

Vol 35 No 1 JANUARY/FEBRUARY 2010

ACOUSTICS

BULLETIN

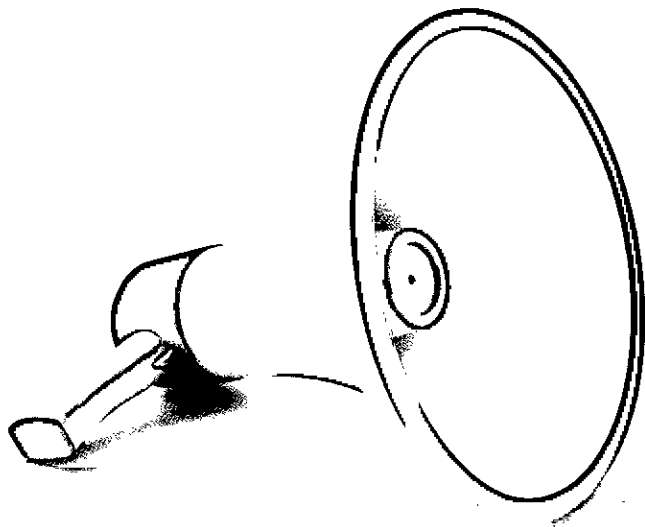


in this issue...
Report from Euronoise 2009, Edinburgh

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plus... Reproduced Sound 25: conference report
IOA response to consultation on Permitted Developments
Noise Action Plans for Agglomerations and Airports:
IOA responses to consultation

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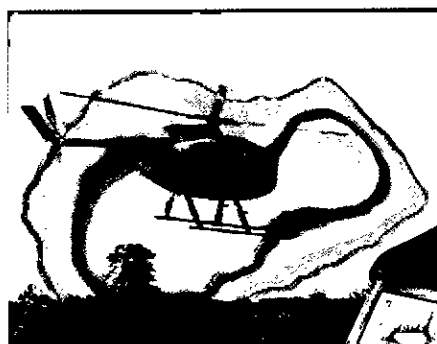
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Contacts

Editor:

I F Bennett CEng MIOA

Associate Editor:

J W Tyler FIOA

Contributions, letters and information on new products to:

Ian Bennett, Editor, 39 Garners Lane,
Stockport, SK3 8SD
tel: 0161 487 2225
fax: 0871 994 1778
e-mail: ian.bennett@ioa.org.uk

Advertising:

Enquiries to Dennis Baylis MIOA,
Peypouquet, 32320 Montesquiou, France
tel: 00 33 (0)5 62 70 99 25
e-mail: dennis.baylis@ioa.org.uk

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This issue of Acoustics Bulletin is very much an exception to the norm. The reader will find no Technical Contributions, and very little in the way of industry or product news. The reason is quite simple: the last few months of 2009 witnessed two very successful conferences at opposite ends of the country: Euronoise 2009 in Edinburgh, and Reproduced Sound 25 in Brighton. There have also been three important consultations to which the Institute has responded, in the fields of Noise Action Plans for Airports, Noise Action Plans for Agglomerations, and permitted development rights for non-domestic development.

It would have been inappropriate to defer the reports on any of these items to a future issue, especially given the landmark status of Euronoise 2009. However, once the 'regulars' were included, there was little space for anything else! Readers can be assured that the March/April 2010 issue will revert to a more normal and balanced content.

Ian Bennett
EDITOR

Front cover photograph: The front cover shows a presentation in one of the state-of-the-art auditoria of Edinburgh International Conference Centre during Euronoise 2009. This image and the photos accompanying the conference report are the work of Simon Williams Photography, whose permission to reproduce them is gratefully acknowledged.

The Institute of Acoustics is the UK's professional body for those working in acoustics, noise and vibration. It was formed in 1974 from the amalgamation of the Acoustics Group of the Institute of Physics and the British Acoustical Society.

The Institute of Acoustics is a nominated body of the Engineering Council, offering registration at Chartered and Incorporated Engineer levels.

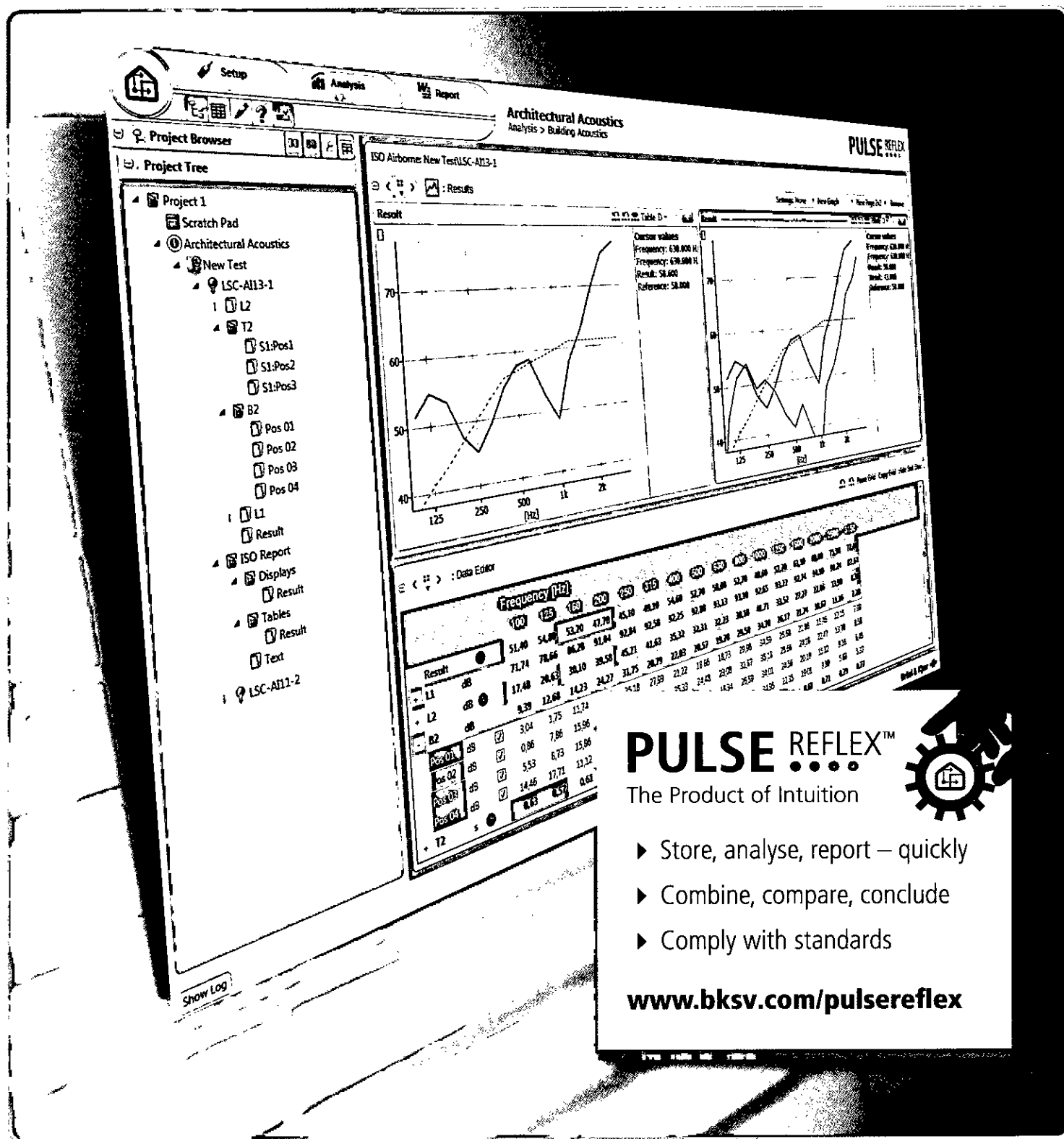
The Institute has over 3000 members working in a diverse range of research, educational, governmental and industrial organisations. This multidisciplinary culture provides a productive environment for cross-fertilisation of ideas and initiatives. The range of interests of members within the world of acoustics is equally wide, embracing such aspects as aerodynamics, architectural acoustics, building acoustics, electroacoustics, engineering dynamics, noise and vibration, hearing, speech, physical acoustics, underwater acoustics, together with a variety of environmental aspects. The Institute is a Registered Charity no. 267026.



