commission proposal was planned on airport charges in general, based on the principles of non-discrimination, cost-relatedness, transparency, including provisions for charges to contribute to environment improvements such as noise abatement.

An acoustical classification of aircraft types in accordance with actual operational noise rather than the criteria of Annex 16 to the Chicago Convention on certification noise could make the introduction of such charges easier in practice and contribute to the overall transparency of charging systems. The Commission, together with airports and manufacturers, will study such a classification.

4. Outdoor machinery

As indicated in chapter 3, in recent years there have been calls on the Commission to extend the current noise legislation to a limited number of types of outdoor equipment. However, if the Community were to embark on the same approach to controlling the noise emissions from other types of machinery as for the seven existing directives, it would mean a vast increase in legislation, which would be time consuming and not cost effective in terms of its impact on industry, and in the use of manpower. In addition, there is no guarantee that such an approach would bring about the environmental improvements that the Community is seeking. The Commission has therefore been working, together with experts from the Member States, on a new approach to control noise emissions of a much wider range of outdoor equipment, which will extend but at the same time simplify the legislation.

In 1997, the Commission intends to propose a framework directive to cover more than 60 types of equipment used outdoors, not only construction plant, but also garden equipment, equipment used on specific vehicles (such as refuse collection vehicles) and which would incorporate the existing seven directives for noise from outdoor equipment. The principal feature of the new directive will be a requirement for manufacturers to label all equipment to be placed on the market with the guaranteed noise emission level. The OECD reported in 1991 that labelling products with standardized information on noise emission levels has attracted interest as an inexpensive means of creating a market for low-noise products (OECD 1991). Noise limit values will be proposed only for the equipment already covered by noise legislation and a limited range of highly noisy equipment on the basis of appropriate

cost effectiveness analyses. The draft directive will include provisions for the addition of other pieces of equipment at a later date. Another important feature will be the collection of information on the range of noise emission values of equipment on the market, their populations and contribution to noise exposure. This would make it possible to take other measures, if necessary, at a later stage—such as additional limit values, criteria for eco-label awards or economic incentives. In addition, the labelling could assist those at the local level in decisions on the use of certain equipment in noise sensitive areas.

4.4 Contributions from the Community to Noise Abatement Action in the Member States—Promoting Exchanges of Experience

Land use planning, education, and raising awareness are instruments of noise policy where the Community can play a role in assisting Member States and local authorities in the implementation of abatement actions by promoting exchanges of experience and dissemination of good practice. In comparison with other environmental issues, there seems to have been less exchange of experience on noise actions among local authorities in Europe. However, the many initiatives for cooperation on urban transport issues between local authorities in Europe will have a beneficial impact on noise abatement.

As part of the review of the Fifth Environmental Action Programme, the Commission, in cooperation with experts from the Member States and associations of local authorities, is intending to prepare a guide concerning the implementation of the Programme at the local level and its implications for local authorities. Noise abatement will be an important feature of this guide.

The Community also has several financial instruments through which cooperative ventures between Member States and particularly local authorities are supported and where noise abatement could be given a higher priority. These include:

- the *LIFE* programme, the Community's financial instrument for environmental protection, where assistance can be requested for demonstration, promotion, and technical assistance actions by local authorities in order to encourage the integration of environmental considerations in *land use development and planning*. Noise, together with air, water, and waste are the priority themes.
- Assistance for environmental awareness measures, from the financial resources available for environment policy.
- The Telematics Applications Programme, Sector Environment, where pilot projects to improve environmental information systems for the public and environmental managers on topics such as noise are supported.
- Assistance for networking and cooperation projects between urban areas and urban pilot projects provided for under article 10 of the European Regional Development Fund regulation, where noise abatement could be part of integrated projects for urban areas.

Conclusion

In this *Green Paper*, the Commission has outlined a possible step-by-step approach to the development of a new framework for Community noise policy, which, up to now, has been a part of environment policy that has perhaps not been given the priority it deserves. The problem of noise is complex and action to reduce noise needs to be set within a long-term context.

Therefore, one of the goals of this paper is to contribute to the efforts being made elsewhere to give noise abatement a higher priority in environment policy making.

The paper does not attempt to present in detail a complete range of the solutions to environmental noise problems, but rather focuses on the areas where it is appropriate and seems cost effective for the Community to be involved in cooperation with Member States and local authorities.

The options for action on measurement methods, monitoring, and exchange of information and its provision to the public, cover important steps for the establishment of an overall framework for action. In particular, providing better information to the public will help raise awareness about the real extent of the problem and can thereby influence changes in behaviour in an area where cooperation across the Community can be of significant added value.

In addition, these actions could assist the Community, Member States and local authorities to evaluate the optimal combination of policy instruments to apply to the different sources of noise. As is pointed out in chapter 4, there is work to be done to evaluate the optimal combinations of such instruments.

The Commission invites comments on these ideas from the Council, Parliament, the Economic and Social Committee and the Committee of Regions and other interested parties. Observations should be submitted to The European Commission, Directorate General for Environment, Nuclear Safety and Civil Protection, *Green Paper on Future Noise Policy*, Rue de la Loi/Wetstraat 200, B-1049 Brussels, Belgium.

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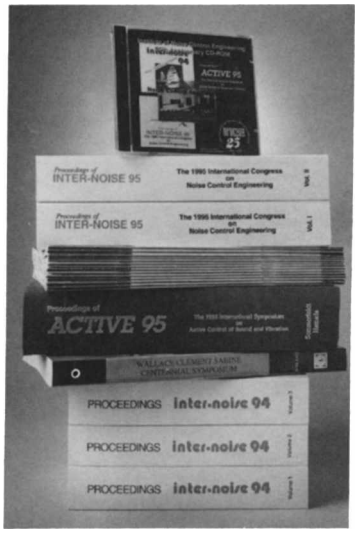

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Annex 1. Table 12 on Noise from the Fifth Environmental Action Programme.

Objective	EC Targets up to 2000	Actions	Time-frame	Sectors/actors
No person should be exposed to noise levels which endanger health and quality of life	Nighttime exposure levels in L_{eq} dB(A)			Transport and industry
	exposure of the population to noise levels in excess of 65 should be phased out; at no point in time should a level of 85 be exceeded	Inventory of exposure levels in the EC	before 1994	EEA + MS + LAs
		Noise abatement programme to be set up	before 1995	MS + LAs
	proportion of population at present exposed to levels between 55-65 should not increase	Further reductions of noise emissions (cars, trucks, aircraft, cranes, mowers, etc.). Directives to be presented progressively, aiming at implementation not later than 2000	before 1995	EC + MS + industry
	proportion of population at present exposed to levels less than 55 should not increase above that level	Standardization of noise measurement and ratings	continuous	EEA + EC + MS
		measures to influence behaviour, such as driving cars, flight procedures, industrial processes operating at night.	idem	MS + LAs + EC
		measures related to infrastructure and physical planning, such as better zoning around airports, industrial areas, main roads, and railways	idem	MS + LAs

Annex 2. The Measurement of Noise

In the original Green Paper, this annex is a general review of noise measurement. In this article, it has been edited to include only the definition of equivalent continuous sound pressure level which is the measure recommended in the body of the report.—Ed.

Equivalent Continuous Sound Pressure Level L_{Aeq} in dB(A).

The equivalent continuous sound pressure level is gaining widespread acceptance as a scale for the measurement of long-term noise exposure. It is used in most of the legislation in the Member States and on the international level. It has been adopted by the

ISO for the measurement of both environmental noise exposure and hearing damage risk. But there are still problems concerning the description of very fast fluctuating sound and of sound events that occur infrequently by L_{Aeq}. To overcome these problems several (supplementary) units to describe the time history are used: e.g., the maximum sound pressure level L_{max}, the statistical noise levels L_n (indicating the level that is exceeded in (100-n)% of time), the noise and number index NNI (taking into account also the number of noise events), and "penalties" added to the L_{Aeq}. Research is ongoing to improve the current averaging method.

Annex 3. The Nature of Environmental Noise

In the original Green Paper, this annex is a general review of the nature of environmental noise. In this article, it has been edited to include only one interesting comparison, the comparison between noise emissions from stationary and mobile sources.—Ed.

Examples of Comparisons between Different Stationary and Mobile Sources:

The sound power output from a modern 300 MW electric power plant is more than three times less than that of one low-noise heavy goods vehicle (measured under a type approval test code), while the noise of a large waste incineration plant is equivalent to 3 passenger cars accelerating from a green traffic light.

Annex 4. Effects of Noise

Sleep Disturbance

Sleep disturbance starts at noise levels of 30 dB(A) for steady state continuous noise at the sleeper's ear. In special situations, even lower levels may disturb sleep. The most important noise exposure parameter for sleep disturbance, however, is the maximum peak level of the exposure, which points to the importance of avoiding noise from lorries and aircraft in residential areas at night. From study findings, the general conclusion can be drawn that to ensure undisturbed sleep the maximum sound pressure level should not exceed 45 dB(A). Field studies indicate deterioration in mood or symptoms such as tiredness, headache and nervous stomach where heavy traffic occurs at night and the recommended values are exceeded.

Extra-auditory Effects

A great number of these mainly psycho-physiological effects of noise have been reported in the literature. The most important of them manifest themselves in physiological stress responses and, particularly at higher levels, in cardio-vascular reactions. But also mental health effects and influences on performance and productivity have been observed and documented. Intensive research on these subjects is still ongoing. It can be generally concluded from the present state of knowledge that exposure to environmental noise acts as a stressor to health as it may lead to measurable changes in, for example, blood pressure, heart rate, vasoconstriction, endocrine excretion levels and admission rates to mental hospitals.

Interference with Communication

Noise levels frequently attained in streets, gardens and on balconies interfere with speech. Noise levels inside buildings usually cause occupiers to close windows if they wish to hold a conversation once the external continuous noise level reaches 70 dB(A). It is generally accepted that noise levels in homes should not exceed 40-45 dB(A), levels that are often exceeded by traffic noise even with the windows closed.

General Annoyance

A less specific, but nevertheless serious, effect of environmental noise is that it simply disturbs and annoys people. The feeling of annoyance results not only from sleep disturbance and interference with communication, but also from less well defined feelings of being disturbed and affected during all kinds of activities as well as during periods of rest. Because of the subjective nature of annoyance, evaluation must be carried out using survey techniques such as questionnaires. Studies to date show the importance of traffic noise as an annoyance factor to the general population.

Annex 5. Policy Instruments for Reducing Noise Exposure

Emission Standards

These are generally laid down by governments and consist of emission limit values applicable to individual sources and included in type approval procedures to ensure that new products are, at the time of manufacture, complying with the noise limits.

Immission Standards

Immission standards are based on noise quality criteria or guideline values for noise exposure to be applied to specific locations and are generally built into planning procedures.

Planning Measures

Land use planning procedures are one of the means of putting immission regulations into practice, and are a key tool for noise abatement to ensure separation of dwellings and other noise-sensitive buildings from noise sources. Over the long term, land use planning is one of the most efficient ways of reduc-

ing noise as it can be used to prevent new problems from occurring. In particular, noise abatement through land use planning can include: restricting the use of land that is already subject to high levels of noise, restricting the siting of new noise generators such as traffic routes or industrial installations in order to protect existing developments and encouraging noise generating activities to be clustered together in order to preserve other low noise areas. Noise is one of the considerations to be dealt with in environmental statements for developments requiring an environmental impact assessment.

Infrastructure Measures
There are essentially two broad categories of infrastructure measures to abate noise: those that limit the transmission of noise—noise protection walls, tunnels, noise attenuation dams, passive protection of buildings through insulation, and those that contribute to the reduction of noise at the source through, for example, the design of road surfaces and railway tracks.

Economic Instruments
The types of economic measures that are and could be used in noise abatement policy include taxes and charges on noise emissions, economic incentives to encourage noise reductions and the development of low noise products, and the payment of compensation to people affected by noise.

Operational Procedures
Among the widely used measures are speed limits on sensitive road and rail sections, enforcing operational flight take-off and landing procedures for aircraft, and noise preferential routes, as well as restrictions on the use of noisy products and vehicles in sensitive areas and during sensitive times.

Research and Development
Scientific research into the effects of environmental noise, the methods of noise abatement, low-noise technologies, and the development of special low-noise products are vital supporting instruments and often initiate improvements in the state of art of noise reduction. Financial support to pilot projects is useful in showing the advantages of technical and planning measures to reduce the noise exposure of citizens.

Information and Education
Education and information activities are important in promoting acceptance of and compliance with noise regulations and to encourage changes in behaviour. They can also be used in their own right to encourage noise abatement and to increase awareness amongst decision makers and the general public.

