NOISE/NEWS INTERNATIONAL

Volume 11, Number 1
2003 March

A quarterly news magazine with an Internet supplement published by I-INCE and INCE/USA

NOISE-CON 2003
Conference is June in Cleveland

Noise Policy and Noise Research
The art of the possible

NNI Feature
Transportation Noise and Recreational Lands

Member Society Profile
Brazilian Acoustical Society


nor118
Real Time Octaves and Third Octaves
120 dB Dynamic Range
Reverberation Time Measurements
High Resolution Backlight Display
Huge Memory
Norsonic

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I-INCE

The International Institute of Noise Control Engineering (I-INCE) is a worldwide consortium of societies concerned with noise control and acoustics. I-INCE, chartered in Zürich, Switzerland, is the sponsor of the INTER-NOISE Series of International Congresses on Noise Control Engineering, and, with the Institute of Noise Control Engineering of the USA, publishes this quarterly magazine and its Internet supplement. I-INCE has an active program of technical initiatives, which are described in the Internet supplement to NNI. I-INCE currently has 46 Member Societies in 39 countries.

INCE/USA

The Institute of Noise Control Engineering of the USA (INCE/USA) is a non-profit professional organization incorporated in Washington, D.C., USA. The primary purpose of the Institute is to promote engineering solutions to environmental noise problems. INCE/USA publishes the technical journal, *Noise Control Engineering Journal*, and, with I-INCE publishes this quarterly magazine and its Internet supplement. INCE/USA sponsors the NOISE-CON series of national conferences on noise control engineering and the INTER-NOISE Congress when it is held in North America. INCE/USA Members are professionals in the field of noise control engineering, and many offer consulting services in noise control. Any persons interested in noise control may become an Associate of INCE/USA and receive both this magazine and *Noise Control Engineering Journal.*

NNI Internet Supplement

www.noisenewsinternational.net

- Links to the home pages of I-INCE and INCE/USA
- Abstracts of feature articles in the printed version
- Directory of the Member Societies of I-INCE with links, where available, to the Member Society Profiles and home pages
- Links to I-INCE Technical Initiatives
- Calendar of meetings related to noise—worldwide
- Links, where available, to NNI advertisers
- Links to news related to the development of standards
- Link to an article "Surf the 'Net for News on Noise," which contains links to noise-related sites—worldwide

How Should Traffic Noise Be Evaluated?

Environmental noise from traffic is a widespread problem. Because of traffic growth, not the least of which is the inherent force of the private car, and limited economic resources available for abatement programs, it is a demanding process to reduce traffic noise and its effects. Progress is slow. It is, therefore, important that we use our resources in an optimum way to decrease the exposure, and that we decrease exposure so that it leads in the most effective way to a reduction in the adverse effects of noise.

How will the seriousness of the problem change? To get a grip on the situation, it is necessary to follow the development continuously, and to check the effectiveness of the investments in counteractions against noise. Are they cost-effective?

According to the EU's Sixth Environmental Program, the target is to achieve a reduction of the number of people regularly affected by long-term high levels of noise from an estimated 100 million people in Europe in the year 2000 by around 10% in the year 2010 and by around 20% by 2020.

Monitoring this progress demands observations with good accuracy. Considering the costs, measurement through a random sample performed in each country seems to be the only possible solution. A sample size on the order of 1000 gives a confidence interval of approximately 3% if the falling off (non-response) is negligible. That should be sufficient. The question is then which quantity to sample.

The first choice would be to sample the actual traffic noise levels indoors and/or outdoors at the most exposed facade. A disadvantage is that the costs of monitoring noise levels in dB through any combination of calculations and acoustic measurements are discouraging considering the necessary sample size for sufficient accuracy. But a still more severe objection is that the abatement actions undertaken may not be cost effective if the goal is to reduce the adverse effects of the traffic noise.

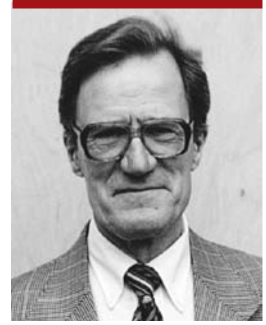
The setting of the goal in dB is based upon relations between dB levels and the effects of the noise. However, the dose/response relations show a large spread.

We need to consider how to reformulate the goal. A good example of a better goal formulation is the one done in Norway. The Norwegian Parliament has set the goal that the adverse effects of environmental noise should be decreased by 25% before 2010 compared with 1999.

The monitoring of the work to reduce traffic noise can then be based on a sampling of the response to questionnaires about the adverse effects—the same method that lies behind our dose/response relations upon which dB targets are based.

There are several advantages. The method is less costly than any sampling method to get sufficiently correct noise levels. The cost reduction is of the order of 100 times, and it means that we measure what we are interested in—fewer adverse effects. We will get direct information on the effectiveness of our method in improving public health. The effects of actual noise levels, actual influence of facade insulation and shields, actual effect of access to quietness, actual effects of more than one noise source, actual effect of the road surface, and the real traffic speed and distribution over time will be included.

A problem with the questionnaire method is that the falling off (the non-response) will be higher than for determinations of acoustic levels. This surely demands a substantial increase of the sampling size, but still the method will be much cheaper.



Tor Kihlman

President, International INCE

Noise Policy and Noise Research—The Art of the Possible...and of the Soluble

Bernard Berry

European Editor
I-INCE VP for Europe and Africa

Sir Peter Medawar FRS, the British Nobel Prize winning scientist, once said "If politics is the art of the possible, surely research is the art of the soluble."

His words seem apposite at this unusually exciting time, both in the development of noise policy at all levels—national, regional and global—and also in closely linked research activity.

At the national level in my own country, the relevant Government Department, DEFRA, (www.defra.gov.uk) has recently published responses from over 250 organizations and individuals to its comprehensive consultation process called Towards a National Ambient Noise Strategy, and is now taking the strategy forward.

More recently, DEFRA launched a parallel Neighbour Noise Strategy, allied with a number of research projects, including work on low frequency noise, leisure noise, and profiling the behaviors and attitudes of noise makers and noise suffererers.

At the European level, we have seen:

- the creation of a Noise Expert Network, whose mission is to assist the European Commission in the development of its noise policy
- the Directive on Environmental Noise, adopted as Directive 2002/49/EC by the European Parliament and Council in June 2002
- progress in the application of the Directive on Equipment Used Outdoors
- further development of existing EU legislation relating to sources of noise, such as motor vehicles, aircraft, and railway rolling stock

Along with these policy developments, we have seen provision of financial support to different noise-related studies and research projects, including:

- adaptation and revision of the noise computation methods in the Directive on Environmental Noise
- dose effect relations for transportation noise and sleep disturbance—published by TNO in January 2003
- HARMONOISE: Harmonised Accurate and Reliable Methods for the EU Directive on the Assessment and Management of Environmental Noise
- RANCH: Road traffic and Aircraft Noise exposure and Children's cognition and Health
- CALM network: Community noise research strategy plan
- Railway Noise: a study to evaluate the applicability of the draft prEN ISO 3095 standard for measurement of exterior railway noise emission in relation to possible future European legislation on type testing or classification of rail vehicles
- SILVIA: Sustainable Road Surfaces for Traffic Noise Control

Details of all of these ongoing policy and research developments are on the EU Europa website at: http://europa.eu.int/comm/environment/noise/home.htm

Looking ahead, we have in recent months seen the launch of the EU's ambitious 6th Framework Progamme for 2002-2006 [FP6], which focuses research on "Integrating and Strengthening the European Research Area" but has an important dimension of wider international cooperation through the INCO programme.

The thematic areas, with great potential for multi-disciplinary projects, with noise aspects as a part, include:

- sustainable development, global change, and ecosystems
- citizens and governance in a knowledge-based society
- aeronautics and space

Details are at www.cordis.lu/fp6.

At the international level, I-INCE has the potential to be a key player on this developing stage, with active Technical Study Groups (TSGs) in a number of key areas, including TSG #5 "Noise as a Global Policy Issue." The status of work in the TSGs was summarized by Gilles Daigle in his overview paper to INTER-NOISE 2002 in Dearborn and in the December issue of this magazine. It can also be seen at www.i-ince.org.

One of our next opportunities to take an active part in this complex but rewarding process will be in May at EURO-NOISE 2003 in Naples, Italy, where Gilles Paque from the European Commission will give one of the keynote lectures on "The EU Environmental Noise Policy: An Integrated Approach."

One of my colleagues on the Executive Board of I-INCE, Jean Tourret, is one of the "founding fathers" of the EURO-NOISE series. I am honored to be taking over from him the task of I-INCE Vice President for the region of Europe and Africa, whilst Jean has become a Distinguished Board Member.

I am delighted to have this opportunity to recognize his major contributions to I-INCE over the years and to wish him well.

I will leave the last words to the Greek philosopher Socrates who, in about 400 BC, said humbly, "I know nothing except my own ignorance."

So it's back to that research!

Available from the INCE/USA Page at the Atlas Bookstore

The INTER-NOISE 2002 Proceedings on CD-ROM.
This CD also contains the Proceedings of SQS 2002.

The NOISE-CON 2001 Proceedings on CD-ROM.
This CD also contains ALL of the NOISE-CON Proceedings beginning in 1996 as well as the SQS 98 Proceedings.

The INTER-NOISE 99 Proceedings on CD-ROM.
This CD also contains the Proceedings of ACTIVE 99.

Noise and Vibration Control—Edited by Leo L. Beranek.
This classic text on noise and vibration control is very widely used throughout the world. The book is divided into three parts: the basics of noise control (including measurement methods, acoustical materials, and sound propagation), application of these principles to reducing noise from sources, and criteria for noise control.

Noise Control in Buildings—Edited by Cyril M. Harris.
Noise Control in Buildings features contributions by leading authorities on noise control, and contains a very complete set of data on the properties of acoustical materials and on the sound insulation of walls and floor/ceiling constructions. This wealth of technical information provides an invaluable resource for the professional as well as the non-professional.

http://www.atlasbooks.com/marktplc/00726.htm

The Brazilian Acoustical Society (SOBRAC)

Sociedade Brasileira de Acústica (SOBRAC) was founded on 1984 November 21 in a historic meeting of 35 founding members. However, several technical meetings and activities had occurred long before this date, involving various groups—including universities, research institutes, consultancies, manufacturers, noise and vibration product suppliers, and equipment manufacturers.

By 2003, SOBRAC had 700 members, including 517 individual, 98 student, and two life members (including one international member). SOBRAC is also supported by 85 organizations from industry. In accordance with SOBRAC by-laws, the elected board of directors serves a three-year term.

SOBRAC's first president was Professor Jules Slama from the Federal University of Rio de Janeiro (1984-1985) and, in 2002, Professor Samir N. Y. Gerges was elected for three years—from 2003 to 2005.

SOBRAC's main objective is to help diffuse information on acoustics and vibration among researchers, manufacturers, consultants, and users. This is carried out during regular annual meetings, symposia, and SOBRAC publications. SOBRAC publishes a biannual technical journal, *Revista de Acústica e Vibrações*, which covers the major fields in noise and vibration. About 100 pages are published in each issue. One thousand copies are distributed to society members in Brazil, and to other acoustical societies in South America, Portugal, and Spain. This journal has a free yellow pages section for organizations and company members. SOBRAC has a web-site at www.sobrac.ufsc.br where all information and activity details can be found.

This is the 41st in a series of articles on the Member Societies of International INCE. This is an update of the profile that appeared in the 1994 December issue of this magazine.—Ed.

SOBRAC is a member of several international organizations: I-INCE (International Institute of Noise Control Engineering) since 1985; ICA (International Commission of Acoustics); IIAV (International Institute of Acoustics and Vibration; and FIA (Federação Iberoamericana de Acústica). SOBRAC has an observer at ICA, EAA, IIAV, and also at I-INCE.

SOBRAC played an active role in the elaboration of the Brazilian "Law of Silence" in 1990, the "Vehicle Noise Law" in 1993, and Noise Labeling in 2000. SOBRAC has representatives in the Brazilian Institute of Standards and in other societies related to safety in the workplace, acoustic comfort, and phonoaudiology.

SOBRAC has several active groups: the Vehicle Noise Group, which has held a symposium every other year since 1991 in Sao Paulo; the Building Acoustics Group, which holds a joint meeting with the Thermal & Ergonomic Groups of other societies; and the Hearing Conservation Group, which works with safety medical officer groups of other societies such as those of audiologists, safety officers, and industrial medical officers.

SOBRAC has held annual meetings since 1980 in Sao Paulo, Rio de Janeiro, Santa Maria, Belo Horizonte, and Florianopolis. The most recent meeting was held in Rio de Janeiro from 2002 October 22 to 24. This congress was organized by SOBRAC members from the National Institute of Metrology in Acoustics (INMETRO) and attracted more than 400 participants and 12 manufacturers' exhibitions.

SOBRAC has played a leading role in the creation of the Federação Iberoamericana de Acústica (FIA), a federation of the acoustical societies of Argentina (AdAA), Brazil (SOBRAC), Chile (SoChA), Mexico (IMA), Peru (SoPeA), and Spain (SEA). FIA's first president was Professor Samir N. Y. Gerges, who presided up to 2002. In 2002 December, FIA organized its third meeting jointly with ASA and IMA in Cancun, Mexico, with over 1200 participants and 1100 papers.

It is our pleasure to cordially invite you to participate in INTER-NOISE 2005, the 34th International Congress and Exposition on Noise Control Engineering to be held in Rio de Janeiro, Brazil, on 2005 August 06-10.

Transportation Noise and Recreational Lands

Nicholas P. Miller, Harris Miller Miller & Hanson Inc.
Burlington, Massachusetts 01803, USA

Introduction

An active and widely distributed transportation system is virtually a requirement for and a hallmark of countries that have a vigorous economy. One of the products of such a system is noise, and it is most certainly true that the prevalent type of noise experienced by the populations of these countries is the noise produced by transportation vehicles. A further result is that the sounds of transportation vehicles can be heard almost everywhere. The question addressed in this paper is: Do these countries that value and use multiple types of transportation vehicles and systems also wish to preserve opportunities for their populations to experience natural outdoor environments that are essentially free of human produced sounds? The combination of technical complexities and political challenge may make such a preservation goal unachievable.

The transportation system in the U.S. creates noise, and, since the 1970s, analysis and mitigation of this noise where people live has become a routine part of the transportation planning process. This analysis generally focuses on specific projects for specific transportation modes. It is, in the author's experience, rare that a systems approach has been applied to examine multi-modal tradeoffs in transportation performance and environmental effects. The focused analyses aid in limiting the most significant effects of noise in the immediate vicinity of the source, and feasibility considerations always play a role in determining the area over which noise effects are examined and mitigated. The result is that there has been little or no real attention given by the acoustics community in the U.S. to the summed effects of all sources of noise over wide areas of the country.

This is not to say that there are not many professional individuals and organizations worldwide that are concerned with a broader perspective of the "soundscape." This broader perspective may address the quantifiable effects of all noise sources on people living in built environments (see, for example, [1], [2], [3]), on developing a coordinated approach to use of noise indicators and assessment methods for examining environmental noise [4], on the qualitative values and effects of the soundscape [5], or on soundscapes in national parks [6]. These types of professional efforts are significant and necessary if we are to develop an understanding of the relationship of the sound environment to human health and well being, and if the soundscapes are to be managed to preserve or improve the quality of life.

This paper suggests yet another perspective on soundscapes. The complexity and extent of the modern transportation system, and the ways in which that system is planned, modified, and expanded, mean that, in the U.S., there is little attention given to the countrywide extent of its influence on the acoustic environment or soundscapes across the country. Further, if the extent of the acoustical influence of the transportation system were better understood, there might be, on one hand, more emphasis on total system acoustical design and,

Nicholas P. Miller

President, Harris Miller Miller & Hanson Inc.

Mr. Miller started his work in environmental acoustics in 1970 at the University of North Dakota, completing a Master's thesis based on scale modeling of sound propagation in urban canyons. In 1973, he began working at Bolt Beranek and Newman Inc. in highway noise and regulatory acoustics. He worked with the U.S. Environmental Protection Agency, the Federal Highway Administration, and several state agencies analyzing, developing, and implementing noise control laws and regulations. He also worked extensively on highway traffic noise problems, conducting measurements, and analyses for state departments of transportation.

He also assisted in providing litigation support for issues related to noise annoyance and noise takings. He began aviation noise work by first measuring, modeling, and assessing the noise of aircraft ground operations, then moved into full analysis of flight operations for the State of Maryland, for other airports, and for the Navy. Helping to found Harris Miller Miller & Hanson Inc. in 1981, he devoted full time to aviation noise. He has since worked on most aspects of aviation noise and vibration, from assessing the effects of aircraft noise on building vibration, to environmental studies of new or lengthened runways, to computer model validation and refinement, to quantifying the effects of aircraft overflights on national parks. He is the current president of HMMH and divides his time among business development, company management, and consulting projects.

on the other, the public perception of the value of managing and preserving natural soundscapes might be altered.