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Dear Members

I hope you had an enjoyable Christmas and may I wish you all a happy and healthy New Year.

Last year was quite a challenge for the Institute but I am pleased to say we have come through unscathed and with our finances relatively intact. However, I am acutely aware that some colleagues, particularly in consultancies, have lost jobs as a result of the economic recession. My best wishes go out to them and I hope that they quickly find alternative employment.

On a happier note I am delighted to tell you that in spite of the recession and the threat of 'swine flu' Euronoise 2009 attracted a record number of delegates and was an unqualified success. Those present enjoyed three excellent plenary lectures and a choice from ten parallel sessions over the three days. I was particularly pleased that sixty-nine students registered for the conference and that most of these took part in the European Acoustical Association's Student Networking Event held on the first evening. The conference was accompanied by a large exhibition with fifty stands. Several of the companies represented provided sponsorship for the conference in various forms, and I would like to thank these and all other sponsors for their support. The conference dinner was enjoyed by 350 delegates including Cathy Mackenzie a previous Secretary of the Institute and one of the organisers of the very first Euronoise Conference that took place at Imperial College in London in 1992. During the dinner I had the pleasure of presenting several medals and awards including the Rayleigh Medal 2009 to Colin Hansen from Australia. Further details on this award and others are included in the conference report in this Bulletin.

There are many people who deserve our thanks for arranging and delivering such a successful event including the members of the organising committee, our staff at headquarters and the staff at the Edinburgh International Convention Centre. However, Bernard Berry, general chairman of Euronoise 2009 and chair of the Institute's Euronoise Organising Committee, and Linda Canty from headquarters deserve special mention. Both worked tirelessly and diligently on the detailed arrangements for the conference.

Euronoise was not the only Conference that we have successfully organised recently. Reproduced Sound 25 'The Audio Explosion' took place in Brighton on 19 and 20 November. This was a notable success attracting 115 delegates. The highlight of the event was undoubtedly the Peter Barnett Memorial Award 2009 paper on 'Endangered sounds' delivered by Neville Thiele. Neville is renowned for designing loudspeakers and is a legend in electro-acoustics circles. Despite recently celebrating his eighty-eighth birthday Neville travelled from Sydney to Brighton to receive his award and entertained us with a mixture of his knowledge and wit during his presentation. The conference report is provided in this issue of the Bulletin.

John Hinton

John Hinton OBE

PRESIDENT



Euronoise 2009, Edinburgh

Conference report

The Euronoise series of conferences came to Britain - specifically, to Scotland - on 26 to 28 October 2009. Nearly 700 delegates enjoyed the purpose-built and truly stunning Edinburgh International Conference Centre, opened in 1995 and owned by Edinburgh City Council. The conference facilities and technology were state-of-the-art, as befits a European capital city: the flexible conference rooms and lecture halls, a centralised visual aids system and computer controlled timings, and the spacious exhibition hall in which the excellent catering was efficiently delivered, all made their contributions to a very successful event. Luigi Maffei, President of the European Acoustics Association (EAA) said that Euronoise 2009 was a great success on both the scientific and the social sides, this being the feedback he had received from the EAA Board and Executive Council during the intensive days of the conference, and several participants had confirmed this impression.

Technical sessions

The conference subtitle was Action on Noise in Europe, with the three main aspects of the 'noise problem', noise sources and their control, the propagation of noise, and the effects of noise on people, or 'source-path-receiver' to use the familiar words.

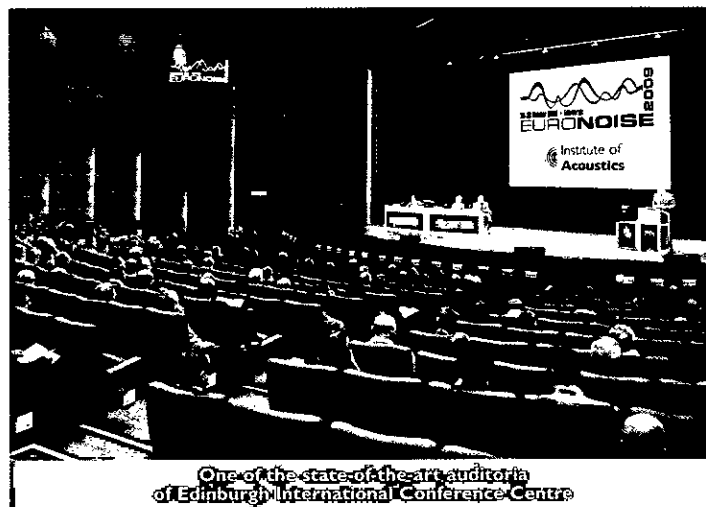
The conference was arranged into plenary and parallel sessions covering the three days of formal proceedings. No reviewer could possibly attend all the presentations, even if this was desirable, and with more than 450 papers in all including the plenary lectures and the poster sessions, this report can only scratch the surface, technically speaking, and provide a record of a little of what was presented and discussed. Following similar reasoning, the names of individual presenters are for the most part omitted: this is to avoid presenting a mere list of participants, as opposed to an overall impression of the conference. However, some session chairmen generously found the time to provide a brief description of the proceedings in their own particular areas of interest, and these are included below. It should be noted that although the conference programme followed the subject index areas as far as practicable, there were inevitably a number of presentations that were categorised under a particular topic heading, but were actually presented among papers in another group where the subject areas overlapped. For example, the session on port noise included a paper dealing with industrial noise prediction, particularly in port areas, which was included in the session dealing with industrial noise control, where it found an equally comfortable home.

The sessions were held in the various flexible presentation spaces in the Edinburgh International Conference Centre: the organising committee is to be congratulated on matching the size of the lecture room to the likely number of interested delegates. Not only were squashes avoided, with only the wind turbine noise session being 'standing room only' as far as I am aware, but there were also very few occasions on which delegates found themselves rattling around in a lecture theatre that was too big!

The subject headings below broadly follow the session titles, but are arranged, it is hoped, so that readers can find a particular topic more easily. Copies of the conference proceedings on CD-ROM are available from the Institute of Acoustics office at St Albans, price £30 (members) or £40 (non-members).

Plenary sessions

There were three plenary lectures, starting each of the three days. After Monday's opening ceremony in the Pentland Suite, **Colin Hansen**, 2009 Rayleigh Medallist, presented his 'Adventures in noise control', in keeping with the 'source' part of the



One of the state-of-the-art auditoria of Edinburgh International Conference Centre

conference theme. This was a brief review of the work in active noise control, undertaken by the author and his colleagues at the University of Adelaide during the past 20 years. The emphasis was on practical issues associated with the implementation of real working systems. Aspects covered include sensors, speakers, controller hardware, software and physical system configuration. Ongoing research at the University of Adelaide was also discussed briefly, with a special focus on fixed and moving virtual sensing.

Tuesday 27 October began with **Dick Botteldooren** and 'Modelling outdoor sound propagation', fitting neatly into the second element of the conference theme, the 'path'. The equations describing sound propagation in homogeneous, still, and isotropic air bounded by locally reacting materials have been known for more than a century. However, the typical outdoor environment is far from these ideal conditions: sound interacts with non-locally reacting (ground) surfaces in a non-homogeneous atmosphere disturbed by wind and turbulence. Moreover, propagation distances were large and scattering objects such as building façades, street furniture, trees and bushes contained a lot of structural detail. To face the challenges imposed by these harsh conditions, a number of numerical models have been developed. A first category of models focuses on delivering results that mimic physical reality as rigorously as possible and can primarily be used to predict the effect of local noise control measures, thus allowing spending noise control money as efficiently as possible. A second category of models tackles the problem of population noise exposure over large areas. They automatically need engineering-type approximations to describe propagation effects in a more semi-empirical way. Examples were given to illustrate how detailed modelling can help designing barriers, green roofs, tree-barrier combinations etc. Finally, Dick analysed the future needs for both categories of models and discussed the possibility of bringing knowledge from rigorous physical modelling into engineering practice.