Annex 6. EC noise emission limits for selected vehicles and products

Motor Vehicles

Vehicle Category	1972	1982	1988/90	1995/96
Passenger Car	82 dB(A)	80 dB(A)	77 dB(A)	74 dB(A)
Urban Bus	89 dB(A)	82 dB(A)	80 dB(A)	78 dB(A)
Heavy Lorry	91 dB(A)	88 dB(A)	84 dB(A)	80 dB(A)

Two and three wheelers

Motorcycles and Three Wheelers	1980	1989	Proposal
<80 cm^3	78	77 dB(A)	75 dB(A)
>80<175 cm^3	80-83 dB(A)	79 dB(A)	77 dB(A)
>175 cm^3	83-86 dB(A)	82 dB(A)	80 dB(A)

Construction machinery and lawnmowers

Type of Equipment	classification	1986	1987	1991
compressors	nominal airflow in m^3/min $Q \leq 5$ $5 < Q \leq 10$ $10 < Q \leq 30$ $Q > 30$	 101 102 104 106		 100 100 102 104
tower cranes		102		100
welding generators	maximum welding current ≤ 200 A > 200 A	 104 101		 101 100
power generators	electric power in kVA $P \leq 2$ $2 < P \leq 8$ $8 < P \leq 240$ $P > 240$	 104 104 103 105		 102 100 100 100
hand-held concrete-breakers and picks	mass of appliance in kg $m < 20$ $20 \leq m \leq 35$ $m > 35$	 110 113 116		 108 111 114
lawnmowers	cutting width in cm $L \leq 50$ $50 < L \leq 120$ $L > 120$		 96 100 105	

Earth-moving machinery < 500 kW

(noise limits existed since 1986; 1996 legislation has enacted a new approach that reduced old limits by approximately 3 dB(A))

type of equipment	classification	1997	2001
tracked machines (except excavators)	$P \leq 65$	107	104
	$P > 65$	$L_{WA} = 87 + 11 \log P$	$L_{WA} = 84 + 11 \log P$
wheeled dozers, loaders, excavator-loaders,	$P \leq 55$	104	101
	$P > 55$	$L_{WA} = 85 + 11 \log P$	$L_{WA} = 82 + 11 \log P$
excavators	$P \leq 15$	96	93
	$P > 15$	$L_{WA} = 83 + 11 \log P$	$L_{WA} = 80 + 11 \log P$

NOISE-CON 98

The 1998 National Conference on Noise Control Engineering 1998 April 05–08

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NOISE-CON 98 is being organized and sponsored by the Institute of Noise Control Engineering (INCE) in cooperation with the Society of Automotive Engineers.

Announcement and Call for Papers

NOISE-CON 98, the 1998 National Conference on Noise Control Engineering, will be held at the Ypsilanti Marriott at Eagle Crest in Ypsilanti, Michigan on 1998 April 05–08. Ypsilanti is fifteen miles west of the Detroit Metro airport, and seven miles east of Ann Arbor. NOISE-CON 98 is being sponsored and organized by the Institute of Noise Control Engineering, and is being held in cooperation with the Society of Automotive Engineers. The theme of NOISE-CON 98 is *Transporting Noise Control to the 21st Century: Planning for a Quiet Future*. The technical areas that will be emphasized are transportation vehicle noise sources, noise control materials, and noise control prediction. Technical papers in all other areas of noise control engineering are also welcome.

An equipment exhibition will also be held in conjunction with NOISE-CON 98. The exhibition will include active noise control systems, computer-based instrumentation, sound level meters, sound intensity systems, signal processing systems, equipment for active noise control, acoustical materials, and devices for noise control.

An accompanying persons program and post conference tours of Detroit area noise control facilities are also planned.

Robert J. Bernhard of Purdue University will be the General Chair for NOISE-CON 98. J. Stuart Bolton, also of Purdue and Paul R. Donavan of General Motors will serve as the NOISE-CON 98 Technical Program Chairpersons.

On April 09, the day following the close of NOISE-CON 98, a special one-day SOUND QUALITY SYMPOSIUM will be held. In addition to the technical sessions, symposium registrants will receive a copy of the symposium proceedings and lunch. Those attending both NOISE-CON 98 and the SOUND QUALITY SYMPOSIUM will be able to take advantage of a special joint registration fee, which will be at a rate lower than registration for each meeting separately. Papers that impact any aspect of sound quality are welcome. A series of demonstrations of sound quality is being planned in conjunction with the Symposium.

Patricia Davies of Purdue University and Gordon Ebbitt of Lear Industries are the General Chairs of the SOUND QUALITY SYMPOSIUM. Gordon Ebbitt will also be the Technical Program Chair and Patricia Davies will also be the Editor of the symposium proceedings.

CONTRIBUTIONS INVITED

Papers related to the technical areas listed above are especially welcome, but technical papers in all areas of noise control and sound quality assessment may be submitted for inclusion on the technical program. Abstracts should be submitted in the format enclosed with this announcement. The deadline for receipt of abstracts for both meetings is **1997 September 16**. Manuscripts for publication in the conference and symposium proceedings are due on **1998 January 16.**

Technical papers in all areas of noise control engineering will be accepted for presentation at NOISE-CON 98. Papers related to the three areas mentioned on the first page of this announcement are especially welcome. Other technical areas of interest include:

- **Active control of sound and vibration**
- **Hybrid active/passive control methods**
- **Adaptive-passive control of sound and vibration**
- **Aerodynamic noise**
- **Exterior noise from transportation vehicles**
- **Transportation vehicle component noise (engine noise, brake squeal, tire-road interaction noise, wiper noise, fan noise, accessory noise)**
- **Optimal design of noise control treatments**
- **New developments in sensing and actuating techniques**
- **Advances in signal processing, algorithms, and controller implementation**
- **Finite elements and boundary element methods**
- **Statistical energy analysis**
- **Novel noise prediction methods**
- **Sound propagation prediction methods**
- **Measurement of acoustical material properties**
- **Modeling and optimization of noise control materials**

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Technical areas of interest for presentation at the Sound Quality Symposium include:

- **Integration of sound quality into product design**
- **Appliance sound quality**
- **Automotive sound quality**
- **Sound quality of fan and compressor noise**
- **Motor noise sound quality**
- **Component sound quality**
- **HVAC sound quality**
- **Psychoacoustic testing**
- **Measuring perception of sounds**
- **Perception of complex sounds**
- **Sound quality of music recordings**
- **Sound quality of audio systems**
- **Sound quality of musical instruments**
- **Sound quality in the concert hall**
- **Measurement of time varying loudness**
- **Fluctuation strength and roughness metrics**
- **Metrics for complex sounds**
- **Models of perception of low frequency noise**
- **Sound quality demonstrations and hardware/software**

CONFERENCE AND SYMPOSIUM VENUE

The Ypsilanti Marriott at Eagle Crest is in southeastern Michigan, seven miles east of Ann Arbor and fifteen miles west (on Interstate 94) of the Detroit Metro Airport. The hotel is attached to the University of Eastern Michigan Corporate Education Center, and is surrounded by the 135-acre Eagle Crest Golf Club. Limousine service operates every 30 minutes between the hotel and the Detroit Metro Airport. In addition to the technical program, there will be a reception in the exhibition area on Sunday, April 05, and one other social event during the meeting. An Accompanying Persons program is being planned. Also, a post-conference tour of noise control engineering facilities in the Detroit area is planned. NOISE-CON 98 technical sessions will be held in both the hotel and the connected Corporate Education Center. The Sound Quality Symposium technical sessions will be held in the Corporate Education Center.

REPLY COUPON

Please return this coupon if you are interested in attending NOISE-CON 98 and/or the Sound Quality Symposium.

Name _____

Address _____

City _____ State _____

Postal Code/Zip _____ Country _____

[ ] I am interested in attending NOISE-CON 98
[ ] I am interested in presenting a NOISE-CON 98 technical paper
[ ] I am interested in attending the Sound Quality Symposium

Please return this coupon to: NOISE-CON 98 Technical Program Office, 1077 Herrick Laboratories, Purdue University, West Lafayette, IN 47907-1077

[ ] I am interested in presenting a Sound Quality Symposium technical paper
[ ] My company may be interested in participating in the NOISE-CON 98 equipment exhibition
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I would like to organize a special session for
[ ] NOISE-CON 98 [ ] the Sound Quality Symposium
If the line directly above is checked, the subject area of the special session could be:

_____

FORMAT FOR SUBMISSION OF ABSTRACTS

NOISE-CON 98
1998 April 05–08

Sound Quality Symposium
1998 April 09

Ypsilanti, Michigan, USA

⇒ **PAPER TITLE IN BOLD UPPER CASE LETTERS (20 words maximum)**

⇒ INCE Subject Classification (see reverse side)

⇒ First author's name, address, telephone number, FAX, and e-mail (optional) for correspondence

⇒ Additional authors' names and addresses (if any)

⇒ **Text of the Abstract:** The text of the abstract should not exceed 250 words. The abstract is to be typed in the format as shown on this sheet following the title of the paper in upper case letters, the INCE subject classification, and the authors' names and addresses. The text should be typed double-spaced and should include: 1) a brief description of the problem being addressed; 2) why the problem is important; 3) a description of the original contribution of the work; and 4) pertinent conclusions.

Please mark your abstract **NOISE-CON 98** or **SYMPOSIUM** and send three copies (or one if by e-mail) of the abstract without a cover letter to:

NOISE-CON 98 Technical Program Office
1077 Herrick Laboratories
Purdue University
West Lafayette, IN 47907-1077
Telephone: (765)494-6078
FAX: (765)494-0787
e-mail: noisecon@ecn.purdue.edu or sndqual@ecn.purdue.edu

NOTE: Abstracts sent using overnight delivery services can be sent to the address shown above.

THE DEADLINE FOR RECEIPT OF ABSTRACTS IS 1997 SEPTEMBER 16.

I-INCE CLASSIFICATION OF SUBJECTS

GENERAL

00 General
01 INTERNATIONAL/INCE
02 INTERNATIONAL/INCE (Continued)
03 INTERNATIONAL/INCE (Continued)
04 INTERNATIONAL/INCE (Continued)
05 Publications (other than technical articles)
06 History and philosophy
07 Education
08 Noise programs
09 Definitions and descriptors

EMISSION: NOISE SOURCES (Noise generation and Control)

10 General
11 Noise-generating devices (including components and subassemblies)
12 Stationary noise sources
13 Moving noise sources including aircraft
14 Specialized industrial machinery and equipment

PHYSICAL PHENOMENA

20 General
21 Physical mechanisms of noise generation
22 Natural sources of noise
23 Propagation, transmission & scattering of sound (general wave equation)
24 Sound propagation in the atmosphere
25 Sound propagation in enclosed spaces
26 Sound propagation in ducts

NOISE CONTROL ELEMENTS (Noise control by external treatments)

30 General
31 Barriers and screens, shielding
32 Enclosures for noise sources
33 Sound isolating elements (including panels, partitions and curtains)
34 Filters, mufflers, silencers and resonators (conventional types)
35 Absorptive materials
36 Hearing protective devices
37 Noise attenuation and transmission in ducts
38 Special treatments (including active noise control)

VIBRATION AND SHOCK: GENERATION, TRANSMISSION, ISOLATION AND REDUCTION

40 General
41 Characteristics of sources of vibration and shock
42 Vibrating surfaces and structures (beams, plates, shells)
43 Propagation in structures (structure-borne noise)
44 Balancing of rotating and reciprocating machines
45 Reduction of impact forces; shock isolation and absorption
46 Vibration isolators and attenuators
47 Vibration-damping materials and structures
48 Vibration generators, shake tables
49 Effects of vibration and mechanical shock (on man, on structures)

IMMISSION: PHYSICAL ASPECTS OF ENVIRONMENTAL NOISE

50 General
51 Building noise control
52 Community noise control
53 In-plant noise control
54 Shipboard and offshore platform noise control
55 Outdoor plant noise control (design and construction)
56 Noise surveys

IMMISSION: EFFECTS OF NOISE

60 General
61 Perception of sound
62 Physiological effects
63 Psychological effects
64 Effects of noise on physical structures
65 Effects of noise on animals and other wildlife
66 Sociological effects; community reaction to noise
67 Economic effects
68 Environmental impact statements
69 Criteria and rating of noise

ANALYSIS

70 General
71 Instruments for noise and vibration measurement
72 Measurement techniques
73 Test facilities (design and qualification)
74 Signal processing
75 Analytical methods
76 Modeling, prediction and simulation
77 Sampling and quality control procedures
78 Audiometry, dosimetry and hearing measurements
79 Psychoacoustical evaluations and testing

REQUIREMENTS

80 General
81 Standards
82 Federal government legislation and regulations
83 State legislation and regulations
84 Other legislation and regulations
85 Ordinances, including zoning requirements
86 Building codes
87 Specifications
88 Auditing, enforcement and certification
89 Labeling

RESERVED FOR FUTURE EXPANSION

90 - 99

Institute Notices

This department includes communications from the Boards of Directors of International INCE and INCE/USA to the Member Societies of I-INCE and the individual members of INCE/USA respectively. It contains information on I-INCE initiatives, notices, bulleting, etc. Items are included here on which a response may be requested.