The goals of this paper are to:
1. Estimate the geographic extent of transportation noise in the U.S.
2. Raise the question: What is the importance to society of seeking to manage natural soundscapes for restoration and preservation?
3. Review some of the technical issues associated with managing and preserving natural soundscapes.
4. Recount some of the efforts to manage specific sources of sound in U.S. National Parks.
5. Raise the question: Can society achieve an equitable balance between competing perceptions of the value of natural soundscape management?

Geographic Extent of Transportation Noise in the U.S.

The method used here for estimating the geographic extent of transportation noise is based on separately examining the layout and noise "influence" of each of the three major transportation networks. These networks may be defined as: 1) highways, including primary limited access highways, primary roads, and secondary roads; 2) freight railway lines; and 3) commercial air carrier jet routes.

In order to generalize the noise "influence" of these three transportation systems for the U.S.[1], a simplified calculation method is used. The method used here is based on several assumptions.
1. All calculations are done county-by-county.
2. All calculations are for a typical daytime hour.
3. Population density is used to derive a "baseline" sound level.
4. This baseline level, produced primarily by the local vehicular transportation network, serves to determine the area in which the noise of the three major networks will be "noticed." A transportation source is assumed to be noticed when its A-weighted sound level equals the A-weighted background or baseline level [7].
5. The higher the baseline sound level, the smaller the area over which the transportation networks will be noticed, and conversely, the quieter the baseline, the greater the area over which the noise of the three networks is noticed.
6. "Influence" by the noise of each of the three networks is determined by:
   a. Determining the maximum distance from the transportation corridor at which the transportation noise source can be noticed.
   b. Multiplying this distance by the length of the corridor in the county, giving an area within which the noise of the particular transportation corridor can be noticed [8].
   c. Comparing the area in each county over which each of the three transportation networks can be noticed with the total area of the counties to compute the percent of each county in which each network can be noticed.
7. Nationwide, the degree of influence is depicted by categorizing the counties by the percent of land in which each transportation noise can be noticed.

In the U.S, there are federally approved mathematical models for computing the sound levels produced by any of these types of transportation [9]. For present purposes, however, the approach is to use only the source sound levels and propagation algorithms of these models to produce estimates of the maximum distance at which the source can be noticed [10].

Baseline Sound Levels

The baseline levels used to determine the maximum distances at which the various transportation types can be noticed are derived from a long-standing simple relationship between community sound level and population density. The relationship of day-night sound level, L_{dn}, to population density was investigated by the U.S. Environmental Protection Agency (EPA) in 1974 [11], and recently reconfirmed [12]. This relationship is:

$$L_{dn} = 22 + 10\log(\rho / \rho_0) \qquad (1)$$

where ρ is population density in people per square mile, and ρ_0 is 1 person per square mile. It is intended to estimate the day-night sound level due to general community activity, and assumes that no major highways or airports are affecting the sound environment.

The relationship of equation (1) was applied to the population densities of U.S. counties to produce Figure 1. As might be expected, higher sound levels are in the counties with significant urban/suburban populations. Because of the map size, some areas of high baseline sound levels, notably San Francisco and metropolitan New York, cannot be distinguished.

For determination of areas of noticeability, the comparison made is between the sound level of the specific transportation source (highway, rail, aircraft) and the "baseline" sound level derived from the levels given in Figure 1. The best representation of such a baseline level is assumed to be the daytime median sound level or L_{50}. Equation (1) yields L_{dn}, so this value must be transformed to L_{50}. Using information collected in 18 communities, [13] the following approximate relationship was derived.

$$L_{50} \approx L_{dn} - 5 \ \ dB \qquad (2)$$

Hence, for each of the transportation sources, the comparison is between the maximum sound level of the source and the baseline of L_{dn} – 5 dB. The distance from the transportation track to the point where the maximum level equals L_{dn} – 5 dB is the distance of noticeability.

[1] *For simplicity, this examination focuses on only the contiguous forty-eight states.*

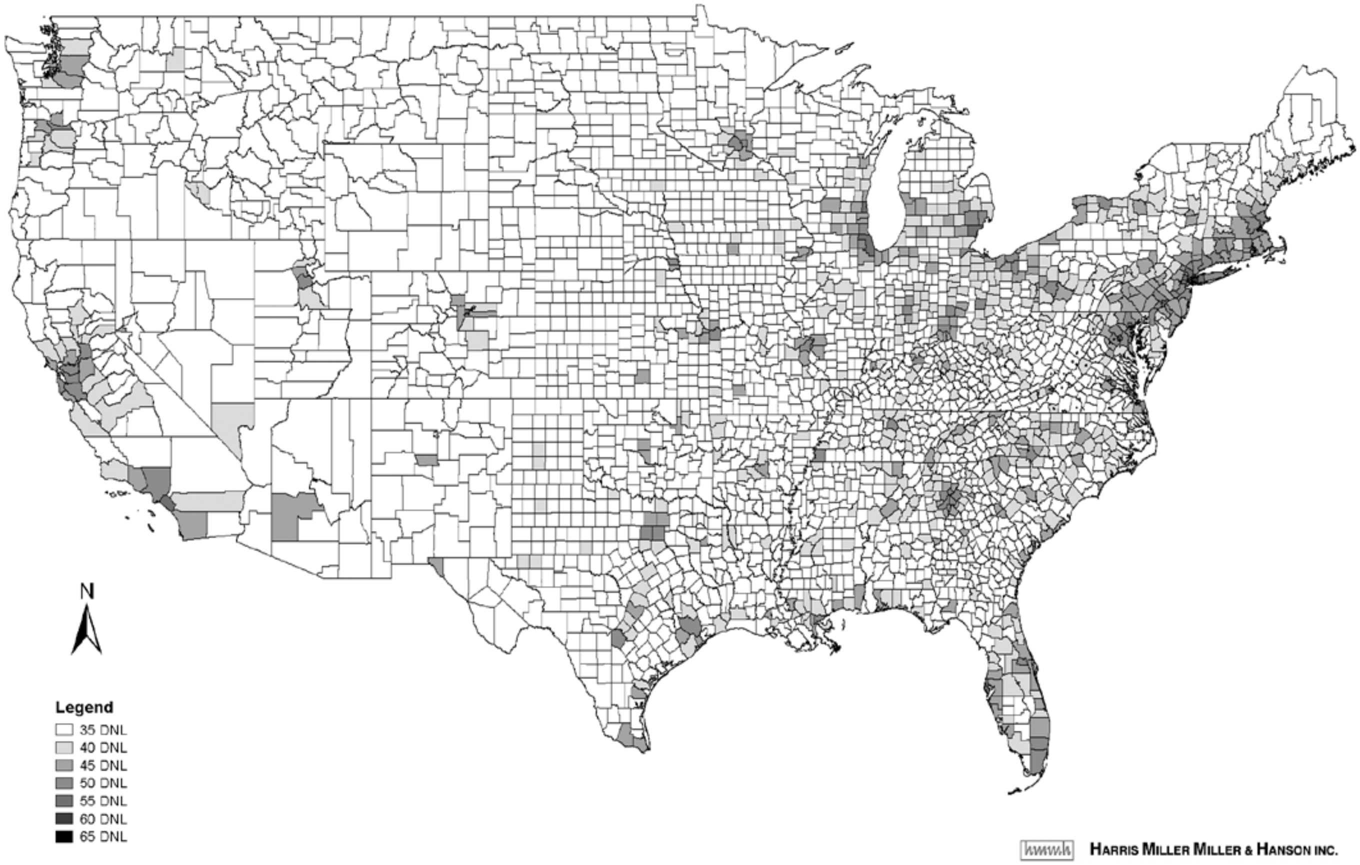


Fig. 1. DNL by County, Developed from Population Density, Equation (1)

Highways

Figure 2 shows the results of the noticeability calculations for highway traffic noise. The specific divisions that depict the percent of county area where the noise is noticeable were chosen assuming that the greater the estimate of noticeable area, the higher the likelihood that the estimates are inaccurate. As the area of noticeability increases, the greater the probability that individual noticeability areas from different transportation segments will overlap. Hence, the divisions increase in size, as the percentage increases.

The percentage of a county in which noise is noticeable depends upon two variables: 1) the number of transportation corridor segments in the county, and 2) the baseline sound level in the county. Thus, a county may have a low percentage of noticeable highway noise either because the baseline level is high or because there are few highways in the county.

Railways

Figure 3 shows the results of the noise influence calculations for railway noise.

Commercial Jet Routes

Figure 4 shows the results for high altitude jet routes. Unlike traffic on highways and railways, each jet follows a unique path. Though in some cases there are fairly distinct corridors, for much of the country the paths are quite dispersed.

The tracks used for the calculations of Figure 4 are shown in Figure 5. These are all jet departures that occurred between 3:00 p.m. and 4:00 p.m. on 2000 October 17, showing the full track to the first destination. Three to 4:00 p.m. was chosen as typical of the numbers of flights during the day, and should include most common routes.

There are a few areas of the country where the estimation method is probably inaccurate. For some locations, the method likely overstates the extent of the audibility of jet traffic. Those areas that have several flights following a relatively narrow corridor, as in parts of Nevada, are likely to have overestimates of areas. In areas that have both high baseline levels and airports, such as the Los Angeles, Dallas-Fort Worth, and Atlanta areas, the method is likely to underestimate the noticeability. For simplicity, all tracks are assumed to be at 30,000 feet, and hence there are no descent and climb portions so that these segments around airports have predicted sound levels that are lower than the actual levels. This combination of high baseline sound levels and aircraft sound levels which are too low probably results in under-estimation of the area affected.

Interest in Preservation of Natural Soundscapes

Can knowledge of the extent of transportation noise alter our perceptions of the value of preserving, restoring, and managing selected natural soundscapes? As we continue to strengthen our transportation systems, making them more effective in geographic reach, will recognition of the

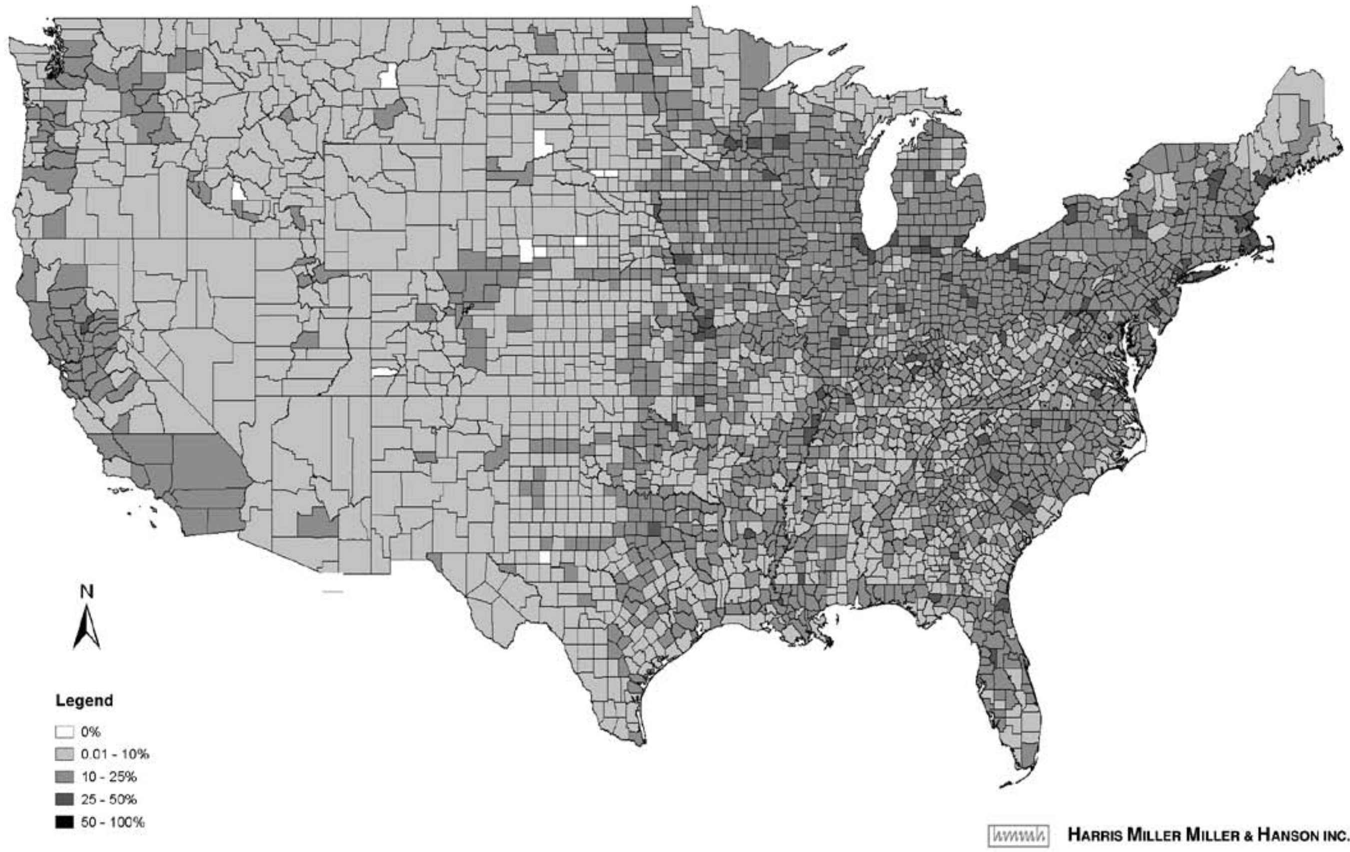


Fig. 2. Percentages of County Areas in which Highway Traffic Noise is Noticeable During the Day

nationwide spread of the associated noise alter how the public (and our government) views the value of managing to preserve areas where natural soundscapes can be experienced? Will it matter if there are no locations in the U.S. where one can sit for an hour and hear only the sounds produced by the natural environment?

It can be said that there is currently no national consensus on the value of natural soundscapes. On one hand, the U.S. Congress (supported by various interest groups) and various federal agencies have traditionally demonstrated a commitment to preserving natural settings, including the natural soundscapes. On the other hand, some businesses that provide motorized park activities, such as snowmobile rides or air tours, and their associated user/interest groups are concerned that preservation of natural soundscapes will prevent the businesses from meeting park visitor needs and make these recreational activities unavailable to those who want them.

U.S. public lands are designated through acts of the U.S. Congress. These acts identify the purposes to be served by the specific land or type of land, and several types of public lands carry the mandate of preserving, restoring, and providing for an experience of the natural soundscape. National Parks can be established for many different purposes, but overall, the National Park Service (NPS) was created primarily to preserve the resources of National Parks [14], [15]. Though NPS management policy has identified the importance of preserving natural sounds, the Director of the National Park Service recently issued Director's Order #47, which states that:

"The purpose of this Director's Order is to articulate the National Park Service operational policies that will require, to the fullest extent practicable, the protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources [6]."

The Wilderness Act of 1964 [16] established a process to identify specific areas as "wilderness." Each area would be an "area of undeveloped Federal land retaining its primeval character and influence … which 1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; and 2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation…."

The Wild and Scenic Rivers Act of 1968 [17] also established a study process to identify and protect free-flowing rivers. Two relevant management objectives for the system are: 1) provide recreationists with the opportunity to experience a river setting similar to that seen by the first explorers; and 2) ensure that the rivers retain an essentially wild and pristine nature [18].