Proceedings were opened on Wednesday 28 October by **Stephen Stansfield**, who took us in 'New directions in noise and health research', neatly rounding up the trinity of themes by looking at the 'receiver'. There have been significant achievements in recent noise research in Europe, but there are also new challenges in relation to the changing noise climate and emerging sources of noise. In the context of the European Noise Directive

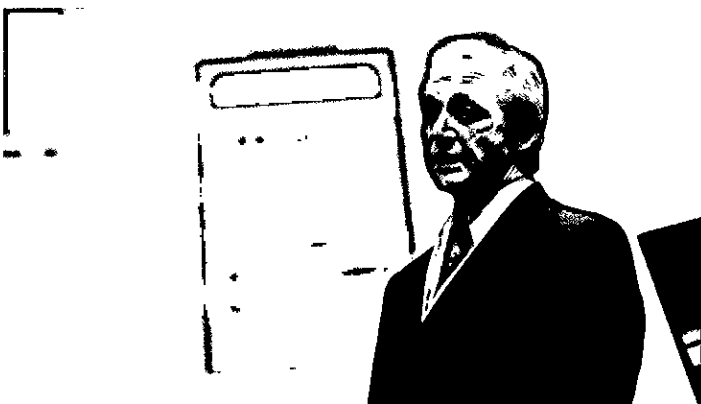
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A traditional Scottish welcome



Bernard Berry opens EuroNoise 2009



Colin Hansen presents his "Adventures in Noise Control"

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Euronoise 2009, Edinburgh - continued from page 6

there is an opportunity to take a new perspective on noise exposure measurement. Increasingly the joint effects of noise and air pollution are being examined with a need for greater consideration of moderating factors in noise research. There is scope for learning from other disciplines in terms of research methods, analyses and measurement of health outcomes. Potential mechanisms such as the stress diathesis model should be examined more critically. Applying insights from genetics might alter our understanding of susceptibility to noise effects. The setting up of a new European Network on Noise and Health will facilitate these developments and draw new researchers into the field from other relevant disciplines to invigorate the research culture. An important function of the new network will be to encourage the training of young researchers in noise and health research. For too long, noise and health research has been carried on in relative scientific isolation. It is hoped that these new developments will bring research into noise and health further into the European scientific mainstream.

Acoustic comfort in architecture

Papers in this subject area included presentations on the acoustical reconstruction of three university halls in Zagreb; the acoustic design of open-plan offices; the lessons to be learnt from open plan offices and classrooms; the study of part of a facade with natural ventilation and sound insulation; and Jonas Christiansen posed the question whether it was possible to create a good working environment in an open plan office.

Acoustic materials: new designs, recycled materials

The topics covered were the effective acoustical properties of random microfibrous materials; a prediction technique for the dynamic modelling of poro-elastic materials; the influence of geometry of lightweight hollow bricks on sound insulation; the acoustical properties of granular microporous materials; and cold extrusion technology to tailor products from granular plastic and rubber waste. They were followed by a high sound pressure model for cellular metallic foam; an experimental study of concentrated compressions on the sound absorption of polyester fibre panels; the measurement of scattering and absorption of profiled-wood surfaces; the transmission of sound through lightweight ferro-cement panels; a numerical study of the aeroacoustic absorption of resonant liners; and an acoustical method for non-destructive determination of porosity of asphalt.

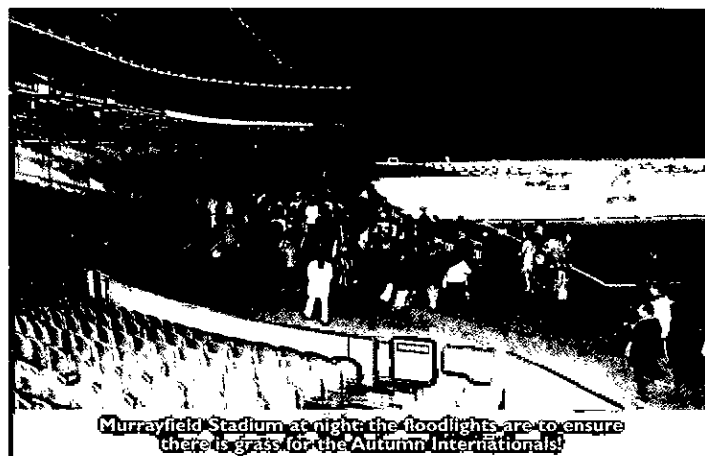
Acoustical exploitation of periodic structures

A paper on three-dimensional idealised unit-cell based method for computing acoustic properties of low-density reticulated foams fell into the 'materials' session, and other work on acoustic beam forming with sonic crystals; the behaviour of sonic crystal barriers including resonant scatterers; the generation of defects for improving the properties of periodic systems; improved attenuation bands using quasi-fractal structures; characteristics of wave propagation through doubly-periodic array of elastic shells; and laboratory experiments on sonic crystal noise barriers was presented in the related session the next day.

Acoustics in Scotland: new noise legislation, action planning, quiet areas

In a session focusing on the Scottish experience, the development of new standards for sound insulation for new housing in Scotland were explored by Sean Smith. Duncan McNab spoke on noise nuisance legislative enhancements in Scotland, and next, Matthew Harrison compared the regulatory constraints on wind energy developments in Scotland with those commonly used in Australia and New Zealand.

The assessment and management of strategic road and rail



Murrayfield Stadium at night: the floodlights are to ensure there is grass for the Autumn Internationals!



Spot the real Scot!

transport noise in Scotland was the subject of Henry Collin's paper, and a review of sound insulation standards and proposed new performance levels in Scotland was presented by Linda Stewart. The session was closed by Mary Stevens, who gave an Environmental Protection UK Scotland view on the promotion and development of Scottish noise issues.

Acoustics of enclosed spaces

Twelve papers were included in this session, including parametric studies on the low-frequency acoustics of listening rooms using a numerical wave model; novel noise monitoring and control solutions for classical musicians; computer model validation and the application of threshold efficient signal to noise room acoustics measurements; an investigation into the distribution of the reflected energy from absorbing and hybrid surfaces; the relationship between acoustic worship ambience and speech intelligibility in Goa's Bom Jesus Basilica; shape optimisation of polygonal rooms based on spatially homogenous sound field distribution and psychoacoustic criteria at low frequencies; and a new type of absorber for use by classical musicians in rehearsal rooms.

A room acoustic investigation of an actor's position and orientation for drama performances followed, then how acoustic particle velocity enabled methods to assess room acoustics. Speech Transmission Index and Articulation Index in the context of open plan offices; and volumetric diffusion from pseudorandom periodic cylinder arrays completed the session.

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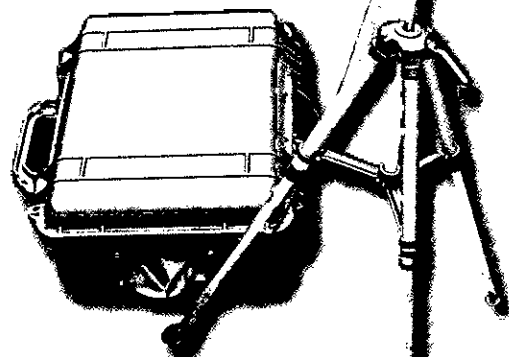
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Euronoise 2009, Edinburgh - continued from page 8

Active noise and vibration control

Adaptive control of acoustic intensity with turbulent flow; suppression of combustion oscillations in gas-fired appliances using passive resistive methods; active control of progressive waves in an rectangular cavity; active noise control in aircraft cabin: state of the art and combination with audio entertainment; investigation of optimal excitation methods used in the active control of sound transmission through a panel; forward-difference frequency domain virtual microphone for active noise control; an alternative inverse filter for global noise control in a small enclosure; active noise control including feedback path cancellation; and finally tests of different control strategies for active noise cancellation of a car oil pan made up the technical content of the 'active' session.