Following is the complete text of a letter and opinion survey that has been sent by mail to the Secretariats of the I-INCE Member Societies. Ther Opinion Survey is in the form of a questionnaire consisting of 30 questions. By publishing the questionnaire in the Institute Notices Department, responses are invited from all readers of this magazine. Readers are requested to follow the same instructions as those sent to the Secretariats of the I-INCE Member Societies. Anonymous responses are welcome, but please insert the name of your Member Society on the reply sheet. **Please return the Reply Sheet by 1997 September 30.**

i-ince

INTERNATIONAL INSTITUTE OF NOISE CONTROL ENGINEERING
P.O.BOX 3067 Arlington Branch Poughkeepsie, NY 12603 USA

Dear Colleague:

You are kindly requested to participate in an Opinion Survey related to the operations and activities of the International Institute of Noise Control Engineering (I-INCE). Included with this letter are three copies of the survey. The same letter with three copies of the survey is being sent to the Secretariats of each of the 41 I-INCE Member Societies. The Secretariats are requested to distribute the three copies to key members of their societies, who are willing to give their *personal* opinions and to return the completed Reply Sheets directly to the Office of the I-INCE President.

Key members of a Member Society include individuals currently serving or having served in the positions of president, chairman, vice-president, vice-chairman, secretary, treasurer, staff or office manager, executive director, etc., or as a member of the governing board of the Member Society, or as a chairman of a noise or vibration committee. *At least* one and preferably all three copies of the survey should be returned by the individuals who receive the questionnaires.

The responses to the survey are intended to be the personal opinions of the respondents, not necessarily the collective opinion or consensus of the governing board of a Member Society. Consideration of this I-INCE Opinion Survey at a meeting of a governing board is not necessary, but certainly may be done if desired and within the deadline date for return.

The purpose of the survey is the examine the actions that have been taken by International INCE during the past few years, to solicit opinions on actions that may be taken in the future, and to provide an opportunity for the submittal of new ideas for consideration by the I-INCE Board of Directors and the I-INCE General Assembly.

This Opinion Survey asks for opinions on issues and options in 11 different areas. Your opinions, as well as your write-in comments, will be considered carefully by the I-INCE Board of Directors.

I want to express the appreciation of the I-INCE Board to each respondent for taking the time to assist the Board in planning for the future of our dynamic organization. Your candid comments will greatly assist the Board in establishing short- and long-range planning goals for International INCE.

Thank you,

William W. Lang, *I-INCE President*
P.O. Box 3067 Arlington Branch,
Poughkeepsie, NY 12603, U.S.A.

OPINION SURVEY

BACKGROUND. This survey deals with the operations and activities of the International Institute of Noise Control Engineering (I-INCE), and is divided for convenience into the following areas: membership, dues, governance, benefits, communications, *Noise/News International*, initiatives, conferences, field of interest, umbrella organizations and general. In this Opinion Survey, background information is given to inform you of the current status of each of the areas of operation of International INCE. The background information is interspersed between **30 questions**. You are asked to answer "yes," "no," or "no opinion" to each question. Your responses will be compiled with those of other respondents to assist the I-INCE Board of Directors and I-INCE General Assembly to determine the future goals for our organization.

At the end of the Opinion Survey on the Reply Sheet, you will find space for write-in comments. Such comments are particularly important.

While preparing your answers to this Opinion Survey, it will be helpful to have available a recent issue of *Noise/News International (NNI)* for reference.

AFTER READING A QUESTION, PLEASE CHECK ONE OF THE THREE COLUMNS ON THE REPLY SHEET (YES, NO, OR NO OPINION) FOR THAT QUESTION, AND THEN ADD ANY COMMENTS YOU MAY HAVE IN THE SPACE FOR WRITE-IN COMMENTS. ATTACH AS MANY ADDITIONAL SHEETS AS YOU WISH FOR WRITE-IN COMMENTS. **AFTER COMPLETING ALL 30 QUESTIONS, PLEASE MAIL, FAX OR E-MAIL YOUR REPLY SHEET WITH YOUR WRITE-IN COMMENTS TO THE OFFICE OF THE I-INCE PRESIDENT BEFORE 1997-09-30.** THE MAIL ADDRESS FOR REPLY IS GIVEN ABOVE. THE FAX NUMBER FOR REPLY IS +1 914 473 9325. SEND ALL E-MAILS TO langww@aip.org IF YOU ARE RESPONDING BY E-MAIL.

MEMBERSHIP

BACKGROUND. At the end of 1996, the membership of International INCE consisted of 40 Member Societies (37 Participating and 3 Observers), 8 Institutional Members and 6 Sustaining Members. (Please refer to a recent issue of *NNI* for listings of the three classes of members.) Non-profit national societies which themselves have individual members are eligible to become Member Societies. Other organizations may become Sustaining Members or Institutional Members. The I-INCE Board has endeavored to enroll at least one Member Society in each of the countries where noise control engineers practice. In large countries with many noise control engineers, more than one society may become an I-INCE Member Society. The current Member Societies of International INCE fall into three categories: societies dedicated to noise and vibration control, acoustical societies with noise and vibration control as sub-fields of acoustics, and large engineering societies, some with multi-national operations, that have individual members interested in noise and vibration control.

QUESTION 1 (Membership). IS THE CURRENT MEMBERSHIP STRUCTURE OF INTERNATIONAL INCE, WITH MEMBER SOCIETIES, INSTITUTIONAL MEMBERS, AND SUSTAINING MEMBERS, APPROPRIATE FOR THE NEXT MILLENNIUM?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 1.

QUESTION 2 (Membership). SHOULD WE CONTINUE TO SEEK MEMBERSHIP IN INTERNATIONAL INCE FOR AT LEAST ONE SOCIETY IN EACH COUNTRY THAT HAS A SIGNIFICANT NUMBER OF PRACTICING NOISE CONTROL ENGINEERS?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 2.

QUESTION 3 (Membership). SHOULD MEMBERSHIP IN INTERNATIONAL INCE BE ENCOURAGED FOR LARGE ENGINEERING SOCIETIES THAT HAVE INDIVIDUAL MEMBERS INTERESTED IN NOISE AND VIBRATION CONTROL?

Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 3.

DUES

BACKGROUND. An important source of revenue for International INCE is the annual dues paid by the participating Member Societies. These annual dues have been CHF 300 (300 Swiss francs) since the founding of International INCE in 1974. Up to the present time, International INCE has functioned with a small group of volunteers. The operation of the Secretariat has been maintained at almost no cost within the confines of a leading university laboratory. The financial statement of International INCE published annually in *NNI* has a small balance. No funds are expended for salaries, honoraria, or travel. International INCE has profited greatly from the services that have been donated since 1974. To cover the increased costs of operating International INCE in the future, the dues of each class of I-INCE member will have to be increased over the current annual dues that were established in 1974. One option is to set the amount of the annual dues for a Member Society (and its associated voting power in the I-INCE General Assembly) according to the number of individual members in the Member Society. The proposal is to define a small society as having fewer than 100 individual members, a medium society as having fewer than 500 members, and a large society as having more than 500 members. These definitions would apply to those members within a society who are interested in the engineering control of noise and vibration. A small society would pay annual dues of CHF 300 and have one vote in the General Assembly, a medium society would pay annual dues of CHF 600 and have two votes, and a large society would pay annual dues of CHF 900 and have three votes. Any change in the dues structure of International INCE must be approved by the I-INCE General Assembly.

QUESTION 4 (Dues). SHOULD A REVISED DUES STRUCTURE BE PROPOSED FOR ADOPTION BY THE I-INCE GENERAL ASSEMBLY WITH THE LARGER MEMBER SOCIETIES PAYING HIGHER DUES THAN THE SMALLER SOCIETIES?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on Question 4.

QUESTION 5 (Dues). SHOULD LARGER MEMBER SOCIETIES BE GIVEN INCREASED VOTING POWER IN THE I-INCE GENERAL ASSEMBLY IN RETURN FOR THE PAYMENT OF HIGHER DUES?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 5.

GOVERNANCE

BACKGROUND. The affairs of International INCE are managed by its President and Secretary-General who report to its Board of Directors and General Assembly. Six members of the Board of Directors represent the six most recently-held INTER-NOISE Congresses. Each member of the General Assembly represents a Member Society. The Secretariat of the Institute is maintained and operated by the Secretary-General in his laboratory located in Leuven, Belgium. In the future, it is likely that a permanent Secretariat with a paid professional staff may be needed to carry out the work that has been performed for International INCE by volunteers since 1974. This would result in an increased expense to International INCE. The additional revenue needed to operate the Secretariat would come, in part, from the proposed increase in annual dues described above.

QUESTION 6 (Governance). IS THE CURRENT ORGANIZATIONAL STRUCTURE OF INTERNATIONAL INCE WITH GOVERNANCE BY A BOARD OF DIRECTORS AND A GENERAL ASSEMBLY SATISFACTORY TO THE MEMBERSHIP?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 6.

QUESTION 7 (Governance). IS THE CURRENT MANNER OF CONDUCTING MEETINGS OF THE I-INCE GENERAL ASSEMBLY IN CONJUNCTION WITH INTER-NOISE CONGRESSES SATISFACTORY TO THE MEMBERSHIP?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 7.

QUESTION 8 (Governance). SHOULD INTERNATIONAL INCE PLAN EVENTUALLY TO ESTABLISH A PERMANENT SECRETARIAT WITH A PAID PROFESSIONAL STAFF AND A TARGET IMPLEMENTATION DATE EARLY IN THE NEXT DECADE?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 8.

BENEFITS

BACKGROUND. The benefits of I-INCE membership are broad in scope. Member Societies of International INCE: *contribute* to the work of a worldwide organization dedicated to the control of environmental noise, *participate* in meetings of the I-INCE General Assembly through their representatives, *receive* sufficient quantities of the quarterly issues of *NNI* for distribution to the individual members of the Member Societies, and *receive* one copy of the Proceedings of each INTER-NOISE Congress.

QUESTION 9 (Benefits). SHOULD THE CURRENT LEVEL OF BENEFITS PROVIDED TO THE I-INCE MEMBER SOCIETIES BE MAINTAINED?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 9.

COMMUNICATIONS

BACKGROUND. Improvement of communications between International INCE and the officers and secretariats of the Member Societies is a matter of great importance. For those Member Societies that are national acoustical societies, communications have sometimes been inhibited because noise control engineering is a small area of interest to the total organization, and no formal communication means have been established. Yet, in many parts of the world, it is the intense interest in noise that provides a strong motivation for the work of a country's acoustical society. From its inception until 1992, International INCE published a newsletter. Jointly with INCE/USA, International INCE now publishes a news magazine, *NNI*, that is intended to serve as the primary vehicle for communications between International INCE and its Member Societies. (Questions in this section relate to communications. Questions in the next section relate to the format, editing, and distribution of *NNI*).

QUESTION 10 (Communications). SHOULD *NNI* CONTINUE TO SERVE AS THE PRIMARY MEANS OF COMMUNICATING NEWS AND OTHER INFORMATION WITHIN INTERNATIONAL INCE?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 10.

QUESTION 11 (Communications). SHOULD INTERNATIONAL INCE WORK TOWARD GREATER USE OF ELECTRONIC MAIL (E-MAIL) FOR COMMUNICATIONS WITH THE I-INCE MEMBER SOCIETIES?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 11.

NOISE/NEWS INTERNATIONAL

BACKGROUND. *NNI* first appeared as an I-INCE news magazine with the 1993 March issue. Each issue contains two editorials and a profile of an I-INCE Member Society. One or more feature articles cover a variety of subjects of interest to

noise control engineers. The news sections include news items from Europe, Asia-Pacific and Pan America (North and South America). The update department includes news of the organizations responsible for the magazine: I-INCE and INCE/USA. Also included are a world conference calendar, a specialized meetings calendar, product news and standards news. With the greater use of electronic communications in the future, it may happen that the print edition of *NNI* will be supplemented or superseded by an electronic edition. The *NNI* staff faces two important problems in the current production of the magazine: timely coverage of the significant news of noise and vibration control around the world, and ensuring that copies of the magazine reach every reader who is concerned with the engineering aspects of noise and vibration control.

QUESTION 12 (*NNI*). SHOULD THE CURRENT FORMAT AND CONTENT OF *NNI* BE CONTINUED UNTIL THE APPROPRIATE TIME FOR CONVERSION TO AN ELECTRONIC FORMAT?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 12.

QUESTION 13 (*NNI*). SHOULD THE I-INCE MEMBER SOCIETIES BE REQUIRED TO FURNISH MORE NEWS ITEMS TO THE EDITORIAL STAFF OF *NNI* FOR TIMELY INCLUSION IN THE QUARTERLY ISSUES?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 13.