Figure 6 shows federal areas of the continental U.S. that might be the subject of soundscape management; these are National Parks, National Seashores, Wild and Scenic

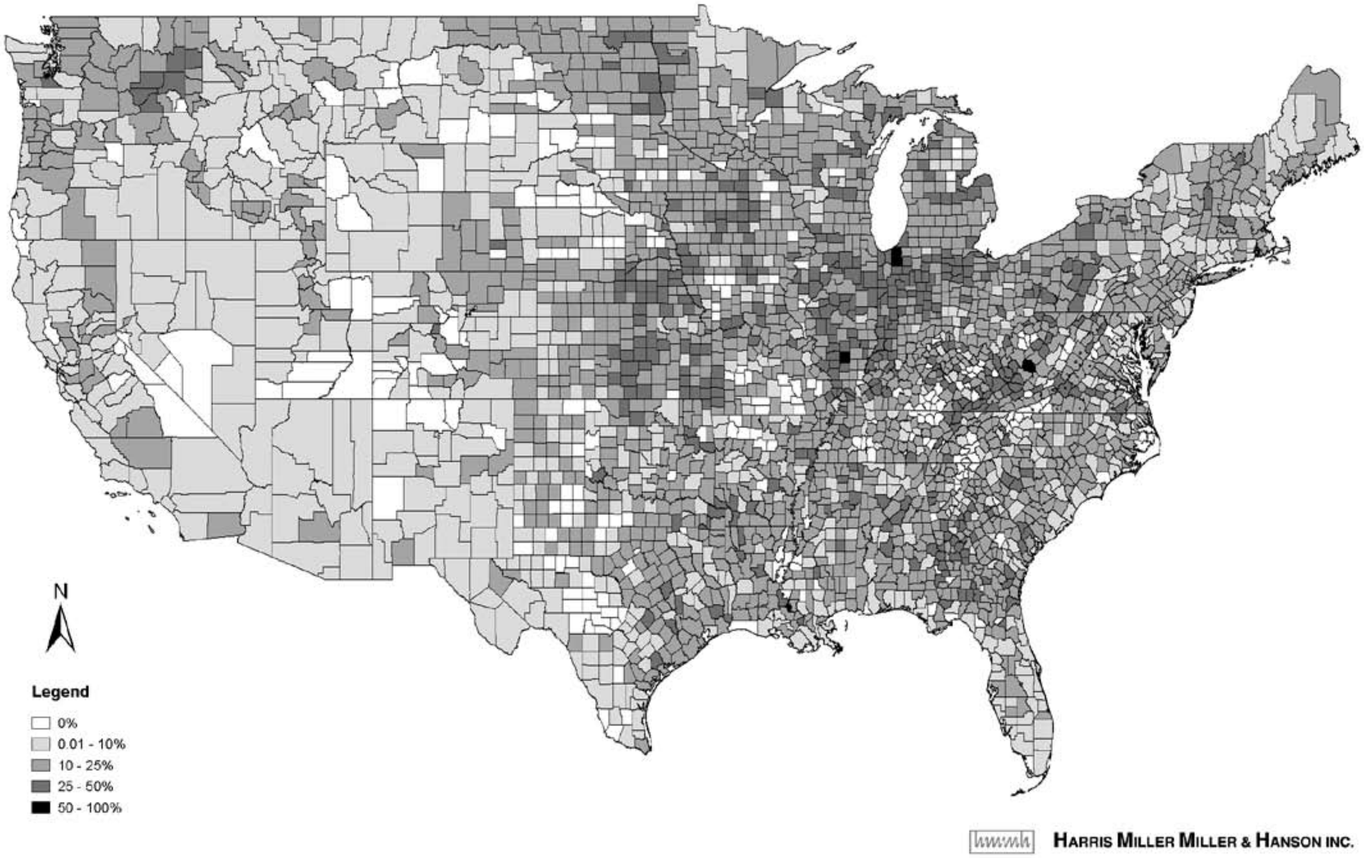


Fig. 3. Percentages of County Areas in which Rail Traffic Noise is Noticeable During the Day

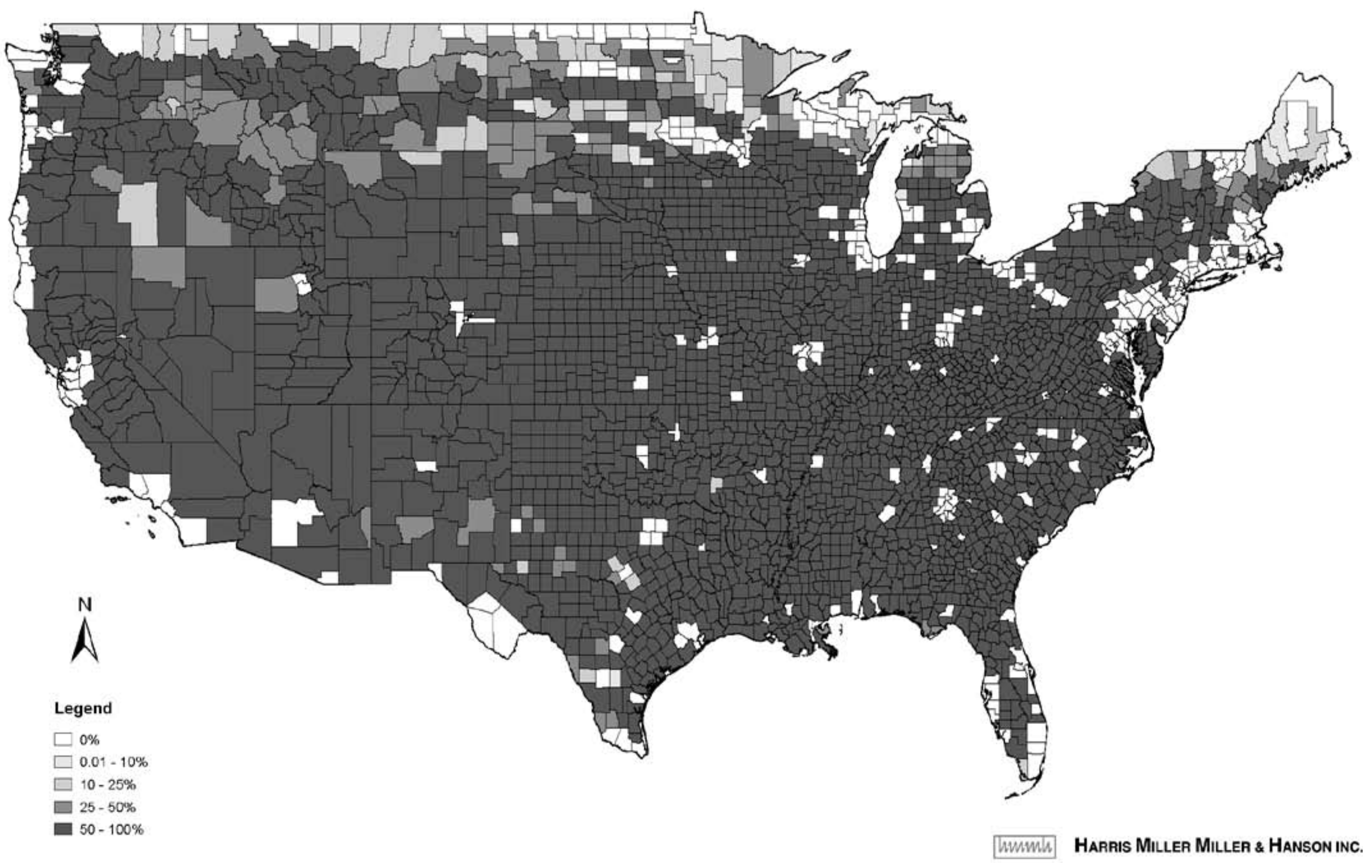


Fig. 4. Percentages of County Areas in which Jet Traffic Noise is Noticeable During the Day

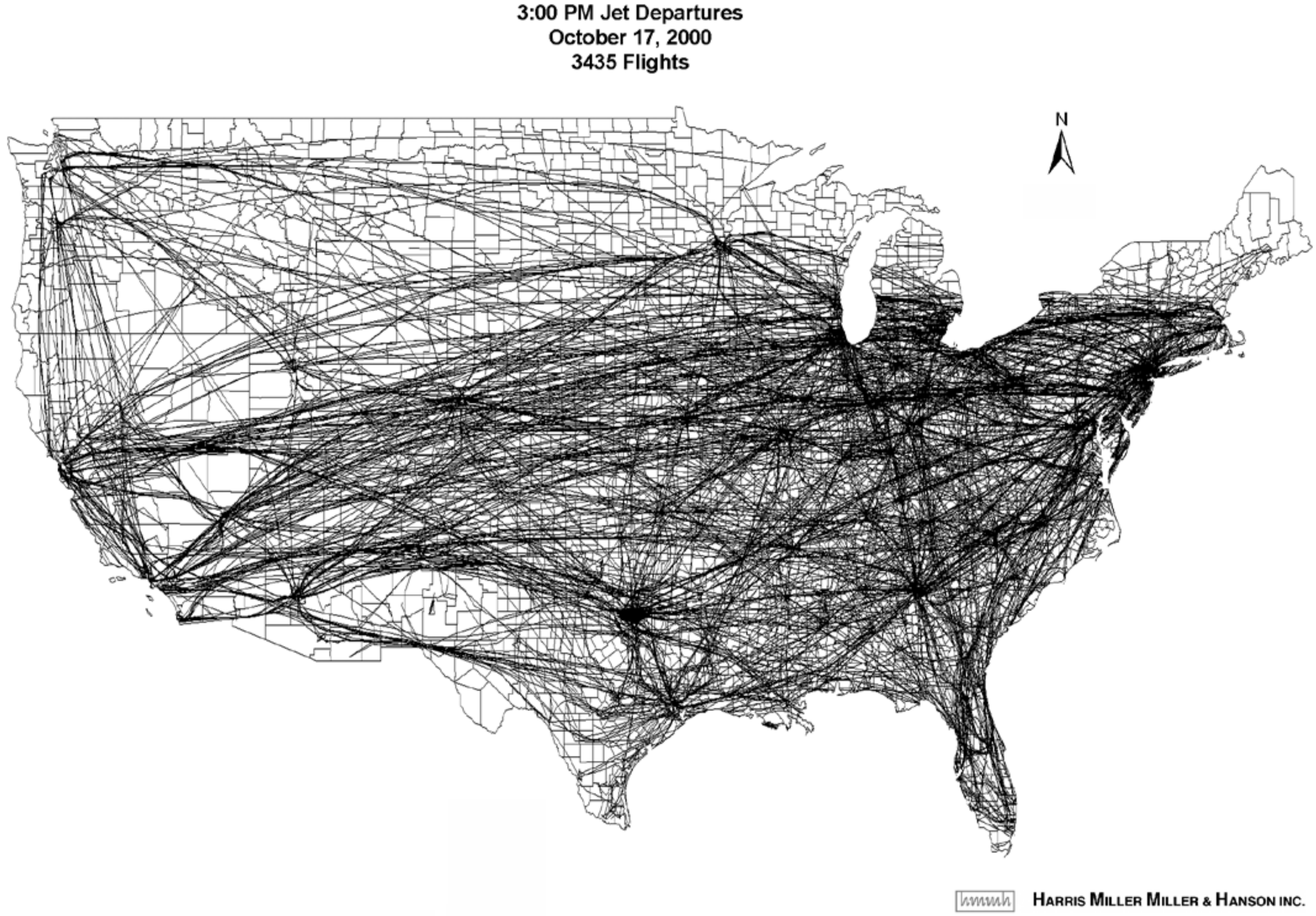


Fig. 5. Jet Flight Tracks Used To Compute Noticeability Areas, Fig. 4.

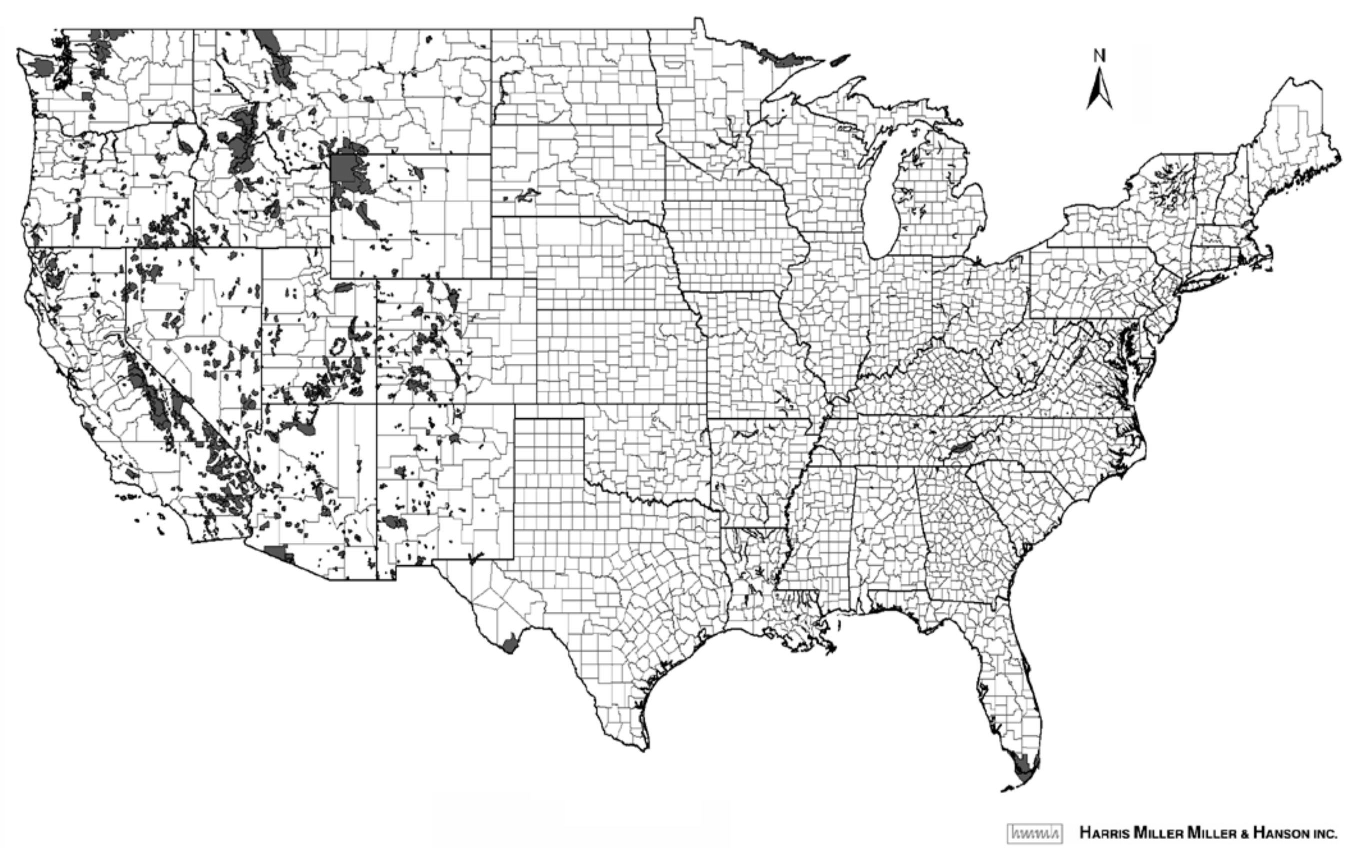


Fig. 6. Federal Lands that Might Be Considered for Soundscape Management

Rivers, designated Wildernesses, and areas designated as potentially wilderness. These areas account for about 3% of the 48 states.

These different public lands have been established for various reasons, most of which are preservation, and the NPS has specifically identified natural soundscape preservation as a management objective for national parks. Users of these public lands and associated interest groups, however, can have a wide range of expectations that may or may not include experiencing the outdoors in a natural state. The popularity of snow machine use in Yellowstone, the use of personal water craft in parks or recreation areas such as Glen Canyon National Recreation Area, and the many passengers on air tours over Grand Canyon National Park and over the Hawaiian parks suggest that many visitors seek experiences other than witnessing natural settings free of the effects of "man's work."

The validity of such park experiences is not in question here, but these experiences conflict with another view of the purpose of parks expressed by Joseph Sax [19]. In this view, parks are to provide the opportunity for members of the public to experience nature on its own terms. Visitors should be able to temporarily leave behind their to-do lists, their pursuit of objectives, even if recreational, to discover what they themselves are like when surrounded by the natural environment. Clearly, to provide opportunities for both this type of experience and for the more active motorized recreational experiences (bus, air and car tours, power boats, snowmobiles, etc.), management of park soundscapes is required.

Some Technical Issues Related to Management of Natural Soundscapes

Managing natural soundscapes requires some means for identifying the presence (or absence) of both natural and human-produced sounds in a way that provides useful information for making decisions about whether management goals are being met. Some special characteristics of parklands mean that characterizing the soundscape and judging the effects of human-produced sounds raise difficult technical issues.

Characterizing the Natural Soundscape

What to Measure. Some would argue that natural soundscapes cannot be described quantitatively [20]. In the broadest sense, this perspective is true. What really matters is what the environment sounds like, not what the numbers are that quantify it. However, it is the author's opinion that in order to manage soundscapes effectively and efficiently, some sort of quantification is necessary. Quantification helps identify long-term trends and enables the prediction of future conditions. It also permits development of verifiable goals—goals that can be monitored for achievement. Whether the objective is to eliminate intrusions or to limit intrusions, such goals will be very difficult to set or test without quantification. The challenge is finding metrics that make sense to decision-makers and that will give them confidence that decisions based on the metric values will yield the expected results.

If quantification is necessary, then what metrics should be used and how will they be measured or estimated? Additionally, how can the natural sounds be separated from the intruding sounds? One possible approach, consistent with most current practice in acoustics, is with the use of sound levels. Figure 7 shows a one-hour sample of one second A-weighted sound levels measured in White Sands National Park. In this figure, the periods when aircraft flew over the site are clearly visible in the sound level time history. The maximum A-weighted sound levels are 65 dB to 70 dB. An observer was present for the hour, logging the periods when each different source was audible. The bars across the top of the figure at 100 dB, 90 dB, 80 dB and 70 dB identify the periods when the sources of Aircraft Overflights, Distant Aircraft, Road Vehicles, and No Human Sounds were audible to the observer. The overflights were audible for 21% of the time and, disregarding all other sounds, produced an hourly equivalent A-weighted sound level of 53 dB.

What is less obvious from the time varying sound level is the almost continuous presence of road vehicle sounds. The observer logs show that road vehicles were audible 61% of the time. Even though for most of the time the sound levels were low (15 dB to 25 dB), this is clearly an hour when the natural soundscape (Background) was rarely solely audible—only 10% of the time. For comparison, the "Background" or natural hourly equivalent A-weighted sound level was 24 dB, and was computed by assuming the sound levels that were measured when no human sounds were audible were present throughout the hour.