Aircraft noise

Both 3D-coherent and 2D-coherent acoustic intensity measurements for source identification in aircraft cabins were discussed, and noise comfort design approaches for the next regional aircraft generation were posed.

Moving outside the aircraft cabin, measurements of aircraft noise levels and their variability with model results were compared; coaxial jet noise in an inhomogeneous density field; a method to calculate ambient aircraft background noise; the FAA's efforts to characterise and mitigate aircraft noise impacts; a hybrid parallel implementation of the fast multipole method applied to aircraft noise control; and jet noise source distribution for coplanar nozzles were then covered.

This was followed by aerodynamic noise reduction using fine structure grids; the efficient frequency domain calculation of aft fan acoustical modes; assessment of jet noise shielding prediction parameters; broadband trailing edge noise predictions with a stochastic source model; monitoring and analysis of local aircraft noise at Zagreb airport; study of counter-rotating fan noise at anechoic chamber; spectral estimation of the sound sources in jet flows; numerical calculation of pressure modes at high frequencies in lined ducts with a shear flow; automatic liner optimisation for bypass ducts; uncertainty in aircraft noise modelling; a numerical study on the effects of three-dimensional features of a turbofan aero-engine intake on the far field noise; broadband shock-associated noise predictions; and finally a fast multipole method implementation for Meyer formulation applied to acoustic scattering problems.

Auralisation and virtual acoustics prototyping

Prediction and auralisation of construction site noise; sound field simulations in a car passenger compartment using combined wave- and ray-based simulation methods; real-time filtering for interactive virtual acoustic prototyping; development of a virtual prototype for the acoustic optimisation of a variable displacement pump; multi source auralisation of soundscapes in large buildings; perceptual evaluation of a real time auralisation tool; auralisation of traffic noise within the LISTEN project; perceptual clustering for ray based auralisation; objective study of spatial attributes in the room impulse response's late part and their relevance for auralisation; determination of perceptual auditory attributes for the auralisation of urban spaces; auralisation and dissemination of noise map data using virtual audio; and combining measurement and modelling in acoustic simulation showed the variety of work throughout Europe in the area of auralisation and virtual prototyping.

Building services noise

Just three papers were presented in this mainstream area of acoustics and noise control. These were active vibration isolation



Rupert Thornely, Taylor and Frank Fahy



VIPs and Award winners

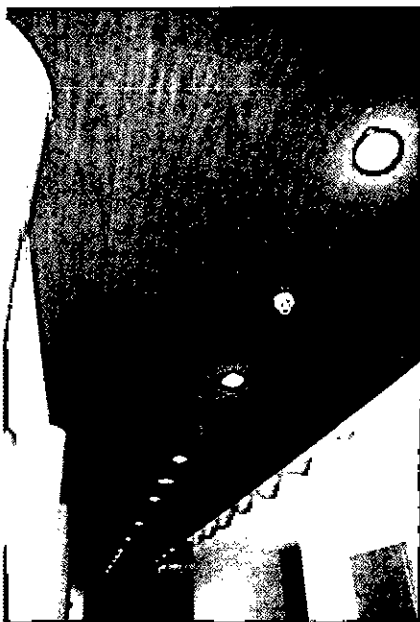
for structure-borne sound from installations in buildings, by Moritz Späh; the prediction of airflow generated noise in ventilation system take-offs, by David Waddington; and Bernadette McKell discussed ventilation and noise reduction in cities, with particular reference to the constraints associated with PAN 56 and natural ventilation.

Classroom acoustics

The minimum area covered by a sound absorber, estimated from its ISO 11654 classification and required reverberation time, was postulated by Christian Simmons, then Charlotte Clark presented findings from the UK RANCH follow-up study on the long-term effects of aircraft noise exposure on children's cognition. The lessons learned from acoustic testing in schools in the south-west of England were the subject of Thomas Mitchell's paper, then acoustics measurements and subjective assessment of acoustic quality in classrooms were discussed by Paulo Henrique Trombetta Zannin. The connection between unfavourable acoustics in sports halls and high prevalence of voice problems in PE teachers was confirmed by Valdis Ingibjörg Jonsdottir, and the benefits of using amplification in ordinary classrooms were the next logical step in her next paper, which considered the changes in male teachers' speech during a working day, with and without sound amplification.

Preliminary results on the benefits of improved classroom acoustics to speech perception by students with typical hearing, auditory processing disorders, and hearing loss were presented by Frank Inglehart, and Nicola Prodi looked at some psychoacoustics experiments on the efficiency of communication in auralised classrooms.

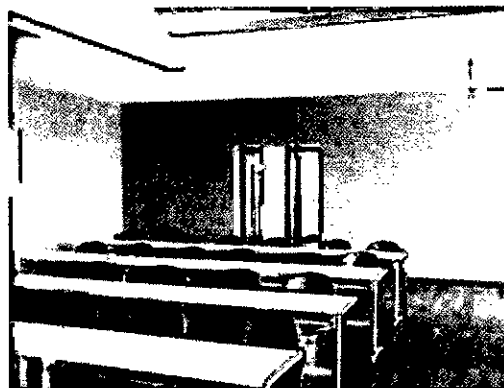
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A long-term continuous complex acoustical climate evaluation in selected schools was presented by Maciej Szczodrak, then Arianna Astolfi drew a comparison between intelligibility scores before and after an acoustical treatment in primary school classrooms. Emma Greenland looked at the control of noise for speech intelligibility in open plan classrooms, and Renzo Vitale described the measurement of scattering coefficients for a computer simulation of classroom acoustics. Anne Budd described the development of a speech intelligibility test for use with young children in realistic classroom environments, and a pilot study on the effects of aircraft noise on the cognitive functioning of South African school children was offered by Joseph Seabi.

Community noise

The three papers falling into this category were subsumed into the noise and health - annoyance sessions. First, Miguel Ausejo presented a set of subjective noise web-based surveys carried out over the internet on a neighbourhood in a small Spanish city. Next, Christian Tibone evaluated the noise exposures inside and outside late night premises, and an investigation of the speech intelligibility on board metro trains was described by Massimiliano Masullo.

Computational acoustics: BEM, FEM, SEA

A wave-based analysis for acoustic transmission in for fluid-filled elastic waveguides was presented by Andrew Peplow, then high amplitude acoustic pulse attenuation and transmission in rigid porous media were discussed by Diego Turo.

Vicente Cutanda Henriquez spoke about the use of acoustic vortices in acoustic levitation, and in the first of two papers, Terence Connelly showed the prediction of automobile interior noise levels by statistical energy analysis from exterior sound

fields created by fast multipole BEM. Several examples of open-source software for the acoustician were demonstrated by Mikael Ögren, then Terence Connelly predicted muffler insertion loss and shell noise using a hybrid FE acoustic-SEA model.

Dose-response relationships

Under this subject heading, Dirk Schreckenberg presented FFI and FNI, two effect-based aircraft noise indices proposed for the further development of Frankfurt airport.

EN 12354 series: the state of the art

After an overview of the development of the EN 12354 series, 1989-2009, a redefined Kij formula for junction with flexible interlayers was proposed. Then, in-situ measurement of the flanking transmission using two different measurement methods was discussed, followed by modelling the acoustic behaviour of ceramic brick double walls with peripheral resilient layers. The influence of the physical test set-up and in-plane waves on the measurement of flexural wave coupling parameters between heavyweight building elements was the subject of the next paper, and the session proceeded with the prediction of flanking sound transmission in lightweight building structures with SEA, assessing the implications for the EN 12354 method. Finally, the audience listened to a presentation about the automatic calculation of sound insulation in a whole building.