QUESTION 14 (*NNI*). SHOULD THE I-INCE MEMBER SOCIETIES BE REQUIRED TO REPORT ANNUALLY TO THE I-INCE GENERAL ASSEMBLY ON THE METHODS USED TO DISSEMINATE COPIES OF *NNI* TO THEIR INDIVIDUAL MEMBERS WHO ARE INTERESTED IN THE CONTROL OF NOISE AND VIBRATION?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 14.

INITIATIVES

BACKGROUND. In 1992, the General Assembly undertook new initiatives with the objective of producing a series of reports on critical issues in noise control engineering. To date, two draft reports have been published in *NNI*, one on exposure to noise in the workplace and the other on the effects of regulations on the reduction of road traffic noise. These reports were prepared by two I-INCE Working Parties; all Member Societies were invited to nominate specialists for these Working Parties. Appointment and selection of the convener was then made by the President from among the nominees. Two additional draft reports are currently being prepared, one on community noise and the other on the effectiveness of noise barrier walls. I-INCE technical reports are intended to be critical assessments of important subjects for noise control engineers. While participation by representatives of the Member Societies on the four existing Working Parties has been excellent, the same is not true for two new Working Parties, one on building acoustics and the other on consumer product noise information. The establishment of these new Working Parties was proposed in 1996, but the Member Societies failed to appoint a sufficient number of specialists, and the projects were postponed. This was due either to a lack of interest in the subjects proposed for investigation or to poor communications with the Member Societies, or both.

QUESTION 15 (Initiatives). SHOULD THE I-INCE GENERAL ASSEMBLY BE ENCOURAGED TO CONTINUE ACTIVE PURSUIT OF TECHNICAL INITIATIVES ON TOPICS OF IMPORTANCE TO NOISE CONTROL ENGINEERS WORLDWIDE?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 15.

QUESTION 16 (Initiatives). ARE THE TOPICS CURRENTLY BEING INVESTIGATED BY THE FOUR EXISTING WORKING PARTIES OF IMPORTANCE TO NOISE CONTROL ENGINEERS WORLDWIDE?

Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 16.

QUESTION 17 (Initiatives). IS IT IMPORTANT FOR THE CURRENT WORKING PARTIES TO PRODUCE I-INCE TECHNICAL REPORTS THAT REFLECT AN INTERNATIONAL CONSENSUS?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 17.

QUESTION 18 (Initiatives). SHOULD EFFORTS CONTINUE TO ESTABLISH I-INCE WORKING PARTIES FOR THE TWO INITIATIVES ON BUILDING ACOUSTICS AND CONSUMER PRODUCT NOISE INFORMATION?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 18.

QUESTION 19 (Initiatives). SHOULD THE CURRENT PROCEDURE FOR ESTABLISHING I-INCE WORKING PARTIES BE CONTINUED, WITH GREATER EMPHASIS PLACED ON THE IMPORTANT ROLE PLAYED BY THE MEMBER SOCIETIES?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 19.

QUESTION 20 (Initiatives). SHOULD THE I-INCE GENERAL ASSEMBLY TAKE STEPS TO ENSURE THAT THE MEMBER SOCIETIES PARTICIPATE MORE ACTIVELY IN THE SELECTION OF TOPICS FOR FUTURE INITIATIVES?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 20. *Please include in your comments a list of topics that you propose for adoption as technical initiatives .*

CONFERENCES

BACKGROUND. I-INCE sponsors the INTER-NOISE series of International Congresses on Noise Control Engineering. Through 1996, 25 INTER-NOISE Congresses have been held once a year in major cities of the world, each hosted by an I-INCE Member Society. The number of participants has ranged from 500 to 1400. Typically, more than 300 technical papers are presented in three days by participants from more than 30 different countries; the manuscripts of these papers are published in a Proceedings of the INTER-NOISE Congress. In addition, I-INCE sponsors International INCE Symposia, usually on specialized topics within noise control engineering. With respect to the INTER-NOISE Congress series, a number of current practices need to be examined. The annual INTER-NOISE Congresses are now rotated among three geographical regions: Europe, Asia-Pacific and Pan America. This rotation of venue provides the primary opportunity for annual presentation of current information of interest to noise and vibration control engineers around the world. Most of the abstracts submitted for a Congress are accepted for presentation. This practice, combined with the constraints that the duration of the INTER-NOISE Congress is limited to three days and the maximum number of parallel sessions is 10, has resulted in difficulties for both organizing committees and participants. An effective means of limiting the number of abstracts submitted by one author, singly or in combination with other authors, is the I-INCE policy of requiring payment of one Congress registration fee for each manuscript accepted for inclusion in the Proceedings of the Congress. This policy has been applied to both contributed and invited papers.

QUESTION 21 (Conferences). SHOULD THE CURRENT PRACTICE FOR INTER-NOISE VENUE SELECTION CONTINUE, WITH SITES ALTERNATING AMONG THE THREE MAJOR GEOGRAPHICAL AREAS OF THE WORLD?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 21.

QUESTION 22 (Conferences). SHOULD INTERNATIONAL INCE FORMALIZE A PROCEDURE FOR USE BY AN INTER-NOISE TECHNICAL PROGRAM COMMITTEE TO REJECT ABSTRACTS ON THE BASIS OF DEFINED ACCEPTANCE CRITERIA?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 22.

QUESTION 23 (Conferences). SHOULD A LARGER NUMBER OF PRESENTATIONS BE ACCOMMODATED AT AN INTER-NOISE CONGRESS BY REQUIRING SOME OF THE CONTRIBUTED PAPERS TO BE PRESENTED IN POSTER SESSIONS RATHER THAN IN LECTURE-TYPE SESSIONS?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 23.

QUESTION 24 (Conferences). SHOULD THE POLICY BE CONTINUED OF REQUIRING THE PAYMENT OF ONE CONGRESS REGISTRATION FEE FOR EACH MANUSCRIPT ACCEPTED FOR PUBLICATION IN AN INTER-NOISE PROCEEDINGS?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 24.

QUESTION 25 (Conferences). SHOULD THE PROLIFERATION OF CONGRESSES, CONFERENCES, MEETINGS, AND SYMPOSIA AROUND THE WORLD, WHERE INFORMATION OF INTEREST TO NOISE AND VIBRATION CONTROL ENGINEERS IS PRESENTED, BE OF CONCERN TO INTERNATIONAL INCE AND ITS MEMBER SOCIETIES?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 25.

I-INCE FIELD OF INTEREST

BACKGROUND. International INCE was chartered in 1974 in Zurich, Switzerland according to Swiss Civil Law for the following purposes - to organize international congresses; and to promote cooperation in a) research, b) the application of engineering techniques for the control of environmental noise, and c) the exchange of technical information. Shortly after its founding, work was started on an I-INCE Classification of Subjects for noise control engineering. The purpose of the classification scheme is to list those topics that fall within the scope of noise control engineering. The classification scheme has been updated many times, and was most recently published in its detailed form in the 1994 March issue of *NNI*. The I-INCE Classification of Subjects fills many pages to list the topics that are included within the field of noise control engineering. But a short description of what noise control engineering involves as an engineering discipline has not yet been presented to the I-INCE Board of Directors or the General Assembly for approval. The I-INCE field of interest can be considered to be synonymous with a concise definition of noise control engineering. To illustrate what is meant, a draft has been prepared for this Opinion Survey. This draft is a single sentence:

Noise control engineering involves the application of physical means to optimize the levels of environmental noise by controlling the fluidborne sound and solidborne vibration transmitted through a medium or generated and radiated by structures, machines, products, systems and processes.

Those participating in this Opinion Survey are encouraged to prepare an improved version of the above draft. Please include a proposed field of interest statement in your comments to Question 26. All submittals will be presented to the I-INCE Board of Directors for review.

QUESTION 26 (Field of Interest). IS IT IMPORTANT TO PREPARE A CONCISE STATEMENT OF THE FIELD OF INTEREST OF INTERNATIONAL INCE?

Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 26. *If you answered YES, please include a proposed field of interest statement in your comments.*

QUESTION 27 (Field of Interest). WOULD SUCH A STATEMENT, FOLLOWING ADOPTION BY INTERNATIONAL INCE, PLAY A SIGNIFICANT ROLE IN DISCUSSIONS WITH OTHER INTERNATIONAL ORGANIZATIONS CONCERNING COOPERATION?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 27.

UMBRELLA ORGANIZATIONS

BACKGROUND. In 1996, there was much discussion of the roles that should be played by various international organizations in coordinating meetings on a variety of topics, some of which fall within the scope of noise control engineering. During the first two decades of its existence, International INCE did not seek to ally itself closely with other international organizations. Only an informal liaison has been maintained with the International Commission on Acoustics (ICA). The ICA has been informally recognized for many years as the umbrella organization representing international activity in the broad discipline of acoustics, including all of its many sub-fields. On the other hand, there has been no umbrella organization devoted exclusively to coordinating activities in the engineering control of noise and vibration.

QUESTION 28 (Umbrella Organizations). SHOULD INTERNATIONAL INCE ASSUME A MORE ASSERTIVE ROLE TO BECOME THE UMBRELLA ORGANIZATION FOR COORDINATING INTERNATIONAL ACTIVITIES IN NOISE CONTROL ENGINEERING?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 28.

QUESTION 29 (Umbrella Organizations). SHOULD INTERNATIONAL INCE FORMALLY RECOGNIZE THE INTERNATIONAL COMMISSION ON ACOUSTICS (ICA) AS THE UMBRELLA ORGANIZATION RESPONSIBLE FOR THE COORDINATION AND SPONSORSHIP OF INTERNATIONAL ACTIVITIES IN ALL FIELDS OF ACOUSTICS?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 29.

GENERAL

BACKGROUND. The current and future operations and activities of International INCE have been considered above in ten different areas. While an attempt has been made to cover as many aspects of International INCE as are relevant at the present time, it is possible that some important topics have been omitted from this Opinion Survey. If so, please discuss the omitted topics in the write-in comments for this final question.

QUESTION 30 (General). HAS THIS OPINION SURVEY COVERED THE MOST IMPORTANT TOPICS RELATED TO CURRENT I-INCE ACTIVITIES AND TO THOSE ACTIONS INTERNATIONAL INCE SHOULD TAKE IN THE FUTURE?
Please check YES, NO, or NO OPINION on the Reply Sheet. Then give recommendations on this matter in the space for write-in comments, identifying them as comments on your response to Question 30.

Thank you for responding to this opinion survey. The reply coupon is on the reverse side of this sheet.
Please return the reply coupon no later than 1997 September 30.

REPLY SHEET

(FAX this reply sheet to +1 914 473 9325 or send to I-INCE, P.O. Box 3067 Arlington Branch, Poughkeepsie, NY 12603, USA, or respond by email to langww@aip.org).

Member Society Name _____

Question 1.	☐ yes	☐ no	☐ no opinion	Question 16.	☐ yes	☐ no	☐ no opinion
Question 2.	☐ yes	☐ no	☐ no opinion	Question 17.	☐ yes	☐ no	☐ no opinion
Question 3.	☐ yes	☐ no	☐ no opinion	Question 18.	☐ yes	☐ no	☐ no opinion
Question 4.	☐ yes	☐ no	☐ no opinion	Question 19.	☐ yes	☐ no	☐ no opinion
Question 5.	☐ yes	☐ no	☐ no opinion	Question 20.	☐ yes	☐ no	☐ no opinion
Question 6.	☐ yes	☐ no	☐ no opinion	Question 21.	☐ yes	☐ no	☐ no opinion
Question 7.	☐ yes	☐ no	☐ no opinion	Question 22.	☐ yes	☐ no	☐ no opinion
Question 8.	☐ yes	☐ no	☐ no opinion	Question 23.	☐ yes	☐ no	☐ no opinion
Question 9.	☐ yes	☐ no	☐ no opinion	Question 24.	☐ yes	☐ no	☐ no opinion
Question 10.	☐ yes	☐ no	☐ no opinion	Question 25.	☐ yes	☐ no	☐ no opinion
Question 11.	☐ yes	☐ no	☐ no opinion	Question 26.	☐ yes	☐ no	☐ no opinion
Question 12.	☐ yes	☐ no	☐ no opinion	Question 27.	☐ yes	☐ no	☐ no opinion
Question 13.	☐ yes	☐ no	☐ no opinion	Question 28.	☐ yes	☐ no	☐ no opinion
Question 14.	☐ yes	☐ no	☐ no opinion	Question 29.	☐ yes	☐ no	☐ no opinion
Question 15.	☐ yes	☐ no	☐ no opinion	Question 30.	☐ yes	☐ no	☐ no opinion

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Write-in Comments for Question _____

Write-in Comments for Question _____

Write-in Comments for Question _____

Write-in Comments for Question _____

use additional sheets as necessary

Books

Industrial Intelligent Control
Yong-Zai Lu
John Wiley & Sons, 605 Third Avenue, New York, NY 10158
Hardcover, 1996, 325 pp, 74.95 USD.
This is a mathematically oriented book that deals with control systems of various kinds. Some of the topics included in the book are fuzzy logic and fuzzy systems, neural networks, learning strategies, modeling of systems, adaptive control systems, optimization techniques, and quality control.