Figure 8 shows a second hour of data collected at the same site when no aircraft flew overhead. Even though the sound levels were slightly higher, there was

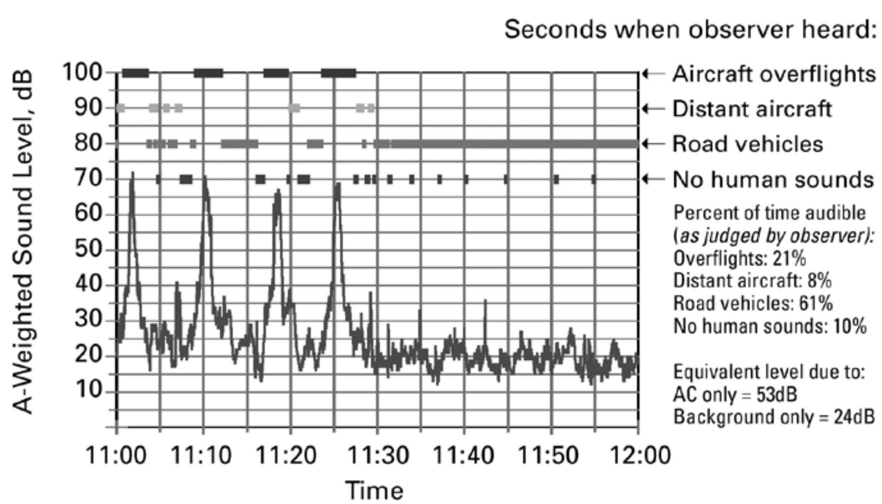


Fig. 7. One Hour of One-Second Sound Levels, White Sands National Park

considerable period, 57% of the time, when no human-produced sounds were audible; that is, the natural soundscape existed without intrusions for 57% of the hour.

These two figures show that determining the presence or absence of intrusions is either a labor-intensive process, requiring a full-time observer to identify sources, or one that requires more sophisticated methods than basic monitoring of the A-weighted sound level. One possibility for determining whether sounds are of natural or human origin is the monitoring of spectral data. Many sources have characteristic spectra, and it is these spectra that make a source audible to a listener. Figure 9 provides an example of the value of collecting spectral data.

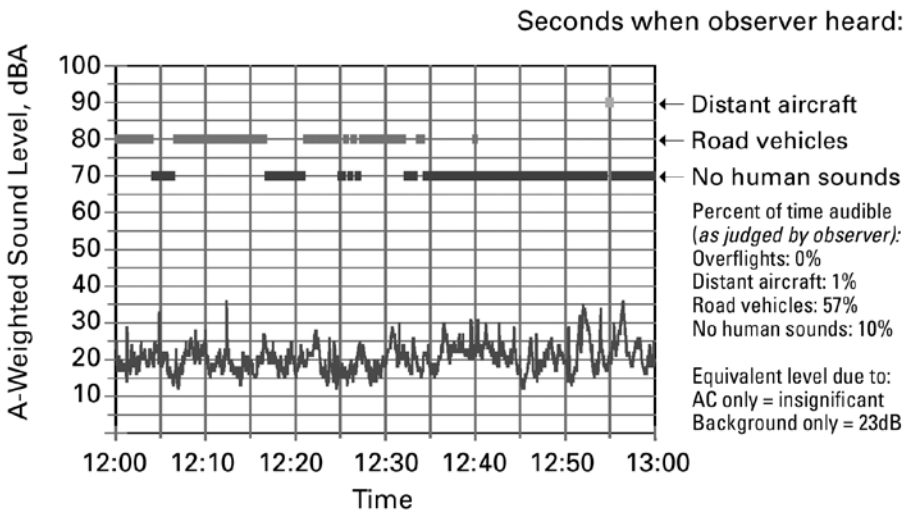


Fig. 8. Second One-Hour Sample of Sound Levels, White Sands National Park

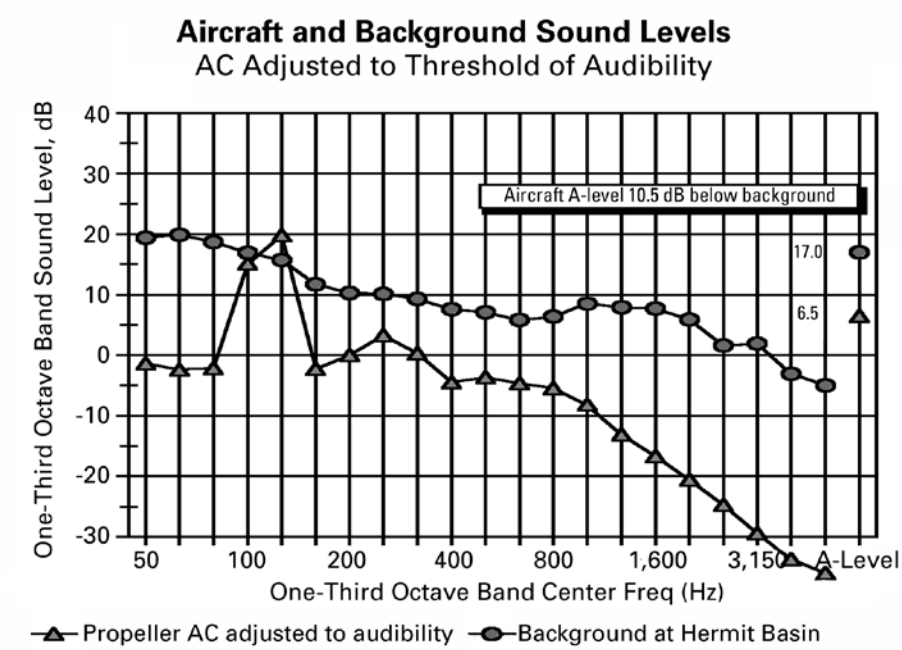


Fig. 9. Example of an Aircraft Spectrum Compared with Background at Threshold of Audibility

A source becomes audible to a listener when the sound levels in one or more narrow frequency bands (approximately one-third octave bands) approach or exceed the background sound levels in the same band or bands [21]. Figure 9 shows a hypothetical situation of a propeller aircraft spectrum overlaid on a Grand Canyon background spectrum at the level when the aircraft would just be detectable by an attentive listener. Though measurements of such a situation will naturally show only one level for each frequency band, it is possible through continuous time analysis to identify increases in specific bands that indicate the approach of an intruding source of sound.

Figure 9 also identifies an important consequence of using audibility of sounds as a metric. Audibility, as mentioned previously, depends upon frequency. A-weighted levels lose the frequency information and result in a single number. Figure 9 shows the A-weighted sound level of the background to be 17.0 dB and the A-weighted level of the aircraft to be 6.5 dB. Thus, in this example, the intruding sound of the aircraft is just audible when the A-weighted level of the aircraft is 10.5 dB lower than the level of the background. Thus, though it may be confusing, it is nevertheless correct to say that an intrusion can be audible when it is 10 dB quieter than the background sound level—if the levels are A-weighted.

One additional complicating factor related to choosing appropriate metrics of public land soundscapes is the relationship of the intruding sound to the sound levels that exist when no intrusive sound is present. Studies relating visitor response to the sounds of tour aircraft have shown that metrics that correlate best with human reaction are measures of the difference between the aircraft and background sounds [22], [23], [24], [25][2]. Typical correlated metrics can be a difference in decibels, such as the

[2] *For example, in one study of visitor response, 20 percent to 30 percent of the visitors surveyed at the most sensitive park locations reported being moderately to extremely annoyed by tour aircraft when the aircraft A-weighted equivalent level equaled the background equivalent level during the visitor's stay at the site. See [22] or [25].*

equivalent level of the intrusion minus the equivalent level of the background, or a measure of the duration of the intrusion, such as the percent of time the intrusion was audible. These metrics are quite different from the metrics commonly measured and computed for analysis of environmental noise and will require new methods and new understanding.

Where to Measure. Parks can be very large, containing thousands to millions of acres (Grand Canyon is about 1.2 million acres or about 4500 square kilometers), and there are over 300 units of the National Park system. Both within parks and from park to park, there are tremendous variations in geology, topography, vegetation, sensitive wildlife species, visitor activities, infrastructure or the lack of it, etc.

Large size complicates selection of acoustical data collection sites. The existing soundscape includes all natural and human-produced sounds in the park. Currently, the approach, yet to be fully validated, is to assume that parks contain multiple different "acoustic zones." It is assumed that areas having similar topography, foliage, wildlife habitats, and water drainage or flow conditions should have similar natural soundscapes. If a park can be divided *a priori* into different acoustic zones, then measurements made at a few or several locations within each zone would be sufficient to quantify the existing natural soundscape. Figure 10 shows how the Grand Canyon may be divided into zones likely to be related to types of natural soundscapes. Full statistical validation of this concept of acoustic zones is likely to occur only after long-term (months-long) monitoring has been completed in many park environments.

When and How Long to Measure. Different parks may have different periods of interest, depending upon the soundscape management objectives. Also, the periods of interest may be quite long, varying from several months to an entire year. Determining the periods of interest is a park management responsibility, and these determinations would presumably include consideration of what times/days/seasons the intrusions are judged to be present or are expected to be present, and what times/days/seasons are most sensitive to intrusions.

Once the time period or periods of interest are determined, the appropriate length for the measurement must be determined. Should the measurement be conducted continuously for each full period of interest, or is a limited time of measurement, say one or two weeks, sufficient? It is likely that initial measurements should be made for as much of the full time period of interest as possible, recognizing that available staff and equipment will limit the duration of the measurements. This large amount of data is necessary because, prior to measurements, the variability of the natural soundscape will be unknown. The measurements will be used not only to show what sound levels and sound sources were present, but how the sounds changed over time.

Figure 11 presents an example of the time variation of the A-weighted sound metrics,

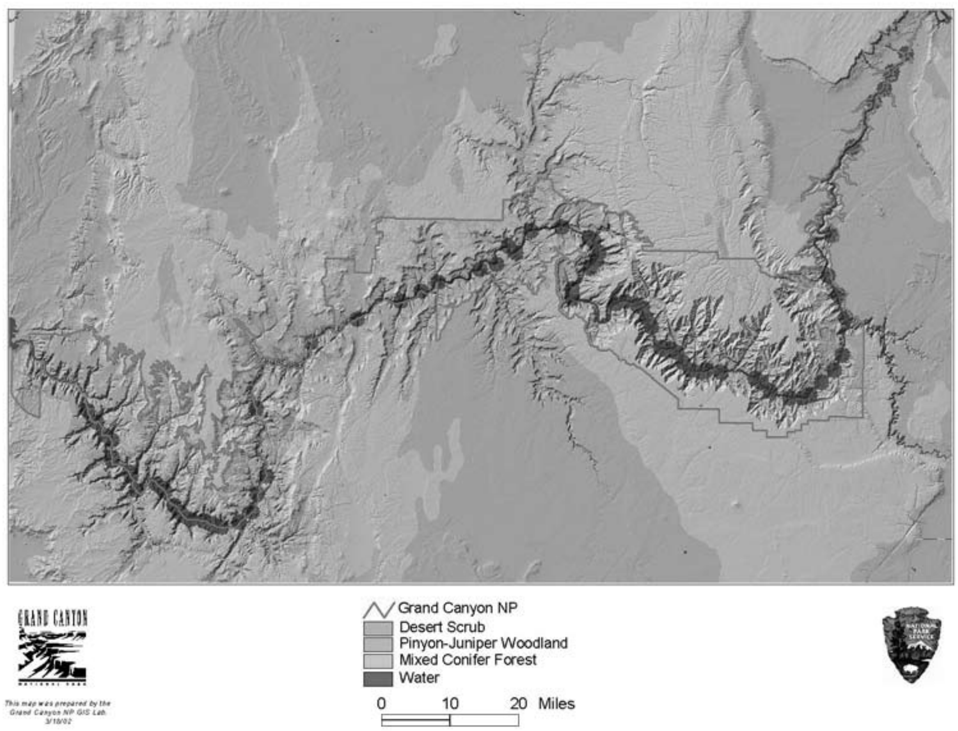


Figure 10. Division of Grand Canyon NP into Different Acoustic Zones

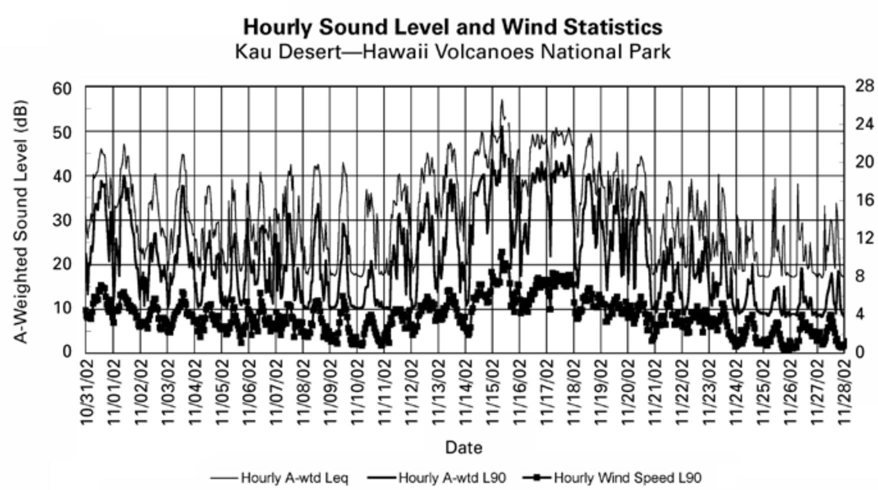


Fig. 11. Example Variation of Sound Metrics and Wind Speed with Time

hourly L_{90} and L_{eq}, and the 90th percentile wind speed, measured over a period of about one month in Volcanoes National Park in Hawaii. In this location and for this time period, one measurement of one or even two weeks would have yielded an incomplete assessment of the variability of the sound levels. Perhaps it is more appropriate to ask not "How long should measurements be?" but "What are the 'acoustic seasons' and how long do they last?" Simple statistical tests suggest that visual inspection of time histories, such as that of Figure 11, are adequate for determining periods of constancy and periods of change. The real challenge is identifying the sources of the sound levels and the causes of the changes. In this figure, wind appears to correlate closely with sound levels. Hence, in such locations, sound levels may be as consistent or as variable as is the wind.

Low Levels of Natural Soundscape

The natural soundscapes in parks can have sound levels that are very low in comparison with typical levels experienced in common living and working outdoor environments. Figure 12 depicts possible relationships of these various levels.

These low levels raise technical issues, while also making management of park soundscapes more difficult. Specific technical issues include selecting equipment and methods that will yield accurate results. Off-the-shelf acoustic instrumentation may have insufficient sensitivity to detect and record low sound levels accurately. Winds of even relatively low speeds can induce turbulent noise at microphone windscreens, resulting in spurious sound level data. Winds can also significantly alter the sounds generated by foliage and vegetation, thus requiring measurement methods capable of determining why sound levels have changed.

Finally, the low natural sound levels mean that very distant sources of sound may be audible. In most environmental noise analyses, the area over which the sound levels are of concern are generally confined to lie within a few hundred meters of, or at most within perhaps a kilometer of the source under investigation. Where natural background sounds commonly have A-weighted levels below 20 dB, however, a source such as a snowmobile may be audible at distances of 3 to 5 kilometers [26], and an aircraft may be audible as far away as 15 to 20 kilometers. If hearing an intrusion is considered an impact, then impacts may extend over very large areas, and mitigation of impacts could entail significant limitations on where, when, and how the intruding sources may be operated.

Judging the Effects of Intrusions

Resolution of the technical issues will take time and trial, and their solution will provide decision makers with, at best, some objective data on which to base judgments of the effects of intruding sounds. Non-natural sounds may alter not only the experiences of recreationists or visitors to parklands, but may also have adverse effects on wildlife and wildlife habitats. Intruding sounds can also adversely affect cultural and historic settings, or disrupt tribal religious ceremonies. In general, parkland management will need to develop policies that identify the appropriateness or inappropriateness of human-produced sounds in specific settings and locations during specific times. Some quantitative guidance may be derived from such tools as acoustical measurement results, visitor surveys, and wildlife research, but developing specific soundscape management policies will require considerable coordination among managers and, ultimately, agreement on what will be informed subjective judgments of appropriateness, if the policies are to be uniformly applied and be effective.