Future developments of building acoustics

In a session dominated by Scandinavian research, Krister Larsson gave some conclusions from a state-of-the-art report on acoustics in wooden houses, then Tor Erik Vigren discussed sound

continued on page 12

Euronoise 2009, Edinburgh - continued from page 11

transmission in multilayered structures. Jonas Bruskog investigated the sound transmission of finite single walls using a variational technique, and Alfonso Rodriguez-Molares determined vibration reduction indices by numerical calculations. Delphine Bard looked at the measurement of vibration induced by human walking on wooden floors, and Klas Hagberg at the acoustic development of a lightweight building system.

Noise and health

The effects of long-term road traffic noise exposure on sleep in a large population study were put forward by Yvonne de Kluizeaar. MP3 player listening levels when using noise cancelling headphones, by Stephen Dance, and the noise exposure of students on degree courses related to popular music, by Christopher Barlow, were also presented.

In the physiological and cardiovascular health session, chaired by Peter Lercher and Wolfgang Babisch, Marja Heinonen-Guzejev found in the Finnish twin cohort study that at baseline self-reported noise sensitivity was associated with a variety of health outcomes, including hypertension, even after adjustment for lifetime noise exposure (assessed by questionnaire). In the follow-up part of the study, cardiovascular mortality was significantly higher among noise-sensitive women, but not in men. Noise-sensitive women who had reported a high lifetime noise exposure were at higher risk for coronary heart mortality.

Results of associations between road noise, NO_2 as a traffic related indicator of air pollution, annoyance and self-reported health problems were shown by Ronnie Klæboe based on data of a community survey from Oslo. Noise sensitivity was strongly associated with self-reported health outcomes.

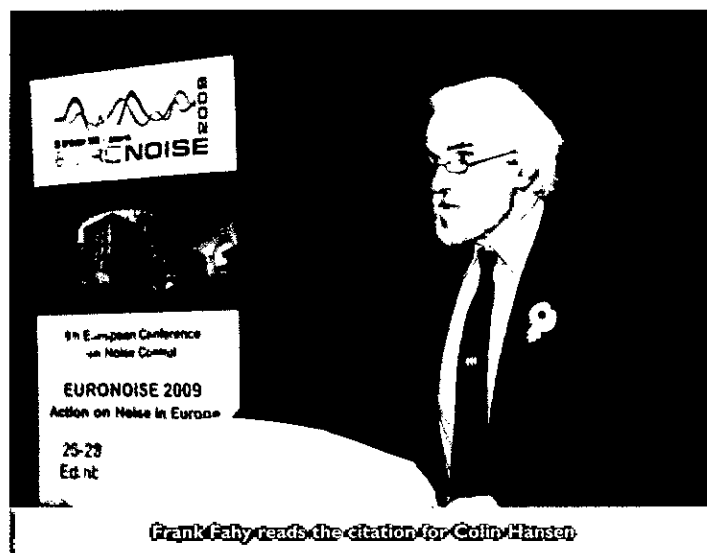
Health complaints, diagnosed health disease and medication use were assessed in residents living in the vicinity of Frankfurt Airport. Dirk Schreckenbergl reported the results of the field study. The results did not support the assumption of a direct effect of aircraft noise exposure on physical and mental health. However, associations between noise annoyance, noise sensitivity and self-reported health could be observed. A model was suggested as a possible explanation that describes a recursive process of health complaints and noise sensitivity intensifying noise annoyance, which in the long run lead to further health effects.

Gösta Bluhm reported the results of a follow-up study carried out around Stockholm's Arlanda airport on the incidence of hypertension. For aircraft noise levels of 50dB(A) or more outside the subjects' houses a significant increase in risk was found in males, but not in females, after controlling for confounding factors.

Katarina Paunovic studied the effects of road traffic noise on high blood pressure in children in Belgrade. Noise was assessed during the day at the schools and during the night at home. Higher systolic and diastolic blood pressure readings of the children were significantly associated with the noise exposure at school, but not at home.

Irene van Kamp reported the results of an exploratory study carried out in Sydney looking at the impact of noise on elderly people. Living along a busy street road was associated with a higher percentage of severe annoyance and sleep disturbance. There was no direct association between noise and housing indicators and hypertension/CVD. However, length of residency, annoyance due to neighbours and noise-induced sleep disturbance were associated with an increased risk.

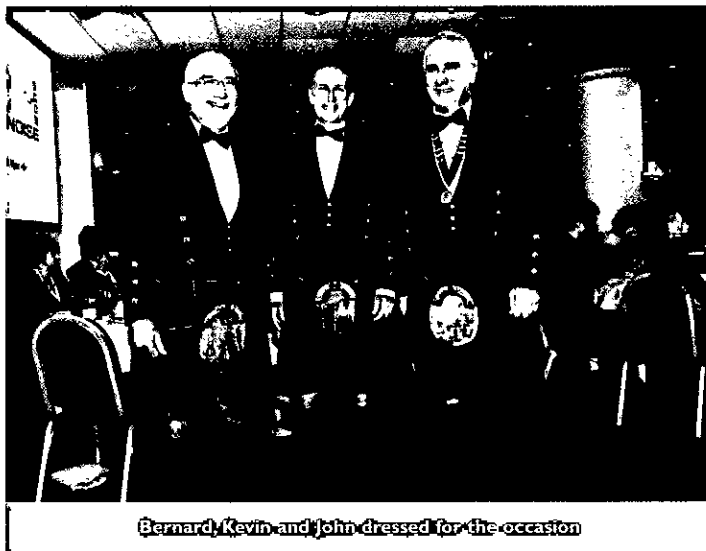
Within the framework of the HYENA study, the intake of prescribed medication in relation to aircraft and road traffic noise was studied in middle-aged subjects. The results were presented by Sarah Floud. An increased risk of taking anti-hypertensive and anxiolytic medication was found for those exposed to aircraft



Frank Fahy reads the citation for Colin Hansen



Euronoise 2009 organisers (and a hanger-on in a striped shirt)



Bernard, Kevin and John dressed for the occasion

noise at night, but not for the other drugs under investigation.

DALYs (disability adjusted life years) are more and more frequently used for the quantification and comparison of the environmental burden of diseases and public health management. Guus de Hollander gave a critical presentation regarding their use and applicability. He discussed several reasons

not to rely too much on DALYs while rationing resources in (environmental) policy.

A new methodology for evaluating the quality of the living environment making extensive use of GIS information and traffic modelling was proposed by Luc Dekoninck. The quality of the living environment is unravelled by a number of basic components, including accessibility to basic functions, healthy living conditions, enjoyable landscape and soundscape undisturbed by noise or odour, and stimulating social interaction. Evaluating these quality aspects involves not only the dwelling and the exposure of its façade but also the wider environment.

Speech-recognition-based evaluation of voice quality in tracheoesophageal and esophageal speech was discussed by Marzena Miesikowska. The aim of the research was to evaluate the voice quality of patients after total laryngectomy on the basis of speech recognition process.

Another presentation regarding speech intelligibility was given by Massimiliano Masullo. His paper was concerned with speech intelligibility inside metro trains for different ride conditions (running along a straight and around a curve, running in gallery or outdoors). Several acoustic measurements have been performed inside the metros of European and not European cities (Naples, Rome, Milan, Turin, Paris, Berlin and New York). The results demonstrated that the acoustical conditions on board metro trains are often unsatisfactory and can cause disruption to the normal conversations of passengers, requiring strenuous additional vocal efforts.

Health - annoyance

Exposure to motorcycle noise in alpine residential areas, a case study in public health risk assessment, was presented by Peter Lercher. The role of study characteristics in changes in aircraft noise annoyance over time was considered by Sabine Janssen, and the smoking ban and the resulting noise effects on residents were discussed in a paper by Scott Lothian.