Noise cancellation itself is a minor part of the book—appearing only in one chapter on learning strategies, but many of the techniques in the book should be applicable to the design of active noise control systems.

Active Control of Noise and Vibration
Colin H. Hansen and Scott D. Snyder
E & FN Spon, 7625 Empire Drive, Florence, KY, USA, an imprint of Chapman and Hall, 2-6 Boundary Row, London SE1 8HN, United Kingdom
Hardcover, 1997, 1267 pp, 358 USD (195 GBP)
This 1,267-page book is more than a treatise on active control of noise and vibration; it covers the fundamentals of acoustics and vibrations as well as the theory of active control systems.

Chapter 1 is in introduction which gives the background of active control. The early work of Lueg and Olson is described; the chapter also gives an overview of potential applications of active control, feedback, and feedforward systems.

Chapter 2 covers the fundamentals of acoustics and vibrations. This includes a derivation of the wave equation (including sources and one-dimensional mean flow). The discussion then turns to the fundamentals of mechanics, including Newton's laws and some of the important concepts in analytical mechanics. The vibrations of continuous systems (beams, plates, and shells) are then reviewed. The chapter continues with a review of the theory of Green's functions in unbounded spaces, enclosed spaces, and ducts. Following that formalism, impedance and sound intensity are discussed. The material on impedance leads directly to an explanation of radiation efficiency. Mechanical impedance is also covered, and intensity in both air and structures is reviewed.

Chapter 3 is a review of spectral analysis and digital filtering. Chapter 4 covers modal analysis—both theoretical and experimental.

The theory of active noise and vibration control begins in Chapter 5 with a review of modern control theory. This includes discrete-time models, frequency domain analysis, and random processes.

Feedforward systems, including various formulations of LMS algorithms are covered in Chapter 6. The discussion leads naturally into adaptive filtering. There is also material on adaptive filtering using neural networks.

Chapter 7 begins the discussion of one of the first applications of active control, active control in ducts. Examples of various configurations of active cancellation systems are given. This chapter also includes material on active headsets.

Chapter 8 is devoted to control of sound radiation in a free field. The use of a canceling source near the actual source (modeled as a dipole) is discussed—as is the control of radiation from structures such as panels. Next comes an exposition—in Chapter 9—on control of sound fields in enclosed spaces. Examples of control of aircraft and automobile interior noise are given.

Chapter 10 is devoted to feedforward control of vibration in beams in plates, and Chapter 11 continues with material on feedback control using a modal description of flexible structures. Chapter 12 covers active vibration isolation.

Electronic issues, such as analog to digital conversion, are covered briefly in Chapter 13, and the discussion then turns to sources and sensors in Chapter 14. Sources and sensors for both airborne sound and for vibration control are covered.

Throughout the book, there are numerous references to current activity in the field. There is one appendix in the book which is a brief review of linear algebra.

One subject not covered is patents. The authors have given a brief discussion of this topic in the preface, and point out that this is a very complex issue. They suggest that any company entering the field to develop a product have patent rights. They say that "It seems that lawyers and judges have made more money from active control than any engineering company." They urge reason with regard to patent rights since these problems can slow down new product development (and enrich the legal profession).

Pump Application Desk Book
Paul N. Garay
Fairmont Press, Lilburn, GA, USA
Hardcover, 1996, 706 pp. 82 USD.
This book is a practical guide to both the design and use of pumps in a number of industrial applications. The topics covered include descriptions of various kinds of pumps, the principles upon which they operate, applications of pump theory, methods to modify pumps to improve efficiency, water hammer, seals, and pump system parameters.

There is a chapter on the classification of pumps, and a summary is given of different kinds of pumps - gear pumps, centrifugal pumps, screw pumps, piston pumps, etc.

There is also a chapter on applications of pump theory which contains a general discussion on cavitation in pumps.

Noise is clearly a factor in pump design, but this topic is mentioned only briefly in Chapter 17 which is titled "Effect of Pump Speed on Selection, Design, and Use." The author points out several benefits that will (and will not) occur when pump speed is reduced. It is said that "fortunately, pumps are normally quiet machines. Some conditions under which noise should be considered are listed. The general information on pumps may, however, be valuable to an engineer faced with a pump noise problem.

Asia-Pacific News

A. Lawrence, *Asia-Pacific Editor*

NEW ZEALAND

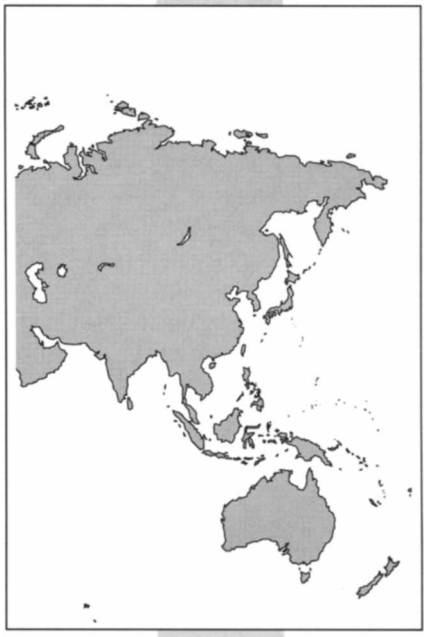
Reply Coupon for INTER-NOISE 98. The Organizers of INTER-NOISE 98 would like to receive the reply coupon below from all potential delegates to the International Congress. Information on INTER-NOISE 98 published previously in *Noise/News International* may be found on the World Wide Web at http://users.aol.com/inceusa/in98.html Below is a summary of the events that will take place in 1998 November, and a reply coupon for those who are interested in additional details. It is expected that the Announcement and Call for Papers for the Congress will be published in the September issue of this magazine.

INTER-NOISE 98 will be held in Christchurch, New Zealand on 16-18 November 1998. The venue is the Christchurch Convention Centre and the Parkroyal Hotel, both of which are within short walking distance of the city centre and the casino.

The Congress has been scheduled to immediately precede the International Commission on the Biological Effects of Noise (ICBEN) conference on Noise as a Public Health Problem being held in Sydney, Australia on 23-27 November 1998.

A satellite symposium on Recreational Noise linking these two congresses is also being planned for 20 November 1998 in Queenstown which is a short flight from Christchurch.

There will be a trade exhibition of products, equipment and services associated with the congress.



INTER-NOISE 98

Registration of Interest

Title _____ First Name _____ Surname _____

Postal Address _____

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Phone: _____ FAX _____

e-mail _____

Please place my name on the mailing list for all further information on the following: (please tick boxes)

INTER-NOISE 98 ☐ Queenstown ☐ ICBEN ☐

Please send me more information about tourist attractions in New Zealand ☐

I am interested in pre- or post-conference tours ☐

Send to: The INTER-NOISE 98 Secretary
NZ Acoustical Society
P.O. Box 1181
Auckland 1001
New Zealand
Telephone: +64 9 623 3147 FAX: +64 9 623 3248
e-mail: internoise98@auckland.ac.nz

Internet home page: http://www.auckland.ac.nz/internoise98

Topics under consideration for the special sessions include: Active Noise Control, Airport Noise, Building Codes, Designing for Very Low Noise, Environmental Noise Control, Prediction of Sound Insulation for Wall Structures, and Transmission Loss and Noise Reduction Measurement.

The General Chairman is Harold Marshall and the Chairman of the Technical Committee is Murray Johns.

For further information, please return the coupon to the left.

Pan-American News

A. Lawrence, *Asia-Pacific Editor*

BRAZIL

IberoAmerican Federation of Acoustics is Formed. The IberoAmerican Federation of Acoustics (Federação IberoAmericana de Acústica—FIA) was formed in 1996 April, in Buenos Aires, Argentina, as a non-profit scientific federation whose membership is open to acoustical societies of Spanish- and Portuguese-speaking countries.

The acoustical societies in South America have been working together for a long time organizing conferences, such as the 1st Brazil/Argentina congress in acoustics held in Florianopolis in 1994 April, and the various congresses organized by the Institute de Acoustics of the Austral University of Chile in Valdivia in 1994 and 1995—with the participation of the Spanish and Peru acoustical societies.

FIA was officially created in Valdivia/Chile in 1995 October, composed of the following societies:

- Associate of the Acoustics Argentines (AdAA);
- Brazilian Acoustical Society (SOBRAC);
- Chilean Acoustical Society (SCA);
- Peru Acoustical Society (SPA);
- Spanish Acoustical Society (SEA);
- Portugal Acoustical Society (recently applied to become a member).

FIA by-laws were approved by the above five societies in a historic meeting in Buenos Aires in 1996 April. FIA accepts only as members acoustical societies that are non-profit and legally established in Spanish- or Portuguese-speaking countries. The FIA Directors Council is composed of: President: Samir N.Y. Gerges (Brazil); Vice-President: Antonio M. Mendez (Argentina); Treasurer: Leonardo Parma (Chile); Council Member: Carlos Jimenez Dianderas (Peru); Council Member: Antonio Pérez-Lopez (Spain); General Secretary: Antonio Calvo-Manzano (Spain).

The objectives of FIA are to advance the science of acoustics and diffusion of information between the member societies. FIA will consolidate the existing societies and help the establishment of new societies in the Spanish- and Portuguese-speaking countries. FIA cooperate with scientific organizations in all countries and with other international organizations with the aim of increasing information exchange by sponsoring, supporting seminars, workshops, congresses, courses, meeting and publication.

FIA is organizing its first congress in Florianopolis, Santa Catarina state, Brazil from 4 to 8 April, 1998. For more information of FIA congress contact: FIA, The Federal University of Santa Catarina, Mechanical Engineering Department, Noise and Vibration Laboratory, Cx.P. 476 - SC - Brazil - CEP: 88040-900. FAX: +55 48 2319677 or 2341519. e-mail: gerges@mbox1.ufsc.br

SOBRAC to Organize Symposium. The Brazilian Acoustical Society (SOBRAC) is organizing its fourth Brazilian Symposium on Vehicle Noise (VI SIBRAV), which will take place in Sao Paulo city—Brazil, on August 18 and 19, 1997. This symposium is organized by a team from Mercedes-Benz, General Motors, Brüel and Kjær and others. It is expected about 120 participants from the vehicle industry (FIAT, VW, MB, GM and others), manufacturers of components, research institutes and universities. Contact SOBRAC, UFSC/CTC/EMC - Cx.P. 476 -Florianopolis - SC - Brazil. CEP:88040-900. Fax: 55-48-2341519 or 2319766. e-mail: gerges@mbox1.ufsc.br.

USA

FAA Releases INM, Version 5.1. The Federal Aviation Administration (FAA) is pleased to announce the release of Version 5.1 of the Integrated Noise Model (INM) for the Windows 95 operating system and newer versions of Windows NT. Version 5.1 offers superior performance by taking advantage of the 32-bit processing available in the new operating systems.

In addition to upgraded Windows support, INM offers an expended aircraft database including military aircraft data from the U.S. Air Force NOISEMAP program and two new configurations of the MD90. Approximately 100 new military aircraft from NOISEMAP now give INM users more ability to conduct joint use studies.

Aircraft profile generation is also more flexible in Version 5.1. These profile enhancements allow for the modeling of more complex arrivals and departures and include an improved methodology for modeling touch-and-go operations. We have also provided a new INM "Profile Review Checklist" in the Users' Guide to facilitate the review process for using non-standard profiles for analysis in regulatory actions.

Further steps have been taken to enhance GIS capabilities. These include a recent update to the National Flight Data Center (NFDC) database which contains the locations of runways, Navaids and fixes. State and County codes can now be extracted from Census population data. INM also supports both 1994 and 1995 TIGER street map data formats. Further, all INM coordinates may now be placed in a latitude and longitude format that is consistent with formats used by major GIS systems. The CAD capability within INM has been updated to read the AutoCAD R13 DXF format and the INM output graphics can now export a file in colored layers.

Studies developed under Version 5.0 are automatically converted to the newer Version 5.1 format as they are opened in the new system. INM also maintains the capability of converting older Version 4.11 studies.

For more information about Version 5.1, please contact John M. Gulding by telephone: +1 202 267 3654; FAX: +1 202 267 5594; or by e-mail at john.gulding@faa.dot.gov.

European News

A. Cops, *European Editor*

EUROPE

The European Acoustics Association (EEIG) is United with FASE. The contacts between the Federation of the Acoustical Societies of Europe (FASE) and the European Acoustics Association (EAA) have led to unification of FASE and EAA, which was the intent of the EAA member societies at their board meeting in Antwerp, Belgium on 1996 March 30.