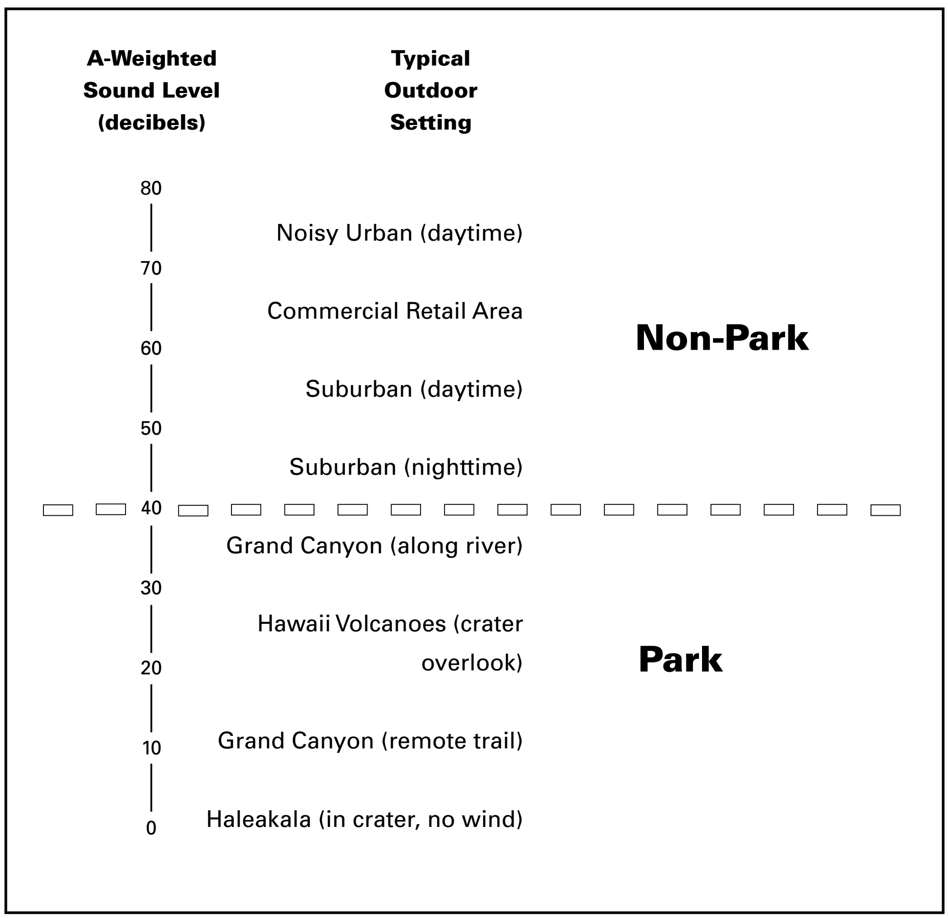


Fig. 12. Comparison of Various Common Outdoor A-Weighted Levels in Different Environments

Recent Efforts at Managing Natural Soundscapes

Three examples of on-going efforts to manage human-produced sounds in U.S. National Parks provide insights on the conflicts that appear to be inherent in soundscape management.

Air Tours

In 1987 August, Congress enacted the Overflights Act [27]. Section 3 of the Act states that "noise associated with aircraft overflights at the Grand Canyon National Park is causing a significant adverse effect on the natural quiet and experience of the park…." In this Act, Congress required the Secretary of Transportation, the Federal Aviation Administration, the Secretary of the Interior, and the National Park Service to work toward the goal of providing for "substantial restoration of the natural quiet" in the Grand Canyon. Former President Clinton, in an Earth Day memorandum, directed that the restoration of the natural quiet be achieved by 2008.

Reports, proposed rules, and notices were developed over the subsequent years. On 1996 December 31, the FAA issued a final rule and proposed two additional rules. The Final Rule adopted three NPS determinations: 1) the appropriate measure for quantifying aircraft noise was the percentage of time that aircraft are audible; 2) an aircraft was audible if it increased the ambient noise level by three decibels; and 3) the phrase "substantial restoration of the natural quiet" requires that 50% or more of the park achieve "natural quiet" (no aircraft audible) for 75-100 percent of the day. It also established new and modified existing flight free zones, established new and modified existing flight corridors, instituted flight curfews, set caps on the number of aircraft that can fly in the park, and established reporting requirements. The two proposed rules were: 1) to establish new and modify existing flight routes and 2) to require operators to use quieter (and larger) aircraft.

In 1997 November, litigation regarding the Final Rule addressed differing concerns. The Air Tour Coalition argued that the Rule was too restrictive in its meaning of "natural quiet" and in what should be used to determine quiet and visitors' disturbance. Clark County, Nevada, felt that the flight free zones were issued too soon; they should have been proposed in association with the new flight corridors and tour routes. The Hualapai Tribe also argued that the Final Rule was promoted too soon and that it failed to consider whether the establishment of expanded flight free zones would push aircraft noise off the Park and onto the Hualapai Reservation.

Since that time, the FAA has taken further steps to enact the Rule. Each step that they have taken has been challenged either by those who criticize that the Park Service is going too far (the air tour industry) or is moving too slowly (environmentalists).

> *Former President Clinton, in an Earth Day memorandum, directed that the restoration of the natural quiet be achieved by 2008.*

Snowmobiles

The Park Service Organic Act of 1916 established the National Park Service and stated that parks should be maintained "unimpaired for the enjoyment of future generations[14]." In 1997 May, a group of environmental organizations sued the NPS over the Winter Use Plans at Yellowstone and Grand Teton National Parks, specifically over the use of snowmobiles. They felt the NPS was "putting tourists ahead of the natural beauty." They stated that the NPS failed to conduct adequate analysis under the National Environmental Policy Act (NEPA), and failed to take into account how the grooming of trails would affect endangered species and wildlife. As part of the settlement, the NPS was required to consult with the EPA to regulate snowmobile emissions, with OSHA to look into excessive carbon monoxide emissions for park staff, and with the NTSB to study accidents involving snowmobiles. The Park Service selected Alternative B from the draft Environmental Impact Statement (EIS)—which would allow public shuttle buses, instead of snowmobiles, to use the west entrance. However, snowmobiles would be allowed to use other trails.

In response to the draft EIS, the Bluewater Network, an association of organizations that want to preserve the natural quiet, petitioned the NPS to consider a total ban on snowmobiles in order to protect "wilderness, natural sounds and solitude." In response to this action, a Final EIS (FEIS) was published in 2000 October, and Alternative G—the elimination of recreational snowmobile use by 2003/2004 and the initiation of snowcoaches for winter use—was selected by the NPS.

In response to the findings of the FEIS, the International Snowmobile Manufacturers Association, along with the State of Wyoming, the Wyoming State Snowmobile Association, and the Blue Ribbon Coalition, an organization of manufacturers of recreational vehicles and individual recreationists, sued the Secretary of the Interior to maintain the use of snowmobiles on public lands. A Supplemental EIS was produced as result of the litigation. In 2002 November, the Bush Administration proposed a cap on number of snowmobiles entering Yellowstone, based on the highest use days, and a gradual transition to quiet technology. This proposed plan is likely to be challenged through legal action by environmental groups.

Personal Water Craft

The National Park Service began examining the use of personal watercraft (pwc) in the parks in 1996. In 1997, the Bluewater Network, along with over 65 environmental and recreational groups and over 6,000 individuals, petitioned the NPS to create strong regulations. On 2000 March 21, the NPS published a regulation in the Federal Register, which banned personal watercraft in 66 of the 87 national parks. The remaining 21 parks were given two years to work with the public in deciding on pwc use in their parks.

In 2001 April, after further litigation by the Bluewater Network, the NPS agreed to do full environmental assessments under the National Environmental Policy Act. If the analyses were not done by the deadlines, 2002 April, for 13 parks and 2002 September, for eight, the parks were to be closed to pwc use until the rules were issued.

The Personal Watercraft Industry Association (PWIA) attempted to intervene in the lawsuit, but was denied the opportunity because the court felt that the rulemaking process required by the settlement allowed for public comment. The PWIA would be able to comment at that time. The PWIA believes that the industry has made great advances in pwc technology since 1998. According to the PWIA website (www.pwia.org/), "Today's personal watercraft are 75% cleaner and as much as 70% quieter."

Can Natural Soundscapes be Preserved?

It has long been recognized that portions of the nation's natural heritage should be preserved, and the extent of transportation noise throughout the U.S. emphasizes the importance and difficulty of this preservation as applied to natural soundscapes. Yet, several current attempts to preserve/restore natural soundscapes in National Parks are being strongly resisted through both political and legal means. From an acoustical perspective, the technical complexities of characterizing and assessing natural soundscapes are significant and open many opportunities for dispute. This combination of significant resistance and significant complexity suggests that development of a uniform, feasible, effective soundscape management approach will at best be extremely difficult and time consuming.

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7. As used here, "notice" has a specific definition based on signal detection theory and associated laboratory and field developed data that relates human detection of "target" sounds masked by background "noise." [See for example, Green, D.M. and J.A. Swets, "Signal Detection Theory and Psychophysics," Peninsula Publishing, 1988.] This theory and the derived calculations have shown that, for broad-band sources such as jet aircraft or road traffic vehicles, human detection of these in the presence of typical human-activity influenced background noise occurs when the source in terms of A-weighted levels, is about 5 to 10 dB below the A-weighted level of the background noise. [See Miller, N.P. "A-weighted Level Differences Compared with Detectability" in April 25, 1997 memorandum to W. Henry, National Park Service, published in "Review of Scientific Basis for Change in Noise Impact Assessment Method Used at Grand Canyon National Park," National Park Service, DOI, January 2000.] Further, laboratory experiments have demonstrated that people engaged in a specific activity demanding concentration are about 10 dB less likely to identify an intruding sound than when they are intent on listening for the sound. [See Potter R.C. *et al.*, "Detectability of Audible Warning Devices on Emergency Vehicles," Bolt Beranek and Newman Inc. Report No. 3333, July 1976.] This result is interpreted here to mean that noise from a transportation corridor is noticeable when its maximum level is approximately equal to or greater than the background sound level, in A-weighted terms.
8. Because there are multiple corridor "segments" within each county, a method was needed to sum the areas of noticeability for all segments without double counting overlapping areas. The method used was to first compute the area lying within the "noticeability" width for each corridor segment located within the county. By assuming these segments are randomly distributed throughout the county, the overlap of the areas of noticeability were computed statistically then subtracted from the total area of noticeability for all segments in the county. This method will overestimate the area in which the corridor segments are noticeable to the extent that the segments are parallel and lie close to each other, and will underestimate the area of noticeability to the extent that the segments are parallel and widely separated.
9. Highway traffic noise is generally computed using the Federal Highway Administration's Traffic Noise Model, TNM, as described in Anderson, G.S., C.S.Y. Lee, G.G. Fleming, and C.W. Menge, "FHWA Traffic Noise Model, Version 1.0 User's Guide." Federal Highway Administration Report No. FHWA-PD-96-009, January 1998. Rail noise and vibration prediction methods and assessment are described in "Transit Noise and Vibration

Assessment," DOT-T-95-16, Federal Transit Administration, April 1995. Aircraft noise is computed for commercial aviation using the Federal Aviation Administration's program, the Integrated Noise Model, INM, described in "INM User's Guide," FAA-AEE-99-03 September 1999.

10. For each transportation network, the sound levels for the following sources were used to determine maximum distances of noticeability. The sound levels were taken from the methods described in endnote 9.
Highway
Primary, limited access roads–L_{max} for heavy truck at 65 mph, 86 dBA @ 50 ft.
Primary, unlimited access roads–L_{max} for medium truck at 50 mph, 79 dBA @ 50 ft.
Secondary roads–L_{max} for auto at 50 mph, 72 dBA @ 50 ft.
Rail
Diesel locomotive–L_{max} for 50 mph, 88 dBA @ 50 ft.
Aircraft
Boeing 737-400, SEL for level cruise, 30,000 MSL, converted to L_{max} using measured data of B727 departures, ~85 dBA@ 1000 ft..
11. U.S. Environmental Protection Agency, "Population Distribution of the United States as a Function of Outdoor Noise Level," Report 550/9-74-009, June 1974.
12. C. M. Stewart, W.A. Russell, G.A. Luz, "Can population density be used to determine ambient noise levels?", paper presented 137th Meeting Acoustical Society of America, Berlin, Germany, March 1999.
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23. N.P. Miller, *et al.*, "Mitigating the Effects of Military Aircraft Overflights on Recreational Users of Parks," USAF Report AFRL-HE-WP-TR-2000-0034, (or DTIC ADA379467 at http://www.ntis.gov/), July 1999.
24. Fleming, *et al.*, "Development of Noise Dose/Visitor Response Relationships for the National Parks Overflight Rule: Bryce Canyon National Park," DOT-VNTSC-FAA-98-6, July 1998.
25. N.P. Miller, "The effects of aircraft overflights on visitors to U.S. National Parks," *Noise Control Eng. J.* **47** (3), 1999 May-Jun, p 112.
26. Ross, J.C. and C.W. Menge, "Technical Report on Noise: Winter Use Plan Final Environmental Impact Statement," HMMH Report 295860.18, June 2001.
27. 16 U.S.C. 1a-1 note, Public Law No. 100-91.

NOISE-CON 2003

NOISE-CON 2003, the 2003 National Conference on Noise Control Engineering, will be held at the Renaissance Cleveland Hotel in Cleveland, Ohio, on 2003 June 23–25. The Institute of Noise Control Engineering of the USA (INCE/USA) is organizing the conference. It will be the 19th in a series of national conferences on noise control engineering, which have been held in the U.S. since 1973.

Conference overview

NOISE-CON 2003 will include more than 130 invited and contributed papers covering the entire spectrum of noise control engineering, three distinguished plenary lectures focusing on noise control and hearing conservation, a significant equipment exhibition, and a variety of opportunities for technical and social interactions with colleagues.

Industrial noise control, hearing conservation, noise control for the International Space Station, aeroacoustics, power plant noise, and classroom acoustics will receive special emphasis in the technical sessions.

The technical program of the conference will begin each day with a distinguished plenary speaker. John Franks, Kurt Yankaskas, and John Allen will be the plenary speakers. Special full-day technical session tracks have been scheduled on hearing conservation, power plant noise control, International Space Station acoustics, and aeroacoustics. There will also be a variety of sessions covering the entire range of noise control engineering, including measurement techniques and test facilities, community noise, sound quality, and active noise control. More specific information, including titles of accepted papers and authors, will be available on the NOISE-CON 2003 Web site at www.inceusa.org in early March.

Seminars

Two, two-day seminars will be offered following NOISE-CON 2003 on June 26 and 27. Seminar topics are Aeroacoustics: Theoretical, Computational, and Experimental Aspects *(led by Jerry Lauchle, Phil Morris, Dennis McLaughlin, and Lyle Long)* and Low-Noise Product Design *(led by David Nelson and Jeff Schmitt).*

Registration

A conference registration form is available online at www.inceusa.org. The registration fee for NOISE-CON 2003 covers conference materials, attendance at all sessions, attendance at the exhibition, refreshment breaks, Monday and Tuesday evening receptions, and a copy of the proceedings on CD-ROM. The general registration fee does not cover post-conference seminars.

The advance registration fee for NOISE-CON 2003 is USD 350 for INCE members and USD 400 for non-members. Deadline for early registration is 2003 June 1. After this date, registration fees will increase by USD 50. Registration confirmation will be sent upon receipt of your payment. Additional conference details will be sent with the confirmation.

On-site registration will be available at the higher rate. Registration hours are

Sunday, June 22, 3 p.m.–6 p.m.
Monday, June 23, 7:30 a.m.–4:30 p.m.
Tuesday, June 24, 8 a.m.–4:30 p.m.
Wednesday, June 25, 8 a.m.–12 noon

Hotel reservation information

The following information is provided for your convenience. Hotel registrations will be accepted by phone at 1-800-HOTELS-1. You will be asked to identify the property. Also, to receive the special room rate, please mention that you will be attending NOISE-CON 2003.

Renaissance Cleveland Hotel
24 Public Square, Cleveland, Ohio
44113-2222

Rates (per night)

Single/Double Occupancy
USD 155 *(plus tax)*

Club Level Occupancy
USD 185 *(plus tax)*

Deluxe Suite
USD 350 *(plus tax)*

To ensure this rate, reservations must be received by 2003 May 19.

IMPORTANT—PLEASE READ

1. Reservations must be received by the date above.
2. Group rate and availability cannot be honored after the reservation deadline date above.
3. Reservations must be guaranteed with a major credit card

Check-in time: 4:00 p.m.
Check-out time: 12:00 noon

Please be sure that you mention NOISE-CON 2003 to obtain the special room rate above.

Equipment exhibition

A major exhibition of software, instruments, and materials for noise control will be held in conjunction with NOISE-CON 2003. Exhibit space is still available. To receive a floor plan and exhibitor application, please contact Richard J. Peppin, Exposition Manager, Scantek, Inc., 7060 #1 Oakland Mills Road, Columbia, MD 21046. Telephone: 410-290-7726; FAX 410-290-9167; e-mail: PeppinR@aol.com

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Industrial Acoustics Company
LMS North America
Overly Door Company
ViAcoustics
PPG Industries
Casella USA
Data Physics Corp.
Quest Technologies, Inc.
Golterman & Sabo, Inc.
Sage Technologies
MC, Inc./Precision Pier USA
PCB/Larson Davis
CYRO
Sound Fighter Systems, L.L.C.
National Instruments
International Cellulose Corp.
MBI Products Company, Inc.
MSC Engineered Materials & Solutions Group
TEAC America
Heim Data Systems, Inc.
Navcon Engineering Network
Acoustical Society of America Standards Secretariat
Concrete Solutions, Inc.
ESI Group & Vibro-Acoustic Sciences, Inc.
Oros-Noise & Vibration Solutions
Soundown Corporation
INCE Harris, Miller, Miller & Hanson (HMMH)
SAE International
Krieger Specialty Products
Multi Science Publishing

Social events

NOISE-CON 2003 includes two social events—a Monday evening reception in the exposition area and a Tuesday evening reception at Cleveland's most popular attraction, the Rock and Roll Hall of Fame.