The effects of railway noise and vibration in combination were the subject of field and laboratory studies by Evy Öhrström, and reactions to night noise due to leisure activities were given by Sergio Feijoo. Finally, Mark Brink attempted to establish noise exposure limits using two different annoyance scales, by means of a sample case with military gunfire noise.

Health - sleep

Eight papers in this sub-category included studies of nocturnal transportation noise and its effects on heart rate; the evaluation of traffic noise effects on sleep; a neuro-physiological approach for evaluating noise-induced sleep disturbance, using the time constant of the dynamic characteristics in the brainstem; the effects of noise on sleep in subjects habitually exposed to nocturnal noise from road traffic and railway, using the results of a socio-acoustic survey and sleep recordings in the home; the determination of the probability of awakening in night-time noise effects research; the test and retest reliability of actigraphy based sleep measurements and sleep logs, in a field study on the relationship between road traffic noise and sleep quality; the current status of, and research issues in, sleep disturbance due to noise; and finally the effects of railway noise and vibrations on sleep, according to experimental studies within the TVANE Swedish research programme.

Helicopter noise

Seven papers on helicopter noise, both military and civil, began with Paul Kendrick's management of helicopter noise in the UK, and Paul Freeborn then summarised helicopter operations in the UK. John Levertson assessed the public acceptance of helicopters



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in the USA, with importance of the virtual noise component assessed in full: helicopters are more annoying than fixed wing aircraft at the same absolute noise level, because they sound like helicopters. The importance of helicopter noise from a community perspective was then considered by Tony Pike, and the psychological response to helicopter noise at RAF Shawbury was reported by Kathleen Sixsmith Titley. Edward Nykaza presented the lessons learned by the US Army in mitigating helicopter noise annoyance, through intervention at path and receiver, and Geoff Kerry brought the session to a close by evaluating the performance of acoustic double glazing and sound attenuated ventilation units when fitted to a traditional UK dwelling, in mitigating the effects of helicopter noise.

Human response to vibration in transportation and buildings

The five papers were on the topics of the contribution of sound and vibration level to comfort in cars; structure-borne noise and vibration from rail infrastructures; investigations to measure human exposure to vibration in residential environments; human exposure to low frequency horizontal motion in buildings and offshore structures, as assessed using the guidance in BS 6841 and ISO 6897; and the development of a social survey questionnaire for the investigation of human response to vibration in residential environments.

Industrial noise

Janusz Piechowicz presented experimental and model calculations of the sound level distribution in industrial rooms, and Samuel Quintana assessment noise, vibration and perception in excavator operators. Noise emission data for hand-held concrete breakers were presented by Jacqueline Patel, and the noise radiated by a piece of industrial equipment was the subject of a case study by Marc Asselineau. The environmental noise caused by building activities in Rotterdam was reviewed by Piet Sloven, and the reliable detection of cavitation in a centrifugal pump using the noise and vibration signal was described by Jan Cernetic.

Measurement techniques

The papers presented were: a novel wireless pervasive sensors network to improve the understanding of noise across urban areas; comparison of two methods for in-situ measurement of the absorption coefficient; the influence of transient noise in the measurement of room impulse response by sinesweep technique; increasing the dynamic range of the integrated impulse response of a room; directivity measurement in a choir of mixed voices; a novel PU sound intensity based method to assess acoustic leakage of an acoustic enclosure installed in a reverberant environment; acoustic calibrators - a new 'old' design; an acoustic vector sensor based method to measure the bearing, elevation and range of a single dominant source as well as the ground impedance; supplementing Dublin's noise maps with long term monitoring; and the development and performance of a multi-point distributed environmental noise measurement system using MEMS microphones.

Noise barriers: novel designs

Noise barriers and the Harmonoise sound propagation model were discussed by Eric Salomons, and the performance of noise barriers in attenuating road traffic noise by Jeffrey Parnell. Marine Baulac spoke about the acoustic performance of an innovative barrier system designed for freight trains in urban areas, and a comparison was drawn by Nuri Ilgurel of a plain-shaped noise barrier's effectiveness with and without an absorptive layer, by means of measurements in the semi-anechoic chamber. Estimating the effect of semi-transparent traffic noise barrier using the UWVF method was Leu Ding's topic, and finally Yiu Wai Lam

considered the effect of absorption on the performance of diffusive T-shaped barriers.

Noise mapping

The noise mapping session was one of the biggest, lasting all day Tuesday and Wednesday morning. It consisted of 24 papers and two discussion sessions and was well attended with over 30 attendees during the entire session, more for a couple of the invited papers looking into the future of noise mapping in Europe. We were fortunate to have good quality papers, and no authors cancelled, allowing us to maintain the good flow that the co-chairmen had tried to maintain with the papers being grouped according to which particular aspect of noise mapping they approached in the subject. The session covered experiences with noise mapping, including a paper on soundscaping, and their use in action plans before moving onto methodology and their development in the future. Finally, the session covered some noise mapping systems used in practice, good practice, quality assurance and the interaction between measurements and calculations. The discussion forums were useful to create the time required for a useful debate which is not possible in the limited time available between two papers.

The work to structure the session paid dividends as we could move from one issue to another. The joint chairmen recommend repeating this in future conferences. The on-line presentation server worked very well, even rapidly resolving the one, single mix-up there was. The EICC staff should be congratulated on having a well-set-up system which was operated efficiently and effectively.

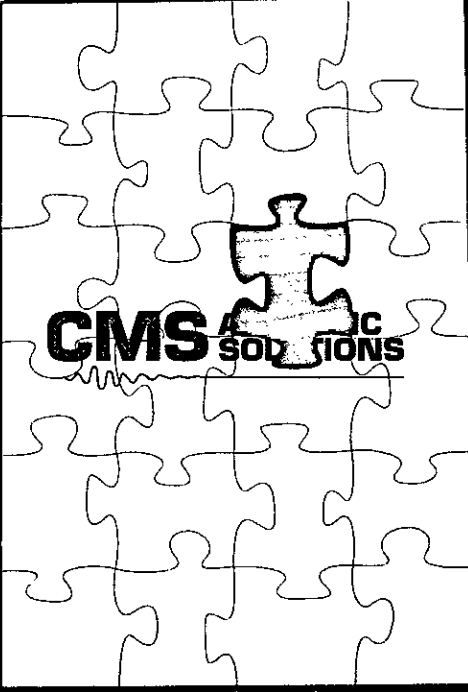
The Tuesday evening discussion from 18:00h to 18:40h was successful, but was suspended after 30 minutes because of fatigue among the participants. It may have been even better if it had occurred as one single discussion at the end of the session.

The subject matter was wide ranging and covered a good practice guide on port (industrial) area noise mapping and management; comparison of measured noise levels and computer calculated noise levels produced by the Birmingham updated mapping project; urban strategy, with noise mapping as an instrument for interactive spatial planning; reverse engineering, or improving noise prediction in industrial noise impact studies; source-receiver distance algorithms and soundscape based methods for hotspots and quiet areas in the strategic action plan of Florence; the results of the first round of the strategic noise maps in Spain and the actions derived from them; equivalence within noise mapping projects; Software-as-a-Service (SaaS) and the future of urban environmental noise modelling; an illustration of QA measures for noise mapping software; assessing the suitability of using the recommended interim method for road traffic noise mapping in Ireland; traffic noise mapping in the small city of Tarancon (Spain); dynamic noise mapping in the city of Gdansk; good practice in the use of noise mapping software; advancement in the development of European common noise assessment methods; noise mapping and action planning in the Italian and Russian experience; accuracy analysis of traffic noise mapping in Florence; the acoustical climate of the Czech Republic; noise mapping in Eastern Europe; large-scale strategic noise mapping using tiled acoustical models; and the implementation of a simplified Harmonoise/IMAGINE method for making noise maps for large areas.