The FASE council met in St. Petersburg, Russia in 1996 September and came to the same conclusion—that a merger of FASE and EAA is of advantage for European acoustics.

Letters have been exchanged between the President of FASE, Dr. R.C. Chivers, and the Managing Director of EAA, Dr. M. Zakharia. Both parties agreed on the following points:

FASE is integrated into EAA effective on 1997 January 01; the following procedures apply:

1. The overall structure of the combination is that of the EAA, with full respect to its present bylaws.

2. The name of the association remains European Acoustics Association (EEIG), but where appropriate the phrase *united with FASE* will be added for a reasonable time. Details will be decided by the EAA Board.

3. The Honorary Members of FASE are named Honorary Consultants to the Managing Director of EAA—and, as such, are invited to the meetings of the Board of EAA.

4. The President and the Secretary of FASE are, for the remainder of their terms, also invited to attend the meeting of the Board of the EAA as consultants to the Managing Director of the EAA.

5. A history of FASE is being prepared and will be published in *Acta Acustica/Acustica*.

6. EAA is setting up an archive which, among other things, will house the original basic documents of FASE.

The European Acoustics Association maintains a number of pages on the Internet that give a good description of the activities of the EAA. For example:

The Association home page may be found at
http://wrangler.essex.ac.uk/eaa/index.html

General information may be found at:
http://wrangler.essex.ac.uk/eaa/inform/inform.html

Membership information with links to pages on the member societies may be found at
http://wrangler.essex.ac.uk/eaa/members.html

Information on the EAA Journal, *Acta Acustica/Acustica* may be found at
http://wrangler.essex.ac.uk/eaa/products/aaa/aaa.html

The EAA constitution may be found at
http://wrangler.essex.ac.uk/eaa/inform/misc/constit.html

News of EAA activities may be found at
http://wrangler.essex.ac.uk/eaa/inform/news/news.html

A diary of coming conferences, etc. may be found at
http://wrangler.essex.ac.uk/eaa/inform/diary/diary.html

SWITZERLAND

The Swiss Acoustical Society SGA/SSA celebrated its 25th anniversary in the autumn of 1996. The present Honorary President, Prof. Eric J. Rathé, was one of the founding members in 1971. Since then, the Society has grown continuously. Today it has about 260 individual and 120 company members. Every year, two conferences are organized: a Spring Conference in the French or Italian speaking part of Switzerland and the Autumn Conference with the General Assembly. In March 1998, SGA/SSA will host the German Acoustical Conference, DAGA, which is to take place at the Swiss Federal Institute of Technology (ETH) in Zürich. Swiss Acoustical Society SGA/SSA held its *annual meeting* and *general assembly* on November 7 and 8 in Lucerne. The main topics covered were:

- Final selection of the SGA/SSA logo (to be used on the World Wide Web and in *Acta Acustica/Acustica*
- Demonstrations for teaching in acoustics
- New developments in hearing aids
- Acoustics on the Internet (workshop)
- Computer-based training in acoustics (workshop)
- Soundscapes—qualitative approaches to the acoustical environment
- Enforcement of the new federal regulation on sound level limits for music
- Exhibition of acoustic material and measuring equipment

DENMARK

Aalborg University in Denmark maintains a page on the Internet that may be of interest to those with Internet access. The page consists primarily of links to other acoustics organizations. The page may be found at

http://www.kom.auc.dk/AKUSTIK/book-ac.htm

NNI Directory

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Korea: Korean Society for Noise and Vibration Engineering, #1406 Renaissance Officetel, 1598-3, Seocho-Dong, Seocho-Gu, Seoul, 137-070. FAX: +82 2 3474 8004

Lithuania: Lithuanian Acoustical Society, Kriviu St. 15-2, Vilnius 2007. FAX: +370 2 223451

Mexico: Sociedad Mexicana de Acústica, Apaseo el Alto 21-2, Col. San Bartolo Atepehuacán, Del. Gustavo A. Madero, C.P. 07730, México, D.F. FAX: +52 5 752 6183

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Poland: Committee on Acoustics of the Polish Academy of Sciences, Polska Akademia Nauk, Palac Kultury i Nauki, Skrytka pocztowa 24, 00-901 Warszawa

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South Africa: N&V Division of the SAIMechE, c/o South African Institution of Mechanical Engineering, P.O. Box 93395, Yeoville 2143. FAX: +27 11 648 1387

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U.S.A: Acoustical Society of America, 500 Sunnyside Blvd, Woodbury, NY 11797. FAX: +1 516 576 2377

U.S.A: Institute of Noise Control Engineering of the U.S.A., P.O. Box 3206 Arlington Branch, Poughkeepsie, NY 12603. FAX: +1 914 463 0201

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Bond voor Materialenkennis, Postbus 390, 330 AJ Zwijndrecht, The Netherlands

Brüel & Kjær A/S Skodsborgvej 307, DK 2850 Nærum, Denmark

LMS International NV, Numerical Integration Technologies NV, Interleuvenlaan 68, 3001 Leuven, Belgium

CEL Instruments Ltd., 35 Bury Mead Road, Hitchin, Herts SG5 IRT, United Kingdom

Norsonic AS, P.O. Box 24, 3408 Tranby, Norway

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International INCE Institutional Members

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Belgium: Laboratorium voor Aoestiek en Thermische Fysica, K.U., Celestijnenlaan 200D, B-3001 Leuven-Heverlee.

France: Centre Technique des Industries Méchanique, 52 Avenue Félix Louat, BP 67, 60304 Senlis.

Japan: Sone Lab., R.I.E.C., Tohoku University, 2-1-1 Katahira, Aoba-Ku, Sendai 980.

Korea: Center for Noise and Vibration Control Engineering, 735 25 Yuksam-dong, Kangnam-ku, Seoul, 135-080.

Portugal: Laboratorio Nacional de Engenharia Civil, Ministerio das Obras Publicas, Transportes e Communicacoes, Av. do Brasil 101, 1799 Lisboa.

Russia: Noise Control Association of the Baltic State Technical University, c/o Professor N.I. Ivanov, 1-st.Krasnoarmejskaja 1, 198005 St. Petersburg

Sweden: Department of Applied Acoustics, Chalmers University of Technology, S-412 96 Gothenburg.

U.S.A.: Graduate Program in Acoustics, The Pennsylvania State University, University Park, PA 16802.

Acknowledgments

The Board of Directors of INCE/USA expresses its sincere appreciation to the **Acoustical Society of America** for its support and cooperation in the publication of Noise/News (1972-92), and Noise/News International since its inception in 1993. The Board also gratefully acknowledges the financial assistance given by the members of the INCE/USA Liaison Program: The Board of Directors of International INCE gratefully acknowledges the support being given by the following Sustaining Members and Institutional Members of International INCE:

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Reader Service Number 10

Specialized Meetings Calendar

This calendar includes specialized meetings (seminars, short courses, workshops, etc.) with limited attendance which feature programs on noise and its control. Entries for this calendar are solicited from the I-INCE Member Societies and other organizations. In order for a listing to appear in this calendar, information *must* be provided by the organizers of a specialized meeting on the sessions planned for the technical program that will be devoted to noise and its control. This is particularly important if the word *noise* does not appear in the name or theme of the meeting. The registration fee for the event is also to be included for each listing. Send requests for listings of future events with required details to: Specialized Meetings Calendar, INCE/USA, P.O. Box 3206, Arlington Branch, Poughkeepsie, NY 12603, USA. FAX: +1 914 473 9325.

1997 July 08-11
Machinery Vibration Analysis I, Downers Grove, Illinois, USA. Fee: USD 850. Contact: The Vibration Insitute, 6262 S. Kingery Highway—Suite 212, Willowbrook, IL 60514, USA. Telephone: +1 630 654 2254; FAX: +1 630 654 2271.

1997 July 08-11
Machinery Vibration Analysis II, Downers Grove, Illinois, USA. Fee: USD 1050. Contact: The Vibration Insitute, 6262 S. Kingery Highway—Suite 212, Willowbrook, IL 60514, USA. Telephone: +1 630 654 2254; FAX: +1 630 654 2271.

1997 August 05-08
Machinery Vibration Analysis I, Charleston, South Carolina, USA. Fee: USD 850. Contact: The Vibration Insitute, 6262 S. Kingery Highway—Suite 212, Willowbrook, IL 60514, USA. Telephone: +1 630 654 2254; FAX: +1 630 654 2271.

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Machinery Vibration Analysis II, Charleston, South Carolina, USA. Fee: USD 1050. Contact: The Vibration Insitute, 6262 S. Kingery Highway—Suite 212, Willowbrook, IL 60514, USA. Telephone: +1 630 654 2254; FAX: +1 630 654 2271.

1997 September 09
Workshop on Machinery Vibration Condition Monitoring, Visakhapatnam, India. Fee: USD 100. Contact: V. Bhujanga Rao, N.S.T.L., Visakhapatnam-27, India. Telephone: +91 558131; FAX: +91 559464. e-mail: *drnstl@ren.nic.in*

1997 September 21-23
PSQ '97, Product Sound Quality 1997, Cape Cod, Massachusetts, USA. Contact: R. Lyon, RH Lyon Corp., 691 Concord Avenue, Cambridge, MA 02138, USA. Telephone: +1 617 864 7260; FAX: +1 617 864 0779.
e-mail: *rhlyon@lyoncorp.com*

1997 October 20-24
Highway Noise Analysis Seminar, Louisville, Kentucky, USA. Instructors: L. Cohn and A. Harris. Fee: USD 995. Contact: L. Naiser, Univ. Center for Continuing and Professional Education, University of Louisville, Louisville, KY 40292, USA. Telephone +1 502 852 6456.
e-mail: *lfcohn@llkyvx.louisville.edu*

1997 October 27-31
Acoustics & Noise Control Course, Somerset, Pennsylvania, USA. Fee: USD 1,425. Principal instructor: W.R. Thornton. Contact: AVNC Continuing Education Division, 250 Shagbark Drive, R.D. #1, Cheswick, PA 15024, USA. Telephone: +1 412 265 4444; FAX: +1 412 367-9233.

1998 February 23-27
Mechanical Vibrations Course, Somerset, Pennsylvania, USA. Fee: USD 1,425. Principal instructor: W.R. Thornton. Contact: AVNC Continuing Education Division, 250 Shagbark Drive, R.D. #1, Cheswick, PA 15024, USA. Telephone: +1 412 265 4444; FAX: +1 412 367-9233.

Product News

Industrial Acoustics Company Introduces a New Website. The Industrial Acoustics Company (IAC) has announced their newly-established Website: http://www.industrialacoustics.com

Areas to explore include IAC's Corporate Overview, the products of the Architectural, HVAC, Medical, Aviation/Gas Turbine, Door and Industrial Departments. The site will be updated periodically offering news and information on IAC's products and current projects.

The company has also developed a CD-ROM program with SweetSource (http://www.sweets.com) for design professionals to obtain ready access for data on IAC products and specifications.

For more information contact John Handley or Maria Wilhelm at Tel: +1 718 430 4501 or +1 718 430 4504; FAX: +1 718 430 4510; e-mail: info@industrialacoustics.com. **Circle Reader Service Number 50.**

Larson-Davis Announces an Environmental Noise Prediction Program for Stationary Sources. Larson-Davis Laboratories has announced the release of RTA Technologies Environmental Noise Modeling (ENM) software, Version 3.06. ENM is the Windows™ 3.1 and Windows 95 software used to predict noise levels at a distance from sources. The noise level attenuation is calculated for the effects of distance, barriers, ground effects, wind, and temperature gradients.

ENM was first sold as a DOS-based program in 1986. The algorithms used in the software are said to be based on the best research available today and have been verified by field tests.

ENM comes with four modules: *SOURCE* helps characterize the sound producer, *SECTION* describes two dimensions elevation and height-of the ground from the source to the receiver. *MAP* permits 3D topography to be defined using ground contours. The ENM *SCENARIO* Module does the work of calculating sound contours. All modules can be open at once to assure fast and understandable data entry and immediate visualization of the results.

Some of the features of ENM include:

- up to 1000 sources and multiple receivers
- source directives at any selected point, not just the 20 ISO points
- calculates finite width, barriers
- auto batching to do what-if scenarios over a range of meteorological conditions
- full hardware support for Windows 3.1 and Windows 95 with digitizer input
- optional programs meet exact requirements of special algorithms: BBN/EEI, CONCAWE, NORDFORSK. Modules available for ISO 9714 and VDI 2714.