Accompanying persons program

There will be a dedicated meeting room for accompanying persons to gather and discuss daily activities. Some of the possible activities include a luncheon cruise, a tour of nearby Amish country with a possible stop at the region's largest outlet mall, and a tour of Cleveland Museums.

There is real concern about the lack of support at all levels of government for research and education in acoustics in Australia.

AUSTRALIA

Future Directions for the AAS

The Council of the Australian Acoustical Society considers that 2003 is a watershed and that its future directions should be examined in a workshop discussion. One very important issue is to determine the reasons that membership of the Society is not growing at a rate comparable with the increase in acousticians working in Australia. One important part of this examination of the Society role is to hold a member survey to determine the services the members want and suggestions for attracting future members.

New Fellows of the AAS

The grade of Fellow has been awarded to four members: Colin Hansen, the University of Adelaide; Joseph Lai and Marion Burgess, the Australian Defence Force Academy; and Stephen Samuels, consultant.

New AAS Education Initiative

In 2002, the Society launched a new *education initiative* to assist in the teaching and promotion of acoustics. The winning entries were announced at the National Conference in Adelaide: Dr. Fergus Fricke, on behalf of the Acoustic and Audio Laboratory of the University of Sydney, was awarded 2,600 AUD for the purchase of ODEON software. Postgraduate research students, postgraduate course work students, and final year undergraduate engineering students will use the software. It is being used by the Acoustic and Audio Laboratory to generate data to train neural networks as well as to test theoretical models and for auralization work in acoustic simulations.

Marion Burgess and Joseph Lai, Acoustics and Vibration Unit, U.N.S.W., were awarded 2,400 AUD to identify the top 10 issues of concern to the acoustics community and ways of addressing the problems identified. There is real concern about the lack of support at all levels of government for research and education in acoustics in Australia. The project will enable the top issues of concern to be identified and assist with lobbying government.

The finalists in the inaugural *2002 Excellence in Acoustics Award* sponsored by CSR Bradford Insulation were announced at the Annual Conference of the Society in Adelaide and the winner will be announced at Wespac8 in Melbourne in April. The award aims to foster and reward excellence in acoustics, and entries are judged on demonstrated innovation from within any field of acoustics. The range of projects submitted show the diversity of acoustics. The topics included hearing protection software, use of neural networks for prediction of sound reduction performance, noise reduction for a test cell, noise control for bridge joints, sound absorption product, musical acoustics, and reverberation enhancement. The judging panel, two from the Society and two from CSR, were presented with quite a challenge to select the finalists.

The winner of the award, which is a prize to the value of 2,500 AUD, is the Musical Acoustics Group from the School of Physics, UNSW whose project is "Flute Acoustics: New Understanding And New Tools For Musicians." The team, led by Associate Professor Joe Wolfe, uses a novel technique for the measurement of acoustic transfer functions with high accuracy, dynamic range, and speed. These studies led to an expert system to rank all possible notes. A flexible "musician friendly" web service was then developed to provide the world's flutists and composers with easier, better ways of playing difficult passages and chords.

The second prize was awarded to RTA Road and Bridge Technology whose project is "Engineering Methods of Noise Control For Modular Bridge Expansion Joints." As vehicles travel over the joints, annoying environmental noise can be produced. The group investigated a number of methods for controlling this noise. They found that the use of a specially-designed Helmholtz absorber tuned to the dominant acoustic frequencies and installed in the void spaces of the bridge provided a reduction in the A-weighted level of 10 dB.

JAPAN

INCE/Japan Meeting

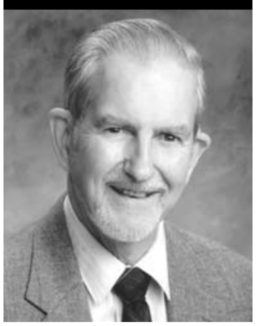
The 2003 spring meeting of INCE/Japan will be held on 2003 April 25 at Tokyo Institute of Technology. This will be the second meeting which is organized by study groups in INCE/JAPAN for recent topics on noise problems. The topics selected are as follows:

- Prediction of ground vibration generated by road traffic
- Outdoor sound propagation—the state of the art
- Sound insulation in dwellings
- Structure born noise of machines in residential buildings

In these sessions, special reports on individual topics will be presented by the leaders of study groups. Contributed papers related to the topics will be also presented.

The 2002 Internet Symposium

In 2002, the Japan Airport Environment Improvement Foundation sponsored an Internet Symposium on the effects of noise. Tetsuya Kaneko is the Net Manager of the Symposium, which was titled "Noise Annoyance, Stress, and Health Effects." The first stage dealt with annoyance and stress, and the second phase dealt with stress and the health effects of noise. A comment period was open until 2003 January 20. A special edition of the journal *Aviation Environment Research* is planned in which all of the papers and comments received will be published. The published papers can be found at www.netsympo.com/2002/, and can be downloaded as PDF files.



Louis C. Sutherland

INCE.Bd.Cert. and 1995 President of INCE/USA

Louis C. Sutherland Receives ASA Silver Medal in Noise

Louis C. Sutherland, INCE.Bd.Cert. and 1995 President of INCE/USA received the Silver Medal in Noise from the Acoustical Society of America. The medal was awarded at the Plenary Session of the Society on 2002 December 04 in Cancun, Mexico.

Lou graduated from the University of Washington with B.S. and M.S. degrees in electrical engineering, worked as a research engineer for the Boeing Company, and, in 1964, joined Wyle Laboratories where he worked for 25 years. He is currently serving as an acoustical consultant. He has made numerous contributions to noise control engineering—including the vibro-acoustic response of structures, sound propagation, sound absorption, community noise, and classroom acoustics. He has served as an editor of the *Journal of the Acoustical Society of America*, and as a trustee of the ASA Foundation. He is an Associate Fellow of the American Institute of Aeronautics and Astronautics, a Life Member of the Institute of Electrical and Electronics Engineers, and a Fellow of the Acoustical Society of America.

In receiving the Silver Medal, he was cited for contributions to the solution of community noise and aerospace problems, and for studies of classroom acoustics and molecular absorption.

SAE to Sponsor Noise and Vibration Conference

SAE International will hold its biennial noise and vibration conference at the Grand Traverse Resort in Traverse City, Michigan, USA on 2003 May 05-08. The technical topics to be covered include:

- Acoustical materials
- Body interior noise
- Squeak and rattle
- Off-road vehicle noise
- Drive-by noise
- Powertrain/engine noise
- Mounts and shock absorbers
- Brake noise
- Diesel engine noise
- Aeroacoustics
- Standards
- Subjective response
- Vibro-acoustic analysis
- SEA design
- Facilities and modeling

The luncheon speaker on May 08 will be Deane B. Jaeger, INCE.Bd.Cert., Harley-Davidson, Inc., who will speak on the acoustical history of Harley-Davidson.

More information on the conference can be obtained from the SAE web site, www.sae.org/calendar/nvc/, or by contacting Patti Kreh—e-mail: pkreh@sae.org.

The Access Board and Classroom Acoustics

Adapted from the 2002 September issue of Access Currents, a newsletter published by the Access Board. The Access Board is a governmental body that defines policy for disabled persons.—Ed.

An abiding goal of the Board's update of its ADA and ABA guidelines has been to harmonize its requirements with model building codes and industry standards, including the International Building Code (IBC). The IBC represents the successful partnership of three of the primary model code organizations in the U.S. in establishing a single model building code.

At a recent meeting, in addition to proposals based on its guidelines, the Board also proposed the addition of new criteria for classroom acoustics into the IBC. This proposal was based on a standard completed by the Acoustical Society of America (ASA) earlier this year that takes into account children with hearing loss. ASA developed the standard through a working group representing various interests and experts in the field. The standard was adopted under procedures of the American National Standards Institute (ANSI), a non-profit organization that coordinates voluntary consensus standards in the U.S. The approved standard, Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools (ANSI S12.60-2002), sets specific criteria for maximum background noise and reverberation.

The Board's proposal sought the incorporation of core provisions of the standard into the IBC. The proposal

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European News

Bernard Berry, European Editor

BELGIUM

On 2002 September 16-18, the Department of Mechanical Engineering of the Katholieke Universiteit Leuven in Belgium organized ISMA2002. It was the 27th edition in a series of two-yearly International Conferences on Noise and Vibration Engineering.

The conference was a success. Over 400 people from industry and from the academic world attended. Thanks to an excellent response to the call for papers, with 270 abstracts accepted, we were able to set up a first-rate technical program. The technical program included two keynote lectures, 10 tutorial lectures and about 270 technical papers scheduled into seven parallel tracks and five plenary poster sessions. Full CD-ROM conference proceedings were published.

The full program and the book of abstracts are available on the ISMA website www.isma-isaac.be/past_conf/isma2002/program.phtml

For more information on purchasing the full CD-ROM proceedings, please visit www.isma-isaac.be/publications.

EUROPEAN UNION

EU Issues Occupational Noise Directive

On 2003 February 06, the European Parliament issued Directive 2003/10/EC which sets minimum health and safety requirements for noise. The Directive sets the following three exposure limit values (decibel values re 20 µPa):

(a) exposure limit values: $L_{EX,8h}$ = 87 dB(A); p_{peak} = 200 Pa.

(b) upper exposure action values: $L_{EX,8h}$ = 85 dB(A); p_{peak} = 140 Pa.

(c) lower exposure action values: $L_{EX,8h}$ = 80 dB(A); p_{peak} = 112 Pa.

The decibel values are time-weighted average values over an eight-hour day. Under some circumstances, a weekly average may be used in place of a daily average. Peak values are in terms of the C-frequency weighted instantaneous noise pressure.

In meeting levels (a), the attenuation of hearing protectors worn by workers is to be taken into account; this is not allowed for levels (b) and (c).

It is the obligation of employers to assess the risk and, if necessary, to measure the noise exposure of workers. Where noise exposure exceeds the lower exposure action values, the employer must make hearing protectors available to workers; and if levels exceed the upper exposure action values, hearing protectors must be used.

If the upper exposure action values are exceeded, the employer must initiate a program to take technical or organizational measures to reduce the noise. Noise reduction measures include:

- adjustment of methods of working
- selection of low-noise products
- design and layout of workplaces and workstations
- training of workers
- use of shields, enclosures, and sound absorptive materials
- damping and isolation of noise
- maintenance programs for equipment in the workplace
- organization of work schedules to reduce noise

The Directive also requires that workers be given training vis-á-vis noise exposure, and gives workers the right to have their hearing checked to determine any early signs of loss of hearing.

The Directive was published in the Official Journal of the European Union on 2003 February 15, and went into effect on that date. The Directive requires a report to the Commission every five years on the practical implementation of the Directive. The full text of the Directive can be found at http://europa.eu.int/eur-lex/en/dat/2003/l_042/l_04220030215en00380044.pdf

UNITED KINGDOM

Phase 2 of Research Into Neighbor and Neighborhood Noise in England, Wales and Other Countries in the EU.

A team of researchers has been commissioned to undertake an in-depth national review of the management of Neighbor and Neighborhood noise on behalf of the Department for Environment, Food and Rural Affairs (DEFRA). The eight-month study builds on the earlier work that reviewed legislation and practice elsewhere in Europe, as reported to the UK Noise Forum in May 2002. (See www.defra.gov.uk/

continued on page 28

It is the obligation of employers to assess the risk and, if necessary, to measure the noise exposure of workers.

Pan-American News *continued from page 26*

was taken up for consideration at the most recent ICC hearing in September, but was not adopted due to concerns about compliance with specific technical specifications and associated costs. However, there was a strong consensus among interested parties to work with the ASA and the ANSI S12 Committee on Noise on resolving these issues.

A New Standard is Available from the Acoustical Society of America

A new Nationally Adopted International Standard (NAIS), developed by ANSI-Accredited Standards Committee S12, Noise, has just been published. The standard, Acoustics: Measurement of airborne noise emitted by information technology and telecommunications equipment, specifies methods for the measurement of airborne noise emitted by information technology and telecommunications equipment. Hitherto, a wide variety of methods have been applied by individual manufacturers and users to satisfy particular equipment or application needs. These diverse practices have, in many cases, made comparison of noise emission difficult. This Nationally Adopted International Standard simplifies such comparisons and is the basis for the declaration of the noise emission levels of information technology and telecommunications equipment.

This Standard is the National Adoption of ISO 7779: 1999 and its amendment ISO 7779: 1999/FDAM 1.

To purchase this Nationally Adopted International Standard or other Standards related to Acoustics, Mechanical Vibration and Shock, Bioacoustics, or Noise, please visit the Acoustical Society of America's home page at: http://asa.aip.org. The price of ANSI S12.10-2002 (ISO 7779:1999) is 150 USD per copy.

CAOHC Announces New Hearing Conservation Manual

The Council for Accreditation in Occupational Hearing Conservation (CAOHC) is pleased to announce that the Hearing Conservation Manual, 4th Edition, by Alice Suter, Ph.D., is off the press.

This manual is for those involved in hearing conservation—especially those complying with OSHA and MSHA regulations—including the "professional supervisor" (a physician, otologist, or audiologist) responsible for the audiometric evaluation portion for those working in industry and mining. This fourth edition is said to be easier to use, more comprehensive as a learning tool, and an excellent resource and reference book for daily work in preventing hearing loss. The author, Alice Suter, has again provided her extensive knowledge and experience in the field of hearing conservation in the writing of this manual.

This new edition includes the latest on OSHA's regulatory changes, MSHA's Noise Regulation 30 CFR Part 62, and among many new features are reference tables, guidelines for revision of baseline audiograms, updated photos and graphs, and three American National Standard Institute documents. The International Standard Book Number is 0-9723143-0-X; the manual can be ordered from CAOHC, 611 E. Wells Street, Milwaukee, WI 53202, USA. E-mail: info@cahhc.org; Internet: http://www.caohc.org. The 55 USD price for a single copy includes handling and shipping. Volume discounts are available for more than one copy.

A key element of the work is therefore consultation, and the researchers would welcome ideas from interested parties.

European News *continued from page 28*

environment/noise/euroreview/index.htm.)

Phase 2 of the research brings the focus firmly back to the UK and aims to provide DEFRA with realistic and practical options to improve the management of neighbor and neighborhood noise. The ideas from the rest of Europe uncovered in Phase 1 will be considered further along with the many new ideas and best practice already in use within the UK. It is recognized that the management of neighbor and neighborhood noise is complex and labor intensive; this study aims to delve deeply into some of the obstacles to improvement. A key element of the work is therefore consultation, and the researchers would welcome ideas from interested parties.

The study is being led by Steve Mitchell at Environmental Resources Management Ltd (ERM) with support from Bernard Berry of Berry Environmental Ltd., Nicole Porter (independent consultant), Colin Grimwood at the Building Research Establishment, Peter Carey of the London Borough of Camden, Tim Clarke of Bristol City Council, and Neil Baker of Clarke Willmott & Clarke.

INCE/USA

INCE/USA Elects 2003 Officers and New Directors

The annual meeting of the INCE/USA Board of Directors was held on 2003 February 1-2, and the annual meeting of INCE/USA was held on 2003 February 2 in Chicago, Illinois. The Board elected Joseph Cuschieri, Florida Atlantic University, as president-elect of the Institute. He will serve in 2003 as president-elect and executive vice president, and will serve as president in 2004. He was also elected a director to fill a vacancy on the Board. Rajendra Singh, Ohio State University, served as president-elect in 2002, and is now president of INCE/USA. Gordon L. Ebbitt, Carcoustics, USA, was elected vice president publications, and John C. Freytag of Charles M. Salter Associates was elected vice president public relations. Richard A. Kolano, Kolano & Saha Engineers, was elected vice president board certification, and David Towers, Harris Miller Miller and Hanson, Inc., was elected vice president membership. Gerald C. Laucle, Pennsylvania State University, was elected vice president technical activities. Daniel J. Kato, Cummins Power Generation, was elected secretary, and Steven E. Marshall, Bristol Compressor was elected treasurer. Paul Schomer, Schomer and Associates, continues as executive director, and George Maling is managing director emeritus.

At the annual meeting of INCE/USA, the results of the election of new directors by the voting members was accepted. Amanda Kachur of Albert Kahn Associates, Jeff G. Schmitt of JGS Consulting, and James K. Thompson of the Link Engineering Company were certified as directors elected by the voting members. At the meeting, Gordon Ebbitt of Carcoustics, USA was elected a director for a two-year term.