Transportation noise action planning

The noise mapping workshop, held from 15:00h to 16:00h on Wednesday 28 October, was chaired by John Hinton and Simon Shilton. It was given over to a presentation by Marco Paviotti of EC DG Joint Research Centre (JRC) setting out the current position with respect to a project being undertaken for EC DG

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Environment to develop a proposal for Common Noise Assessment Methods for Europe (CNOSSOS-EU). The workshop was structured by presenting aspects of the currently-outlined proposed method, followed by a question-and-answer session on each aspect. There were approximately 50 attendees and a lively discussion ensued.

The project was begun with a two-day workshop at DG JRC in Ispra, Italy, in March 2009. Following the workshop the basis of the requirements for 'fit for purpose' noise assessment methods were agreed amongst an expert advisory group supporting DG JRC. There followed an extensive literature review across many existing methods of assessment from across Europe, Japan and the USA. This led to a qualified list of components for the common methods and an initial proposal for the technical solution to each of these aspects. This initial proposal was discussed in detail by the expert advisory group at a one-day meeting in Brussels during September 2009. The key aspects of the common methods were agreed at this meeting. Many aspects are drawn from the Harmonoise/Imagine method, with other elements proposed from recent work within Nord2000, NMPB 2009 or ASJ 2009. The overall approach is to have a single propagation method used alongside specific source models for road, rail and industrial sources. Aircraft noise assessment remains unresolved at present, with a further meeting planned to discuss the relative merits of ECAC Doc 29 Third edition, and the new version of AzB.

There was extensive discussion regarding the potential complexity of the Harmonoise/ Imagine/ Nord2000 methods, as exemplified through experience in Denmark applying Nord2000 for the END strategic noise mapping during 2007. This is to be addressed largely through having one set of common assessment methods, but with two domains of application, each of which is seen as being 'fit for the purpose of application'. The two proposed applications are for delivery of strategic noise mapping results to the EC, and a higher resolution approach more suited to the requirements of noise action planning.

The proposal from DG JRC is that the technical description of the methodologies is to be accompanied by extensive practical guidance on the application of the methods. Indeed many of the detailed questions regarding use of the methods, requirements for input data and management of uncertainty were answered by reference to the forthcoming guidance documents.

To close, the timetable for completion of the project was laid out, and an open invitation was extended for feedback, comments and input from all attendees. It is proposed to have the proposal for the common methods documented, along with guidance on their application for strategic noise mapping, at the end of April 2010, with all documentation complete by the end of 2010.

Noise mapping in Scotland

Three papers were presented in this specific category. They were END: action planning candidate noise management area prioritisation, quiet areas and GIS, by David Palmer; Steve Williamson's presentation taking us from strategic noise maps to action plans and beyond - the Scottish experience; and the Scottish government implementation of the EU Environmental Noise Directive (END) analysed by David Wallace.

Noise policy and regulation: implementation of the END

Colin Nugent opened the session by presenting the recent END noise data reported by Member States: in all, 63% of the expected data have actually been reported. The data show that noise from roads is the major source of the ambient noise levels, with railway noise ranked second. Colin introduced the Noise Observation and Information Service for Europe (NOISE) run by the European Environment Agency at <http://NOISE.eionet.europa.eu>. This database shows the various data reported.

Martin van den Berg showed a number of interesting comparisons between cities and airports showing some surprising figures. The comparison highlighted the importance of careful quality assurance and even the current difficulties in collecting data from the different Member States using different methods and levels of data accuracy.

Stephen Turner presented the English approach to a centralised development of actions plans. He mentioned the English noise indicators $L_{Aeq,18h}$ for railway noise, $L_{A10,18h}$ for road traffic noise and the action levels of 76dB. This approach showed a large number of dwellings exposed. Due to budget constraints the current English approach is to reduce noise at the 1% highly exposed equal to 362,000 by road traffic noise and 10,800 by railway noise.

Rick Jones gave an interesting presentation of the relevant measures to control railway noise with a focus on the wheel/rail interaction. No major reduction in the noise exposure from rail vehicles is to be foreseen, so in the short term, noise control at the 'hot spots' might be given priority.

After lunch Colin Grimwood presented some interesting thoughts about delimiting areas to be considered 'quiet'. Both noise levels and size of the area are taken into account. The delimitation seems to focus on areas with less than L_{day} 55dB and an area of 4.5 hectares, but the final decision on quiet areas might not be based on sound-specific criteria.

Miguel Coutinho from IDAD gave a presentation of the Portuguese approach to developing action plans. They have looked at the difference between the noise from the source in question (ambient noise) and the background noise (residual noise). During daytime the difference should not exceed 5dB, in the evening 4dB, and during night-time the difference should be less than 3dB.

Brian McManus gave an overview of the most critical parts of the END to be reconsidered or revised. Most issues were about clarification, while others were inconsistent with the END or were attributable to misunderstandings.

Balazs Gergely from the European Commission followed up on the previous presentation by giving some deadlines of ongoing work on the review of the END by Milieu and other issues related to the END. Paul de Vos followed up on the issues presented by the two preceding presentations and gave his proposal for 'do's and don'ts' for the second round of the END in 2012. A number of the proposals were in line with those presented by other speakers.

Mary Stevens spoke about her experience of communicating the END mapping results to the public. She mentioned that in UK some 100,000 complaints were made every year about neighbour noise, while only 2,895 complaints were about traffic noise. She said that this low figure might be related to the option and willingness of the authorities to do something about traffic noise. She proposed to put more focus on traffic noise at the annual noise awareness week next year, from 26 to 30 April 2010.

Noise valuation

A hedonic aircraft noise valuation study around Amsterdam airport was presented by Jasper Dekkers, and the Alimos effect: nonlinearities, 'stigma' and tolerance reflected in aircraft noise values by Sotirios Thanos. The influences on the value of noise from transport were considered by Abigail Bristow, and she then asked what could be learned from stated choice experiments in noise valuation. The question of whether investment in noise reduction was a good option in Portugal was addressed by Cecilia Rocha, and the social cost of aircraft noise was queried by Ian Flindell.

Occupational noise

Occupational noise exposure at the Guide Dogs for the Blind Association training centre, Forfar was the subject of investigations by Paul Bassett, then finite element modelling for

the evaluation of the sound attenuation of hearing protectors was assessed by Franck Sgard. The sound power emitted by large machines in the construction sector was Isabel Gonzalez' subject, then a risk assessment of employee noise exposure in nightclubs in Ireland was given by Aoife Kelly. Three occupational noise exposure assessment techniques were evaluated by Richard Neitzel; speech recognition in noise with active and passive hearing protectors was the subject of a comparative study by Annelies Bockstael; and Tobias Schmidt presented the use of an individualised miniaturised noise dosimeter (PMD) for the prevention of hearing loss.

Ports and noise

The session on ports and noise was organised by Rob Witte and Bernard Postlethwaite and included a wide range of topics giving an overview on the implications for ports on the subject of noise.

Ports are usually located close to areas of population and the audience at this session heard the challenges that are faced by noise control engineers and environmentalists in relation to this type of infrastructure, when attempting to ensure the acceptability of noise from port developments. Investigations may also need to extend under the water and consider the noise impacts on marine life. Night-time noise is a particular issue. Amongst other areas, challenges remain in the control of sources of impact noise, such as from container handling. Flexibility in the planning process in relation to environmental noise was evident in presentations from the Netherlands, Germany, Russia and the UK. Of particular interest was the investigation of noise complaints from residents living several kilometres from a port and the use of a detailed micro-meteorological model to help explain the quirks of sound propagation over this extended distance.

The topics and presenters were: Exposure to noise in ports (Luca Barbieri); Noise control in the petrochemical industry (Carl-Christian Hantschk); Container terminal planning (Holger Schuett); Noise management for deep water container terminals (Bernard Postlethwaite); Noise from ro-ro terminals (Rob Witte).