For further information call or write Richard J. Peppin, Larson Davis, Inc., 5012 Macon Road, Rockville, MD 20852. Tel: +1 301 770 3863; FAX: +1 301 770 3979; e-mail: PeppinR@asme,org. **Circle Reader Service Number 51.**

High Performance Panels for Reducing Noise in Facilities are Described. The acoustic environment in a wide range of indoor recreational facilities, commercial/retail/office spaces, manufacturing plants and industrial operations, schools and libraries, religious buildings, high security and correctional facilities, and rapid transit stations can be improved using Eckel's sound-absorbing wall and ceiling panels. These systems are said to offer a convenient method for effectively reducing background noise and reverberation in existing facilities as well as in new buildings. Details on standard noise control systems are provided in a 4-page condensed catalog available from Eckel Industries, Inc., Cambridge, Massachusetts. The brochure also discusses the custom acoustic treatment services that Eckel offers.

One of the most versatile systems developed by Eckel is the Eckoustic® Functional Panels (EFPs) system. The attractive EFPs can be spot located on walls and/or ceilings to correct noise problems in an area, and since EFPs are independent panels, they can be installed without disturbing existing utilities. Various EFP applications are listed, and performance data and construction details supplied. In addition, features, such as low maintenance, are discussed and specifications given.

For a free copy of "Noise Control Panel Systems" contact Alan Eckel, Eckel Industries, Inc., 155 Fawcett Street, Cambridge, MA 02138, or telephone at +1 617 491 3221. **Circle Reader Service Number 52.**

Overly Manufacturing Purchases Peelle Blast and Special Doors Designs & Test Procedures. Overly Manufacturing Company has purchased the designs and test procedures for Peelle Blast and Special Doors of Monroe, NC. The purchase price was not disclosed.

"Peelle," said John T. Brooks, vice president and general manager of Overly Manufacturing Company, "was an important competitor with a widely respected reputation in our industry. We are absolutely delighted to be able to serve their former customers." Overly will provide replacement parts for Peelle Doors.

Peelle will close its former production facilities in Monroe and will no longer be active in the development of blast resistant doors.

Brooks reported that Overly will have some additional significant announcements within the next few months on new products and testing procedures.

Based in Greensburg since 1886, Overly Manufacturing Company provides specialty door and window systems for commercial and industrial applications, in both the private and public sectors. Because it is a custom door manufacturer, Overly can supply its products in virtually any size.

For further information contact John Brooks, Overly Manufacturing Company, P. O. Box 70, Greensburg, PA 15601. Telephone: +1 412 834 7300; FAX: +1 412 830 2871. **Circle Reader Service Number 53.**

CSI Unveils PeakVue. Computational Systems Inc. (CSI) has announced PeakVue™, a patented technology for vibration analysis. PeakVue empowers vibration analysts to uncover certain machinery faults that may go undetected with current demodulation techniques, especially in slow speed machinery.

Now a standard feature of the CSI model 2120 Machinery Analyzer, PeakVue is said to recognize low energy vibration signals on machinery of any speed, exposing faults associated with improper gear meshing, damaged gear teeth and antifriction bearing defects.

For non-2120 Machinery Analyzer users, PeakVue can also be implemented using the SPV-305 PeakVue box with any FFT machinery analyzer.

For more information on PeakVue, contact CSI at 835 Innovation Drive, Knoxville, TN 37932. Telephone: +1 800 675 8033. **Circle Reader Service Number 54.**

Reader Service Number 11

The GA121 Octave Band Sound Level Meter from Castle. The GA121 octave band sound level meter is available from Castle. This Type 1 integrating octave band sound level meter is microprocessor based and boasts several features such as *Octave Band Snapshots* with instant graphical and numerical printout, and simple selection of the correct hearing protection with the GA121's built-in Hearing Protector product library.

The GA121 can store up to 50 octave bands in its memory and then review or print any one of them. The Hearing Protection Library allows an ear defender to be selected by manufacturer and model name on the screen and then compared to an *octave band snapshot* to test its effectiveness for particular noise control area.

The GA121 has all the parameter requires for noise at work risk assessments from SPL and L_{eq}, to octave band analysis and full data logging. It also has the facility (with the addition of a Castle's dBdata4XL software) to download and manipulate enough information for any noise survey, via the RS232 Interface to a computer.

For further information contact Giles Pike, Sales, or Simon Bull, Technical, Castle Group Limited, Salter Road, Scarborough, North Yorkshire, YO11 3UZ, England. Telephone: +44 1723 584250; FAX: +44 1723 583728. **Circle Reader Service Number 55.**

Flagship Portable Analyzer now Available for L5000. Diagnostic Instruments have reduced the price of their

flagship portable analyzer, the DI-2200, to L5000.

The DI-2200 is a real-time FFT analyzer. With battery or mains operation and a rugged plastic case, the DI-2200 is said to be equally suitable for use in the laboratory, on the factory floor, or in the field. The unit has a bright high-contrast cold-cathode backlit LCD with a scratch-resistant, anti-reflective screen, said to provide excellent visibility even in difficult lighting conditions.

For further information on this (or any) Diagnostic Instruments product, please contact Anne McSherry, Sales Administrator, Diagnostic Instruments, 2 Michaelson Square, Kirkton Campus, Livingston EH54 7DP, Scotland, UK. Telephone: +44 1506 470011; FAX: +44 1506 470012. **Circle Reader Service Number 56.**

Noise and Vibration Production Test Analyzer. Diagnostic Instruments has also produced an instrument which is said to make it possible to determine product/component quality based on noise and vibration signatures. The new LineCHECK™ product range from Diagnostic Instruments is said to remove the subjectivity from inspection testing to give an objective assessment of product quality.

LineCHECK™ has already been successfully used to detect component defects such as cracks, inclusions, dimensional tolerance, etc., and electric motor and bearing quality.

For further information on this (or any) Diagnostic Instruments product, please contact Anne McSherry, Sales Administrator, Diagnostic Instruments, 2 Michaelson Square, Kirkton Campus, Livingston EH54 7DP, Scotland, UK. Telephone: +44 1506 470011; FAX: +44 1506 470012. **Circle Reader Service Number 57.**

Cubic Shear ICP® Modal Accelerometer. PCB has introduced Model 333A32 cubic shear accelerometer for automotive NVH testing, modal analysis, and general structural testing. This single axis, ICP®, high resolution sensor provides 100 mV/g output over a broad frequency range of 1 to 3000 Hz ("5%) making it ideal for measuring low-frequency, low-level vibration of small to medium structures. The lightweight, hermetically sealed, titanium housing is said to assure superior long term stability. A cubical design allows for a durable adhesive mount on any of five faces for ultimate installation ease. Model 333A32 can be used directly with FFT analyzers, vibration meters and multichannel acquisition modules (including VXI architecture) that provide constant current excitation.

For additional information, contact PCB Piezotronics, Inc., Attn: Andrea Mohn, 3425 Walden Avenue, Depew, NY 14043. Telephone: +1 716 684 0001; FAX: +1 716 684 0987. **Circle Reader Service Number 58.**

New SNAP™ Compact Industrial Accelerometer. Wilcoxon Research has introduced the new SNAP™ Industrial Vibration Accelerometer for machinery condition monitoring. Designed for ease of installation, SNAP is characterized by a compact, epoxy-mount housing and a unique "snap-on" connector. The unit is said to offer the same outstanding quality and reliability

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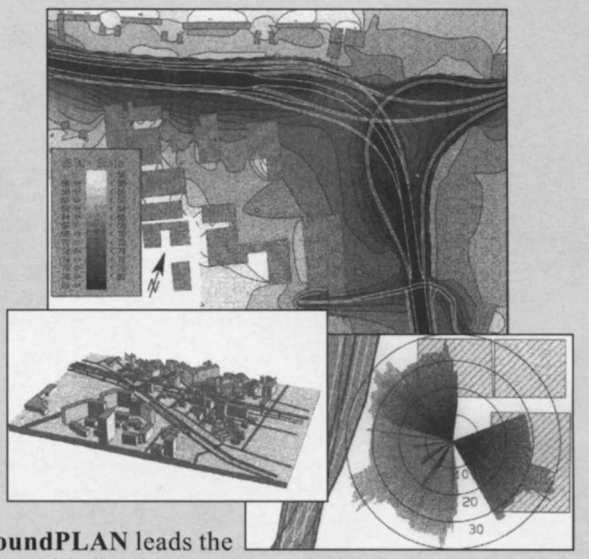

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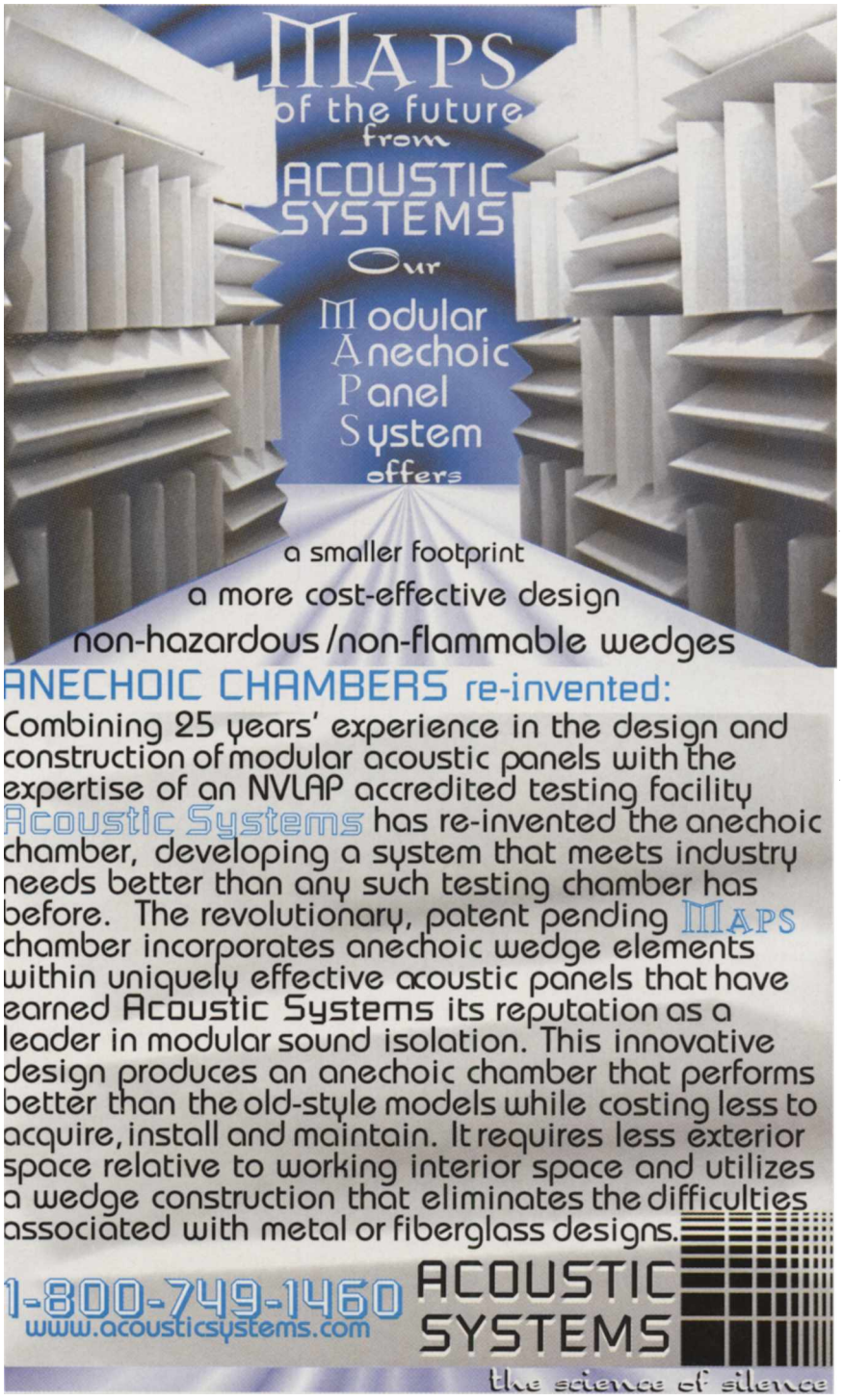
Reader Service Number 26

of our other industrial accelerometers in a low profile, lightweight design for accessibility to monitoring points in confined areas.

SNAP, the new compact accelerometer is said to make it simpler and easier than ever to experience the benefits of multipoint PM programs. SNAP provides a vibration output sensitivity of 100 mV/g over a broad frequency of 1 to 10,000 Hz (±10%) and provides long term stability in an operating range of -50 to 80 deg. C, making it well suited for numerous applications.

For additional information about Wilcoxon products and services, please call Lynn Lyons at Wilcoxon Research, 21 Firstfield Road, Gaithersburg, MD 20878. Telephone: +1 800 WILCOXON or +1 301 216 3019; FAX: +1 301 330 8873. **Circle Reader Service Number 59.**



Reader Service Number 20

PCB Introduces the Model 356A18 1V/g Triaxial Accelerometer and the Model 357A10 Charge Mode Accelerometer. PCB Piezotronics Inc. has announced the Model 356A18 Triaxial Accelerometer. This new accelerometer incorporates three high-resolution shear sensing elements inside a 0.80 inch, lightweight aluminum cube weighing 24 grams. It provides a 1 V/g sensitivity over a frequency range of 1 to 3000 Hz (±5%) with a phase response of (±5%) from 2 to 3000 Hz. Built-in, ultra low-noise microelectronics, when coupled with appropriate signal conditioning, provide a low-impedance voltage signal compatible with most readout, recording, and analysis equipment.