Key committee assignments are: Steven E. Roth, Roth Acoustical Associates, Long Range Planning; Paul R. Donavan, Illingworth & Rodkin, Inc., Finance Committee; Robert D. Hellweg, Nominations Committee; Gregory C. Tocci, Cavanaugh Tocci Associates, Policies and Procedures; Richard J. Peppin, Scantek, Inc., Meetings/Exhibits; and Arno S. Bommer, Collaboration in Science and Technology, Inc., Awards.

New Membership Initiative

INCE/USA has announced a new initiative to encourage individuals to become new Members or Associates of the Institute and enjoy the benefits of membership such as reduced registration fees at NOISE-CON and INTER-NOISE meetings held in the USA. INCE Members and Associates also receive the Institute's two publications—this magazine and the technical publication *Noise Control Engineering Journal* (NCEJ)—as well as the membership directory.

INCE/USA has established a special first-year discount. Individuals who become Associates or Members of INCE/USA between now and 2003 October will pay a first-year fee of USD 50—less than one-half of the regular annual fee. Non-U.S. residents also receive a reduction to 15 USD in the supplement that allows both this magazine and NCEJ to be sent from the USA by airmail.

To take advantage of this special offer, please use the membership application on pages 31-32 of this issue, or download an application from the INCE/USA web site, www.inceusa.org. Payment may be made by Visa or MasterCard.

INCE/USA has announced a new initiative to encourage individuals to become new Members or Associates of the Institute.

More Than 130 Papers Have Been Received for NOISE-CON 03

NOISE-CON 03, The 2003 National Conference on Noise Control Engineering, is being organized by the Institute of Noise Control Engineering of the USA (INCE/USA). More than 130 abstracts of papers proposed for presentation at the conference have been received. NOISE-CON 03 will be held on 2003 June 23-25 at the Renaissance Cleveland Hotel in Cleveland, Ohio, USA. Beth A. Cooper of the NASA Glenn Research Center in Cleveland is the General Chair of the conference and David K. Holger of the Iowa State University is the Technical Program Chair.

The number of abstracts received is the largest in the history of the NOISE-CON series, which began in 1973, and the papers to be presented will cover a wide variety of topics in noise control engineering:

- International Space Station acoustics, including requirements and test facilities
- NASA Glenn research on aeroacoustics and related jet noise papers
- Noise in computer systems, including requirements, the acoustics of personal computers, and component noise reduction
- United States noise policy
- Transportation noise, including multimodal models and assessment, noise barriers, tire-road noise interactions, aircraft noise, shipboard noise and surface transportation noise
- Acoustical facilities, design and testing

INCE Update *continued from page 29*

- Building acoustics
- Acoustical materials, including spray-on finishes
- Classroom acoustics, including HVAC system design and building insulation
- Power plant noise
- Industrial noise sources, including compressors, gas turbines, chillers, saws, and nail guns
- Noise analysis, including holographic techniques
- Sound quality development

A listing of the abstracts received has been placed on the Internet. Go to www.inceusa.org and look for NOISE-CON 03 information. Travel planning and hotel information can also be found at the above URL.

International INCE

More than 800 Abstracts are Received for INTER-NOISE 2003

The organizers of INTER-NOISE 2003 have reported that more than 800 abstracts have been submitted for the congress. INTER-NOISE 2003, the 2003 International Congress on Noise Control Engineering, will be held on Jeju Island, Korea on 2003 August 25-28. The congress is sponsored by the International Institute of Noise Control Engineering (I-INCE), and is being organized by the Korean Society for Noise and Vibration Engineering and the Acoustical Society of Korea. Additional information, travel planning information, and a congress registration form were published in the December issue of this magazine. More information on the technical program and a hotel reservation form may be found on the official web site for the congress, www.internoise2003.com.

The organizers of INTER-NOISE 2003 have reported that more than 800 abstracts have been submitted for the congress.

INTER-NOISE 2004 First Announcement

INTER-NOISE 2004, the 2004 International Congress on Noise Control Engineering will be sponsored by the International Institute of Noise Control Engineering (I-INCE) and organized by the Czech Acoustical Society. The congress will be held in Prague, Czech Republic, on 2004 August 22-25.

The congress will be held at the Czech Technical University in Prague. Josef Novák is Chair of the Organizing Committee, and Jiri Tichy is Chair of the International Advisory Committee.

The topics to be covered at the congress include:

- Active noise control
- Building acoustics
- Community and environmental noise
- Costs and benefits
- Human effects of noise
- Machinery noise control
- Measurement techniques
- Noise control methods and materials
- Noise sources
- Regulations
- Structures and low frequency noise
- Traffic noise

An exposition of acoustical equipment, materials, software for noise and vibration control, measurement and diagnostics, and analysis will be organized during the exposition.

The social program will include opening ceremony with a concert, welcome party, accompanying persons program, Congress dinner, closing events, day tours, and an evening concert.

For further information on the Congress, please contact: INTER-NOISE 2004 Congress Secretariat, Technicá 2, 166 27 Praha 6, Czech Republic. Telephone: +420 224 352 310; FAX: +420 224 355 433; E-mail: intern oise2004@fel.cvut.cz; Internet: www.internoise2004.cz

INTER-NOISE 2004 REPLY COUPON

(Please post or fax this form to the Congress Secretariat)

Name ☐ Mr. ☐ Ms. ☐ Dr. ☐ Prof.____________________

Address ____________________

City __________ Postcode ________ Country __________

E-mail ____________________

☐ I am interested in attending INTER-NOISE
☐ I am interested in presenting a paper
☐ My company may be interested in participating in the equipment exposition
☐ My company may be interested in a sponsorship at INTER-NOISE 2004

Institute of Noise Control Engineering
of the United States of America, Inc.

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☐ INCE Student Associate *(must be a full-time student)* ....*INCE Student Associate applicants should complete this page only.*

Please type or print clearly. Date ______________________

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Name *(last, first, middle)* ____

Date of birth ____

Home Contact Information

Home address ____

City ____________________ State/Province ____________________

Zip/Postal code ____________________ Country ____________________

Home telephone ____

Home fax ____

Home E-mail ____

Business Contact Information

Business/Organization name ____

Business address ____

Position title ____

City ____________________ State/Province ____________________

Zip/Postal code ____________________ Country ____________________

Business telephone ____

Business fax ____

E-mail ____

Areas of Interest *(Please select your first, second, and third area of interest.)*

01 _____Sources
02 _____Propagation
03 _____Passive Control
04 _____Active Control
05 _____Perception and Effects of Noise
06 _____Instrumentation and Measurement Techniques
07 _____Prediction and Modeling Techniques
08 _____Standards
09 _____Transportation Noise
10 _____Building Acoustics
11 _____Industrial Noise
12 _____Community Noise
13 _____Information Technology Equipment
14 _____Product Noise Control
15 _____Other
*(describe)*____________________

Preferred Method of Contact

☐ Home ☐ Business

Applicant's Signature ______________________ Date ____________

For Students

☐ I certify that the applicant is a full-time student

Faculty Member's Signature ____

Annual Fee for INCE Associates and Members

	Fee	Special 1st Year Rate
Student	USD 20	USD 20
Domestic USA	USD 95	USD 50
Outside USA	USD 120	USD 75

INCE Associates and INCE Members receive both *Noise/News International* and *Noise Control Engineering Journal*, and will receive reduced registration fees at INCE/USA conferences.

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☐ MasterCard
☐ American Express

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Card Number

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Signature

Application Submission

○ **Mail**
Please mail this application form with check or credit card information to the address below.

○ **Fax**
Fax this application with credit card information to 515-294-3528.

Contact Information

Institute of Noise Control Engineering
212 Marston
Iowa State University
Ames, IA 50011-2153 USA
Phone: 515-294-6142
Fax: 515-294-3528
E-mail: ibo@inceusa.org

This page to be completed only by applicants for INCE Membership.

Principal Requirements for Becoming a Full INCE Member

- be enrolled as an INCE Associate (Member applicants are automatically enrolled as associates while their credentials are reviewed);
- have earned a baccalaureate (or equivalent four-year academic degree) or higher degree from a qualified program in engineering, physics, or architecture offered by an accredited university or college;
- have instructed, or have enrolled in and successfully passed as part of a degree program, at least one full-semester course of instruction devoted to the physical principles of acoustics;
- have demonstrated academic or professional experience in acoustics and noise control; and
- have the application form endorsed by an INCE Member.

A satisfactory grade on the INCE Fundamentals Examination, or a grade of "B" or better for completion of a course, approved by the Membership Committee, on the fundamentals of noise control engineering, may be considered sufficient for election to membership in lieu of one or more of the basic requirements above.

Education Beyond Preparatory School

College/university	Location	Degree	Major	Year received

Acoustics Course(s)

List at least one, but not more than two, courses in the fundamentals of acoustics taught or taken for credit (identify college/university, department, course title and number, year, credits; include grade received and name of instructor).

Experience

Describe briefly your interests and/or professional experience in the field of noise and its control. Include any special interests, number of publications, patents, etc.

Endorsement

The endorser, an INCE Member whose signature appears below, verifies that the information supplied by the applicant is accurate to the best of the endorser's knowledge.

Endorser's name *(please print)*____

Endorser's signature ______________________________ Date ______________

Applicant's Statement

I hereby make application for INCE membership. I certify that the statements made in this application are true, complete, and correct. If elected to membership, I will be governed by the articles of incorporation, bylaws, and policies of INCE/USA.

Full signature of applicant ______________________________ Date______________

LMS

LMS Participates in a Flow-induced Noise and Vibration Program

(This is an edited version of an article that appeared in the 2002 September issue of LMS News.—Ed.)

Alessia is the name of an ESPRIT project, 50% funded by the European Commission, that is aimed at developing validated and supported software tools for the prediction of fluctuating noise flow problems, especially noise generation. Flow-induced noise and vibration occur in many industries: automotive, aerospace, medical equipment, and architecture. Solving noise flow problems is a multi-disciplinary task that incorporates fluid mechanics, structural dynamics, vibration, acoustics, and statistics.

In response to increased demand for commercial aero-acoustic and computational fluid dynamics (CFD) products, LMS and other Alessia participants are developing tools that combine CFD and acoustics software to produce models that show where noise is related to flow dynamics and to predict fluctuating-flow noise generation.

In a time of strict enforcement of noise regulations, manufacturers using the flow-noise software developed from the Alessia R&D project will be able to avoid the costs incurred by noise levels that disqualify products from reaching the market. For manufacturers in automotive, aerospace, and mass transport industries, achieving even a slight noise reduction can have a major impact in terms of increased allowed traffic or reduced pollution.

AEA Technology's CFX-5 software is used to model the flow, and LMS Sysnoise performs aero-acoustic computations on the model. Applications foreseen for the Alessia software include aerodynamic noise in cyclone separators, mixing vessels, and multi-phase flows in pipelines and rotating machinery. Noise problems created by structures projecting from a vehicle's body (mirrors, antennae, etc.) can be modeled with the surrounding flow in CFX-5 and then remodeled as noise in LMS Sysnoise. This foresight allows designers to make changes to reduce the flow-induced noise early in the process.

Inside a vehicle, cooling systems, HVAC blowers, various ducts, fan blades, and duct openings all generate noise. Each could be refined to generate less noise if designers could predict the levels. Rotating machinery like chemical separators are also potential targets for the CFD and noise prediction software resulting from this research project. The results of Alessia research into flow-induced noise are now part of the Rev. 5.6 of LMS Sysnoise.

For further information, contact LMS International, Researchpark Z1, Interleuvenlaan 68, 3001 Leuven, Belgium. Telephone: +32 16 384 200; Fax: +32 16 384 350; E-mail: info@lms.be; Internet: www.lmsintl.com

LMS International Announces ANSYS Integration Tools For LMS Virtual.Lab

LMS International has announced the availability of an ANSYS Interface for LMS Virtual.Lab, its flagship product for functional performance engineering. The interface is said to provide tight integration between LMS Virtual.Lab and ANSYS, a global innovator of simulation software and technologies designed to optimize product development processes. The interface is available on the newly released ANSYS 7.0.

The Interface for LMS Virtual.Lab and ANSYS provides users with an active, associative link between Virtual.Lab and ANSYS for all linear structural analysis. Virtual.Lab users not only will be able to access ANSYS modeling and results data, they now will be able to make ANSYS an integral part of a Virtual.Lab-supported engineering process. By implementing Virtual.Lab, users also have the ability to automatically set up ANSYS solutions and drive the ANSYS solver.

The ANSYS Interface enables automatic updates, eliminates time-consuming, error-prone data transfers, and significantly increases overall customer productivity.

For further information, contact Sarah Zajas, LMS International, Telephone: +1 248 952 5664; e-mail: sarah.zajas@lmsna.com.

LMS announces new integration tools

Castle Group has "swap shop" for older, sound level, vibration meters

Castle Group Ltd.

Castle Offers Sound Level Meter Swap

Companies are still using sound level meters that do not comply with the British and European standards to produce noise-at-work risk assessments. To help combat this situation, Castle Group Ltd. of Scarborough, U.K., are now running a "Swap Shop," where any old sound level meter, or even vibration meter, of any make or model can be traded in against a new model to save the user money.

In the past buying a new noise or vibration meter often made the old one redundant and worthless, but now it can be used as a bargaining tool! The Castle staff is trained to offer you an estimated trade-in value over the phone without even seeing the instrument. Alternatively, highly-qualified service staff at Castle can examine its condition and determine whether a trade-in is necessary or if a service and calibration would suffice.

For further information, contact Dianne Hamblin, Castle Group Ltd. Salter Road, Scarborough, North Yorkshire, YO11 3UZ, United Kingdom. Telephone: +44 1723 584250; E-mail: sales@castlegroup.co.uk; Fax: +44 1723 583728.

New microphone boom/turntable available from Norsonic

Scantek has product for entertainment venues

News from Scantek

New Microphone Boom from Norsonic

Norsonic has issued a preliminary data sheet for a new microphone boom/turntable, Type Nor265, that has a wide variety of uses in acoustical measurements. Applications of the new device include:

- Building acoustics measurement in accordance with ISO-140
- reverberation time measurement in accordance with ISO 354
- sound power measurements in accordance with the ISO 3740 series, and directional response measurement of loudspeakers

Some of the features of the microphone boom/turntable are:

- Sweep of ±90˚ and ±180˚
- user defined sweeps
- PC control via RS232 interface
- user defined fixed positions
- accurate positioning of turntable angle
- low noise design
- no noisy slip rings

Accurate Control of Entertainment Noise for the Community

Scantek, Inc. is pleased to announce the availability of a product that can assure noise compliance from entertainment venues like discos, theme parks, exercise studios, outdoor concerts. The system, a LRF-04 Limiter by CESVA, controls the input to assure property-line standards are met.

To accomplish this, the owner needs to measure the transfer function between the venue and the closest, or worst case, property line, done by producing a loud noise and measuring the octave band noise reduction between the venue and the property line. This reduction is input to the LRF-04 Limiter along with allowable limits at the property line. If any sounds produced exceed the band limits or the overall limits, the power is shut off.

The LRF-04 has sophisticated signal analysis and delay switches to allow momentary excursions, if this makes sense. The real-time analysis provides accurate measurements to assure community noise requirements are met. The unit is tamperproof and can be calibrated.

The LRF-04 takes its place with the other full range of sound level meters, hand-held FFTs and vibration frequency analyzers available at Scantek. All products are supported with full calibration facilities at Scantek, Inc. in Maryland.

New Castle Group brochure from Scantek

If companies do not comply with the OSHA, FRA, DOT, or Company Workplace Noise Regulations, their staff can suffer permanent damage to their hearing, leading to costly compensation claims or worse.

One problem is that employees do not like wearing hearing protection all day long. This is where the Castle GA902 comes into its own. The sign can be set to switch on at a predetermined level, notifying employees of potentially dangerous noise levels via a highly-visible sign face and an optional flashing beacon. This means that employees are only instructed to wear appropriate hearing protection when absolutely necessary.

The GA902 is versatile as it can be used to trigger slave units, which are identical to the GA902 in visibility but are not noise activated. A remote microphone can be used to maximize efficiency, and signs can be linked together to form systems that will be suitable for any application.

The GA902 is available with a variety of accessories including remote beacons, mini beacons, slave units, customized graphics and lettering. It is also available in stainless steel for clean environments where it can be washed down.

Scantek, Inc., founded in 1985, provides instrumentation sales, rental, technical support, engineering, calibration, and service for CESVA, Norsonic, RION, BSWA, and Castle Instrumentation and for software from DataKustik, RTA Technologies, and TOPsonic.

For further information, contact Richard J. Peppin, P.E., 7060-L Oakland Mills Road, Columbia, MD 21046 USA. Telephone: +1 410 290 7726; Fax: +1 410 290 9167; E-mail: peppinR@ScantekInc.com or info@scantekinc.com

01dB

01dB Defines Equipment Specifications and Provides Links

01dB has provided the following information on product specifications:

ORCHESTRA - Data Acquisition and Frequency Analyzer

- Up to 32 Channel (0 to 20 kHz)
- 16 or 24 Bits Selectable
- Modules Available: Microphones, ICP, Charge, Strain Gage, Thermocouple...
- Basic Software Package: Real time FFT and 1/3 Octave, Direct-To-Disk Digital Recorder, Transient Capture, Shock Response, Post Processing Functions
- Order Analysis, Sound Power (ISO 374X and ISO 9614), Psycho Acoustics
- Works on all 01dB Software Platforms (Environmental Monitoring, Building and Industrial Testing)

Internet: www.01dbsupport.com/Orchestra.html

SOLO - USB Sound Level Meter or 1 Channel PC Front End

- 24 bits DAC - 117dB of Dynamic Range
- Option: 1/1, 1/3 and FFT Analysis built-in
- Fast Transfer Data to a PC (USB)
- Lithium Battery Up to 24 hours
- Memory: 3 Million Values
- Option: Real Time Data Transfer (USB)
- Works on all 01dB Software Platforms (Environmental Monitoring, Building and Industrial Testing)

Internet: www.01dbsupport.com/Solo.html

MK1 Artificial Head for Sound Quality

- Tilt Torso and Neck
- High Repeatability Between Artificial Heads
- Product Reference: The New BMW SERIES 7
- Psychoacoustic Research and Jury Testing
- Speech Research and Analysis
- Environmental Noise Analysis

Internet: www.01dbsupport.com/Artificial_head.html

PC-Based System SYMPHONIE (2-channel) and HARMONY (4-channel)

- Computer Powered
- IEPE Transducers (Acc, Hammer,...) and Microphones Polarization
- Tachometer Input
- Light System
- Noise Generator Built-In
- Works on all 01dB Software Platforms (Environmental Noise Monitoring, Building and Industrial Testing)

For more information, contact Vincent Rey, 01 dB, Inc., P.O. Box 796, Skaneateles, NY 13152, USA. Telephone: +1 315 685 3141; FAX: +1 315 685 3194. Internet: www.01dbsupport.com

News from PCB Piezotronics

High-temperature Accelerometer for 900 deg. F (482 deg. C) Operation

The Model 357B61 high-temperature, charge mode accelerometer from the Vibration Division of PCB Piezotronics, Inc., operates in temperatures beyond the capability of most piezoelectric vibration sensors. The unit withstands temperatures of up to 900 deg. F (482 deg. C) and is designed for vibration studies in the high-temperature, ambient environments found in power generation turbines and equipment, aircraft engines, and vehicle engine and exhaust systems.

The Model 357B61 accelerometer connects to laboratory-style charge amplifiers or in-line charge converters, which condition the output signal for recording or analysis. The robust sensor is structured with a piezoceramic sensing element and an all-welded, hermetically-sealed Inconel® housing. Additional features include a 5,000-g shock limit, a 10-32 coaxial electrical connector and a supplied 10 ft. (3m) high-temperature hardline cable.

01dB defines equipment specifications

PCB Piezotronics has high-temp accelerometer

New series of torque transducers available

Endevco introduces enhanced signal conditioner

Compact torque transducer transmits signals via digital telemetry

The Force/Torque Division of PCB Piezotronics, Inc., announces the release of a new series to the Torkdisc® family of low-profile, high-stiffness rotary torque transducers. Series 5302 offers the same advantages as all other Torkdisc® models, which utilize rugged, strain-gauge sensing technology and wireless, digital signal telemetry to transmit measurement signals to an adjacent receiver. Additional features include compact design, low-weight, low-rotating inertia, RF interference immunity, and low sensitivity to axial thrust and bending moments. The thin, low-profile configuration requires minimal space for mounting, a plus for cramped installation situations.

The Series 5302 sensor is offered with a choice of capacities from 1000 in-lb to 6200 in-lb FS and represents an ideal, state-of-the-art solution for demanding dynamometer applications.

New Kit Reads and Writes TEDS Information to Sensors

PCB Piezotronics, Inc., and The Modal Shop, Inc. (A PCB Group Co.) have jointly released Model 400A76 TEDS Sensor Interface Kit. This kit provides the hardware and software required to interface with more TEDS sensors than any previously-available software interface. Operating on a Windows PC via an RS-232 port, Model 400A76 kit enables the user to read and write TEDS data in 16 IEEE TEDS templates and three templates established by LMS International.

Types of transducers supported includes accelerometers, microphones, charge amplifiers, and microphone preamplifiers. Model 400A76 kit consists of a 100-7158-20 RS-232 Hardware Interface Dongle, TEDS Read/Write software and a cable assembly.

This kit is said to represent one of the most advanced implementations yet of IEEE P1451.4, a developing standard for mixed-mode TEDS sensors. This new software is powered by The Modal Shop's latest TEDS encoding/decoding engine, enabling read/write access to sensors with 256 bits of memory.

For additional information concerning PCB Piezotronics products, contact Andrea Mohn, Marketing Assistant, PCB Piezotronics, Inc., 3425 Walden Avenue, Depew, NY 14043-2495 USA. Telephone: (800) 828-8840; Fax: +1 716 684 0987; E-mail: amohn@pcb.com

News from Endevco

Model 482B Transducer Signal Conditioner Designed for Multi-channel Applications

Endevco Corporation, a designer and manufacturer of dynamic instrumentation, has announced the availability of the enhanced Model 482B rack-mounted signal conditioner. The eight-channel amplifier card communicates with newly-developed SMART, ISOTRON®, (IEEE P1451.4 TEDS) accelerometers, yet provides backwards compatibility for use with other Integral Electronic PiezoElectric (IEPE) transducers and Remote Charge Converters (RCC). The 482B is designed for multi-channel modal testing on large structures such as airplanes, spacecraft, automobiles, bridges, and heavy machinery.

Endevco's enhanced signal conditioner is part of the company's Optimal Architecture Sensor Interface System (OASIS 2000) product line. OASIS 2000 allows the interface of multiple sensor types by using the 400 Series family of signal conditioner cards, all housed in a 16-slot, 19" rack (Endevco Model 4990). 400 Series cards can be mixed or matched in any combination, giving maximum flexibility to customize any system configuration. Specifically, up to 16 Model 482B cards can be used in the Model 4990 rack, providing a powerful 128 channels of flexible, intelligent signal conditioning at a low per-channel cost.

The combination of SMART ISOTRONS and intelligent electronics make the 482B ideal for use in modal test labs. TEDS accelerometers contain all pertinent data, which is automatically loaded into a software database at the click of a button. Data entry errors are virtually eliminated and signal conditioning setup time is minimized. Each Model 482B card also has an independent microprocessor, providing the fastest means of data transfer possible with increased reliability.

The signal conditioner features a programmable gain of 0 to 100 with an accuracy of +/- 0.5% at 1KHz for gains greater than 1. The 482B also has built-in, selectable Butterworth 2-pole low-pass filter corners at 100Hz, 1KHz, 5KHz, and broadband. In addition to an Open/Short ISOTRON Sensor fault detection, the signal conditioner has gain autoranging, digital electronic output channel identification, and a frequency response of 0.015Hz to 100KHz (-3dB corners).

Sensor-specific digital read/write data is in the form of the PIEEE-1451.4 Transducer Electronic Data Sheet (TEDS). TEDS data includes model number, serial number, transducer sensitivity, manufacturer, and date of last calibration. Endevco's Model 4990 rack provides the communication link (Ethernet or RS-232) between the PC and the Model 482B card. The system controlling program is a Windows® based application software providing a user-friendly interface.

New Miniature Coaxial Cable Assemblies Offer Increased Flexibility, Lighter Weight, and Benefits for Low-outgassing Applications

Endevco's new family of versaFLEX and hyperFLEX cable assemblies are said to offer a variety of enhancements, including increased flexibility, lighter weight, and smaller diameters. The new hyperFLEX cables are 50% more flexible than the cables they replace. The new versaFLEX cables are 20% more flexible than the cables they succeed. Models 3090DH and 3090DV feature 10-32 coaxial plugs on both ends, while Models 3053H and 3053V feature an M3 coaxial plug on one end and a 10-32 plug on the other.

Built with materials that have a Total Mass Loss (TML) of 1% or less and a Collected Volatile Condensable Materials (CVCM) of 0.1% or less, the versaFLEX cable assemblies are said to be well suited for applications that require limited outgassing such as use in space or a simulated space environment. In addition, versaFLEX cable assemblies utilize an extruded polymer jacket that resists water penetration, helping to avoid ground loops in applications involving condensation or submersion.

The new hyperFLEX and versaFLEX cable assemblies feature a new coupling nut that utilizes a unique diamond-back knurl. This allows increased torque to be applied to the nut, providing for a more secure connection. The new coupling nut also offers a hexagonal section that enables the use of a supplied wrench or crow's foot. The new coupling nut is made of an alloy that is less susceptible to galling, helping to alleviate cable twist.

Unlike most miniature coaxial connectors in the industry which use press-fit Teflon insulators, Endevco's connectors utilize hermetic construction to ensure a strong bond between pin, insulator, and

Acknowledgements

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USA .... Graduate Program in Acoustics, The Pennsylvania State University, State College, Pennsylvania

Conference Calendar

Below is a list of congresses and conferences sponsored by International INCE and INCE/USA. A list of all known conferences related to noise can be found by going to the International INCE page on the Internet, www.i-ince.org.

2003 June 23-25

NOISE-CON 2003, the 2003 National Conference and Exposition on Noise Control Engineering

Cleveland, Ohio, USA. Contact: Institute of Noise Control Engineering, INCE/USA Business Office, 212 Marston, Iowa State University, Ames, IA 50011-2153. Tel. +1 515 294 6142; Fax: +1 515 294 3528; e-mail: IBO@inceusa.org. Internet: http://www.inceusa.org.

2003 August 24-27

INTER-NOISE 2003, The 2003 International Congress and Exposition on Noise Control Engineering

Jeju Island, Korea. Contact: Congress Secretariat, Covan International Corporation, 3rd Floor, Youngmoon Building, 150-2 Wonnam-dong, Chongro-ku, Seoul 110-450, Korea. Tel. +82 2 766 9580; Fax: + 82 2 762 4946; e-mail: internoise2003@covanpco.co.kr; Internet: http://www.internoise2003.com.

2004 July 12-14

NOISE-CON 2004, The 2004 National Conference and Exposition on Noise Control Engineering

Baltimore, MD, USA. Contact: Institute of Noise Control Engineering, INCE/USA Business Office, 212 Marston, Iowa State University, Ames, IA 50011-2153. Tel. +1 515 294 6142; Fax: +1 515 294 3528; e-mail: IBO@inceusa.org. Internet: http://www.inceusa.org.

2004 August 22-25

INTER-NOISE 2004, The 2004 International Congress and Exposition on Noise Control Engineering

Prague, Czech Republic. Contact: INTER-NOISE 2004 Congress Secretariat, Technicá 2, 166 27 Praha 6, Czech Republic. Tel. +420 224 352 310; Fax: +420 224 355 433; e-mail: internoise2004@fel.cvut.cz. Internet: http://www.internoise2004.cz.

2005 August 06-10

INTER-NOISE 2005, The 2005 International Congress and Exposition on Noise Control Engineering

Rio De Janiero, Brazil. Contact: Prof. Samir N.Y. Gerges, Mechanical Engineering Department, Acoustics and Vibration Laboratory, University Campus - Trindade, Florianopolis, SC - CEP 88040-900, BRAZIL. Tel. +55 48 2344074; Fax: +55 48 2320826: e-mail: samir@emc.ufsc.br.

2006 December 03-06

INTER-NOISE 2006, The 2006 International Congress and Exposition on Noise Control Engineering

Honolulu, Hawaii, USA. Contact: Institute of Noise Control Engineering, INCE/USA Business Office, 212 Marston, Iowa State University, Ames, IA 50011-2153. Tel. +1 515 294 6142; Fax: +1 515 294 3528; e-mail: IBO@inceusa.org. Internet: http://www.inceusa.org.

Product News *continued from page 37*

connector shell by means of a glass insulator that is fired at over 800 deg. C. This makes pin pull-out and intermittent center-pin contact an unlikely occurrence.

Model 7596A VALULINE™ Series Accelerometers are Rugged, Low-cost Solutions for Applications Requiring DC Acceleration Measurement

Endevco's new Model 7596A and 7596AM3 VALULINE accelerometers offer a cost-effective solution for high accuracy, low-level acceleration measurements requiring DC response. Featuring gas damping and internal overrange stops, the VALULINE is able to withstand high shocks (up to 10,000 gs) and acceleration loads. The VALULINE's patented design is said to provide excellent stability with a warm-up time of 10ms and overrange recovery of <10us. The VALULINE is said to be ideal for laboratory measurements, ground transportation studies, and measurements and modal studies on large structures. The Model 7596A features an integral cable, while the Model 7596AM3 incorporates a 6-pin connector, allowing for cable replacement. The 7596AM3 also provides an optional temperature sensor output for external thermal compensation.

Operating from 8.5 Vde to 30 Vde, VALULINE provides a high-level, low-impedance output that can drive most laboratory instruments, tape recorders and data acquisition systems without amplification or signal conditioning. Endevco Model 136 Three-channel System, Model 4430A or OASIS Computer-controlled System are recommended signal conditioners.

Endevco has a factory-direct sales force in the U.S. and is represented in the rest of the world by Brüel & Kjær. Brüel & Kjær has offices in 55 countries and seven accredited calibration centers worldwide. Endevco is a subsidiary of U.K.-based Meggitt PLC, an international group of companies renowned for their specialized engineering skills.

For further information, contact Dave Olney, Product Manager, ENDEVCO, 30700 Rancho Viejo Road, San Juan Capistrano, CA 92675 USA. Telephone: +1 949 493 8181; Fax: +1 949 661 7231; E-mail: davis@endevco.com; Internet: www.endevco.com.

International Advertising Contacts

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Mexico and South America: Ik' Atl, S.A. de C.V., phone 52 5547 4678, fax 52 5547 4678, e-mail, ilhui@altavista.net

SoundPLAN LLC

Argentina: Dakar, +54 11 4865 79 84; email: dakarr@ciudad.com.ar

Australia: Marshall Day Acoustics, +617 3254 4614; +617 3254 4624; email: noelmorris@marshallday.com.au

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Canada: Navcon Engineering Network, +1 714 441 3488; +1 714 441 3487; email: Forschner@navcon.com

China: BSWA Technology Co Ltd, +86 10 62525350; +86 10 62526351; email: bswa@bswa.com.cn

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Denmark: Delta Acoustics & Vibration, +45 45 93 12 11; +45 45 93 19 90; email: Jkl@Delta.dk

Finland: SCC Viatek, +358 9 4301 220; +358 9 4301 413; email: matti.keranen@viatek.fi

France: Euphonia, +33 01 4789 59 57; +33 01 4116 26 64; email: info@euphonia.fr

Germany: Braunstein + Berndt GmbH, +49 7191 91 44 1; +49 7191 91 44 24; email: bbgmbh@soundplan.de

Greece: Industrial Acoustics Hellas; +301 895 3464; +301 895 4653; email: dpramas@hotmail.com

Hungary: CivilSol Kft, +36 1 3810895; +36 1 3810896; email: Papp.tibor@civilsol.hu

India: Foretek Marketing Pvt Ltd, +91 80 526 6813; +91 80 526 6813; email: foretek@mcdecom.net

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New Zealand: Marshall Day Associates, +64 9 379 7822; +64 9 309 3540; email: keith@Marshallday.co.nz

Poland: PC++ Software Studio sc, +48 602 228317; +48 58 5201331; email: koniarek@interecho.com

Portugal: AAC Centro de Acustica Aplicada sl, +349 45 298233; +349 45 298261; email: alberto@aac.pt-alava.es

Russia: Octava+Company, +7 095 482 5108; +7 095 482 1361; email: michael@octava.ru

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USA: Navcon Engineering Network, +1 714 441 3488; +1 714 441 3487; email: Forschner@navcon.com

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TEAC

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Directory of Noise Control Services

Information on listings in the Directory of Noise Control Services is available from the INCE/USA Business Office, 212 Marston, Iowa State University, Ames, IA 50011-2153; +1 515 294 6142; Fax: +1 515 294 3528; IBO@inceusa.org. The price is USD 400 for 4 insertions.

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New portable data recorders use removable PC FLASH cards.

Setting a new industry standard, the new TEAC LX Series Data Recorders feature 8, 16, 24, or 32 A/D input channels with up to 40kHz bandwidth per channel (96kHz sampling). The input amplifiers handle DC, IEPE, differential, or tachometer inputs and are TEDS compatible. The new LX Series operates on AC, DC or battery power. The LX can be a direct PC front-end and record to on-board 576 SDRAM or removable PC FLASH cards (up to 2GB). The FLASH memory cards provide transportable data files, or download data via Ethernet or Firewire. The recording format is compatible with popular analysis applications, so your analysis can start right away. You've never had faster, more convenient ways to capture data. Flexible, compact, and very affordable, the LX Series puts recording and analysis into warp speed. Call for a demo today.

12" x 2.5" x 8"

Four channels at 40kHz (96kHz sampling) per channel
Thirty-two channels at 5kHz (12kHz sampling) per channel

12" x 4.5" x 8"

www.teac-flash.com

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