With its high sensitivity and a broadband resolution of 0.00006 g peak, the Model 356A18 is specifically designed for measuring low-frequency, low-amplitude vibration signals. Typical applications include modal analysis and structural testing.

PCB Piezotronics, Inc. has also the Model 357A10, a 0.5 gram, ceramic charge mode accelerometer designed for vibration measurements on ultra-light structures. This sensor is used extensively on components where mounting area is limited and mass loading is a consideration. Model 357A10 is low profile 0.14 inch (3.5 mm), with a sensitivity of 1.8 pC/g and a frequency response to 13,000 Hz, and operates to 350 deg.F (177 deg.C). For structural integrity, the top protective covering is rigidly attached for long-term use while ground isolation prevents unwanted ground loops. Also available with built-in microelectronics is the 10 mV/g, Model 352B22.

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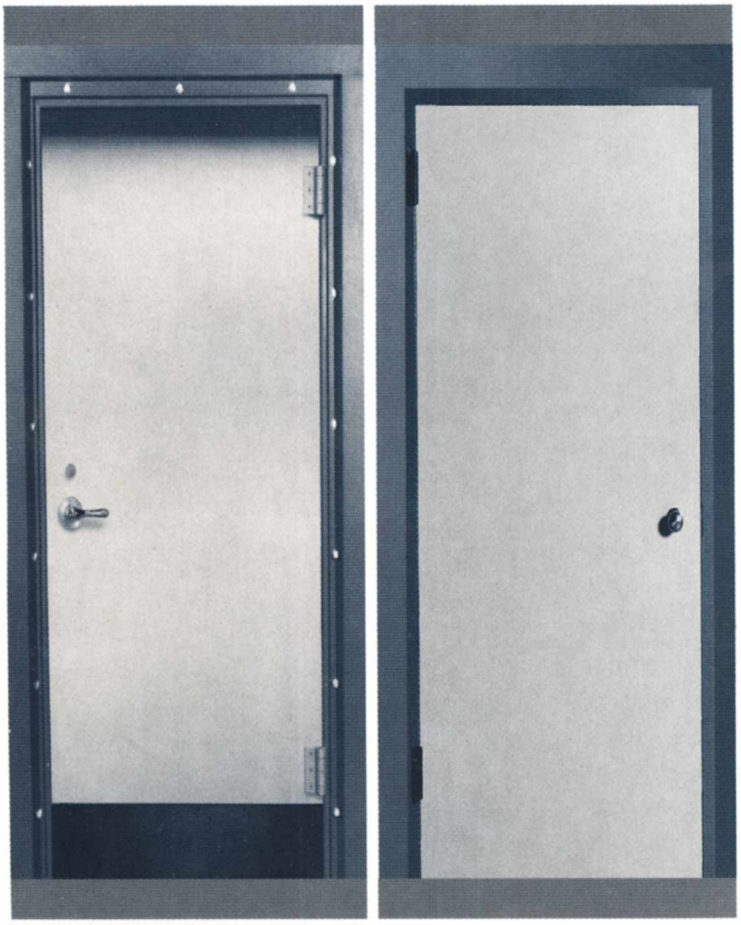

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World Conference Calendar

This calendar includes major conferences which feature programs on noise and its control. The working language of each conference will be English, unless otherwise noted. This calendar does *not* include seminars, short courses, workshops and other small, specialized meetings which are listed elsewhere. The shaded entries in the calendar are conferences which are organized or sponsored by I-INCE or INCE/USA. Entries for this calendar are solicited from the I-INCE Member Societies and from other organizations. In order for a listing to appear in this calendar, information *must* be provided by the conference organizers concerning the sessions planned for the technical program that will be devoted to noise and its control. This is particularly important if the word *noise* does not appear in the name or theme of the conference. Send requests for listings of future meetings with required details to: World Conference Calendar, INCE/USA, P.O. Box 3206 Arlington Branch, Poughkeepsie, NY 12603, USA. FAX +1 914 473 9325.

1997 July 09-12
IUTAM Symposium On Statistical Energy Analysis, Southampton, U.K. Contact: F.J. Fahy, Univ. of Southampton, ISVR, Highfield, Southampton, SO17 1BJ, UK. Telephone: +44 703 592291; FAX: +44 703 593033.
e-mail: *fjf@isvr.soton.ac.uk*

1997 August 21-23
ACTIVE 97, The 1997 International Symposium on Active Control of Sound and Vibration, Budapest, Hungary. Contact: ACTIVE 97 Secretariat, OPAKFI, Fö u. 68, H-1027 Budapest, Hungary. Telephone/FAX: +36 1 202 0452.
e-mail: *A97.opa@mtesz.hu*
An International INCE Symposium

1997 August 25-27
INTER-NOISE 97, the 1997 International Congress on Noise Control Engineering, Budapest, Hungary. Contact: OPAKFI, H-1027 Budapest, Fo u. 68, Hungary. Telephone/FAX: +36 1 202 0452.
e-mail: *IN97.opa@mtesz.hu*

1997 September 01-04
International Modal Analysis Conference, Tokyo, Japan. Contact: N. Okubo, Dept. of Precision Mechanics, Chuo University, 1-13-27 Kasuga, Bunkyo-ku, Tokyo 112, Japan. FAX: +81 3 3817 1820.
e-mail: *jmac@okubo.mech.chuo-u.ac.jp*

1997 September 09-12
31st International Acoustical Conference, High Tatra, Slovakia. * Contact: E. Rajcan, Technical University Zvolen, 96053 Zvolen, Slovakia. FAX: +42 855 321 811.
e-mail: *31iac@tuzvo.sk*

1997 September 10-11
National Symposium on Acoustics, Visakhapatnam, India. * Contact: V. Bhujanga Rao, N.S.T.L., Visakhapatnam-27, India. Telephone: +91 558131; FAX: +91 559464.
e-mail: *drnstl@ren.nic.in*

1997 September 10-12
Euromech Colloquium on Biomechanics of Hearing, Stuttgart, Germany. Contact: W. Schiehlen, Institute B of Mechanics, Universitaet Stuttgart, 70550 Stuttgart, Germany.
e-mail: *wos@mechb.uni-stuttgart.de*

1997 September 14-17
Symposium on Time-Frequency and Wavelet Analysis, ASME Biennial Conference on Mechanical Vibration and Noise, Sacramento, California, USA. Contact: D. Newland, Engineering Dept., University of Cambridge, Trumpington St., Cambridge CB2 1PZ, England. Telephone: +44 1223 332617; FAX: +44 1223 332677.
e-mail: *den@eng.cam.ac.uk*

1997 September 17-19
New Zealand Acoustical Society Biannual Conference, Christchurch, New Zealand.* Contact: Secretary, N.Z. Acoustical Society, P.O. Box 1181, Auckland, New Zealand. FAX: +64 9 309 3540.

1997 October 08-10
Acoustics Week in Canada 1997, Windsor, Ontario, Canada.* Contact: R. Ramakrishnan, 1720 Meyerside Drive, Mississauga, Ontario L5T 1A3, Canada. FAX: +1 905 670 1698.

1997 October 27-29
N&V Global '97, International Noise and Vibration Conference and Workshop, Pretoria, South Africa. Contact: Conference Coordinator, N&V Global '97, P.O. Box 30536, Sunnyside 0132, South Africa. Telephone: +27 12 43 6625; FAX: +27 12 342 4151.
e-mail: *BEST-JH@LGI.ee.up.ac.za*

1997 November 19-21
WESTPRAC VI 97, The Sixth Western Pacific Acoustics Conference, Hong Kong.* Contact: S. Tang, Dept. of Building Services Engineering, The Hong Kong Polytechnic University, Hung Hum, Hong Kong. Telephone: +852 2766 5855; FAX: +852 2774 6146.
e-mail: *besktang@polyu.edu.hk*

1997 November 20-23
IOA Autumn Conference on Environmental Noise, Windermere, U.K. Contact: Institute of Acoustics, Agriculture House, 5 Holywell Hill, St. Albans, Herts AL1 1EU, U.K. FAX: +44 1727 850 553.
e-mail: *acoustics@clus1.ulcc.ac.uk*

1997 December 01-05
134th Meeting of the Acoustical Society of America, San Diego, California, USA.* Contact: Elaine Moran, Acoustical Society of America, 500 Sunnyside Blvd., Woodbury, NY 11797, USA. Telephone: +1 516 576 2360; FAX: +1 516 576 2377.

1997 December 15-18
5th International Congress on Sound and Vibration, Adelaide, Australia. Contact: Congress Secretariat, Dept. of Mechanical Engineering, University of Adelaide, 5005, Australia. Telephone: +61 8 303 5460; FAX: +61 8 303 4367.
e-mail: *icsv5@mecheng.adelaide.edu.au*

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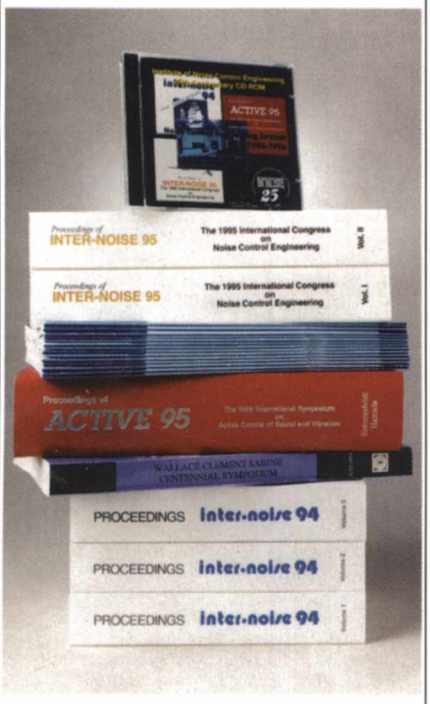

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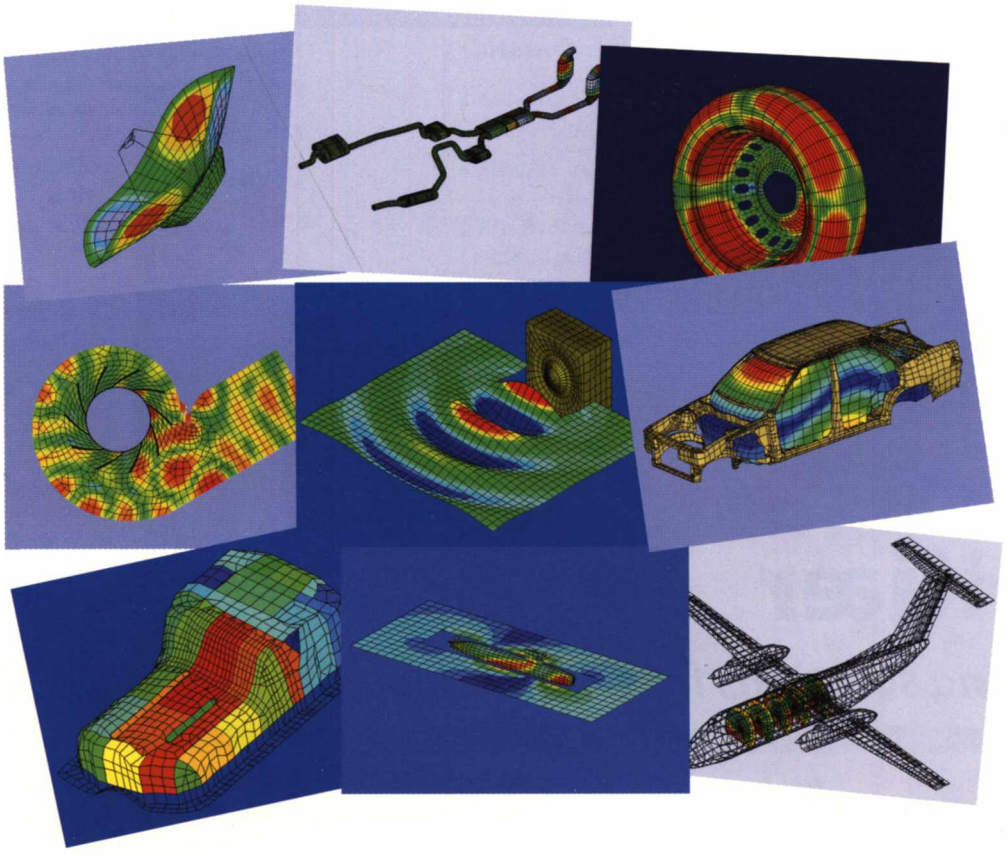

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