Perception of noise above and below the water level was covered by Dieter Knaus in Noise control of harbours, by Jeremy Nedwell in a paper of similar title; by Piet Sloven on noise from remote Rotterdam Port areas, and by Johannes Hyrynen on noise evaluation of sound sources related to port activities (this paper was incorporated into the session on industrial noise).

Sound propagation over large distances with a meteorological acoustic model, at Rotterdam Port, was discussed by Frank van den Berg. Urban development around ports was described by Miriam Weber, and the session was brought to a close by Marion Bing with her review of urban planning in 'conflict areas' dominated by port noise - the HafenCity solution.

Propagation

Seven papers were presented under this general heading, which included studies of sound propagation in city streets and in rural areas.

Railway noise

In all, some 25 papers were presented on railway noise, its prediction and effects. Papers originating from France, Switzerland and the Netherlands were in the majority, perhaps reflecting those nations' high dependence (and public support of) rail travel, but there were four British authors too. A progress report was given on railway noise abatement in Switzerland, and two papers dealt with the new railway noise propagation model sonRAIL. The properties and effects of railway ballast received attention in three presentations, and the reduction of rail-induced vibration was also a popular topic for research, with five papers. Attention was also given to passenger comfort, noise control for tram networks, and the use of noise barriers to control rail noise.

Road traffic noise, vehicle noise and tyre-road noise

These three related topics were covered in a number of sessions over the three days of the conference. The question was posed as to whether traffic noise be calculated; aspects were discussed of the French road traffic noise prediction emission and propagation programme NMPB '08; a shortened measurement procedure for road traffic noise at night was revisited, and environmental traffic noise pollution in an urban community was evaluated.

The relation between accuracy of emission and propagation calculations in noise prediction models; the equivalence of various road traffic noise assessment methods; and the CRTN shortened measurement procedure for road traffic noise in Ireland was evaluated. Recent approaches to road traffic noise monitoring; the impact of traffic route reconstruction on vehicle vibrations; and vehicle vibration on a bridge with elastic expansion joints were other subject areas.

The influence of heavy vehicles on noise from noise-reducing pavements; temperature influence on noise measurements; pass-by measurements using array techniques; and Swiss research activities on low-noise pavements for urban areas were included in the tyre-road noise sessions. Other topics included a comparison of measurements of tyre noise on roads, and on drum test rigs, and the use of a tyre/road model; how to keep 'reference' tyres stable with respect to noise emission; the prediction of road texture's influence on tyre/road noise; the noise absorption of gap-graded mixtures with rubberised asphalt; the performance of road surface noise performance over time;

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and the acoustical performances of new-generation road pavements, as developed in the Leopoldo project.

The vehicle noise session included papers on the following topics: the driving situations which best represent 'the characteristic sound' of diesel engines; active structural control of contributing panels to improve interior vehicle noise; numerical vibroacoustic analysis of plates with constrained layer damping patches; vibratory decoupling of an automotive engine mount using an FRF-based substructuring method; investigation of hybrid methods to compute the wind noise generated by an automotive rain gutter; a structural modification methodology adapted to a vibroacoustic model to improve the interior noise; analysis of the relative contribution of structure-borne and airborne noise; a two microphone method for determining the height of a moving directional broadband source above a flat ground; a new method of separating noise source contributions in earth-moving machinery; and full-vehicle SEA modelling in the real world.

Room acoustics: hospitals

This brief session included five papers, on typical single-bed hospital wards and the effects of furniture and equipment on reverberation; room acoustic comfort in healthcare premises; HTM 08-01 Acoustics (the standard design reference on acoustic design for new hospitals and healthcare facilities in the UK) and whether it works; noise levels in hospital wards and their detrimental effects on patient wellbeing; and acoustical evaluation of wards in a teaching hospital based on staff needs and issues related to the working environment with respect to privacy and aggressive behaviours.

Sound insulation

There were 27 papers within this wide-ranging and popular category. EN 12354 appeared several times, as did the practicalities and repeatability of measuring sound insulation in buildings and of building elements. The investigation and limiting of flanking transmission moved into some new and innovative areas, and the ways in which building codes in several countries, including France, Norway, Finland, Denmark, Austria and Spain, address sound transmission were presented and discussed.

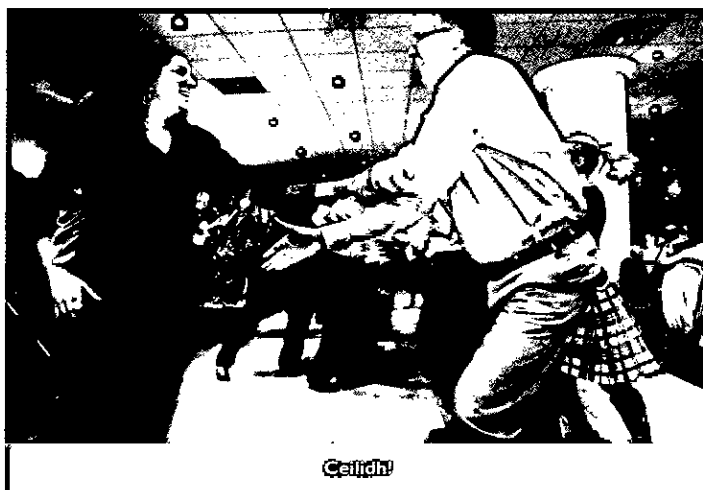
The effects of thermal renovation, window spacer designs, different glass panes, and energy-efficient building products on acoustic insulation performance were examined, and floor impact noise was also covered.

Sound quality labelling

Twelve papers were given on sound quality labelling. They included an analysis of the self-similarity of an environmental sound wave; comfort levels of speech under different illumination; the influence of additional sound on comfort in a living environment; the advantages and limitations of different methods of sound quality evaluation; some aspects of startling noises; the effect of snow on noise propagation of impulsive sounds in the Bavarian mountains; the influence of affective state on loudness judgments of pure tones; improving the sound quality of guiding chimes for the visually impaired to reduce annoyance to the sighted; and how psychoacoustic criteria can be used to evaluate the quality of musical sounds.

Soundscapes

One of the largest structured sessions was devoted to soundscapes, a topic attracting the interest of more and more researchers worldwide, but primarily in Europe. The session ran for two full days in order to accommodate 34 scheduled presentations in all. The session chair was shared by **Giovanni Brambilla, Bennett Brooks, Luis Bento Coelho, Daniele Dubois, Mats Nilsson** and **Brigitte Schulte-Fortkamp**. The



papers presented the state-of-the-art of this multidisciplinary topic, from measurement to analysis techniques, tools for soundscape evaluation and design, description of current projects and case studies, including quiet areas. Questions asked after each presentation and the lively and stimulating discussion at the end of the session on Tuesday were fruitful for planning future collaborations and development of the research areas.

Topics ranged from 'enjoy the silence' through the description of road traffic noise effects, soundscapes in underground shopping streets, an instrument for measuring soundscape quality, the language of aural space, and sound evaluation wherein rumours of the imminent demise of the A-weighted decibel were discussed.

Dick Bowdler asked if simple is better than accurate in terms of the expert becoming distanced from the general public's experience of sound and noise. The concept of meaning in soundscapes with respect to the new experts was explored by Brigitte Schulte-Fortkamp, and the development of the concept of quiet zones within the City of London was reviewed by Claire Shepherd.

Other soundscape topics included an acoustical assessment of cycle paths in urban areas, an acoustical evaluation of public squares used for outdoor concerts, the need for quiet in Amsterdam, and recommendations for public quiet places in the same city, and how a good sound environment in green areas modifies road traffic noise annoyance at home.

Source identification and location

Very near field and far field pressure oscillations generated by the housing of a centrifugal blower; pattern recognition and separation of road noise sources; noise mapping and sound power quantification in the space using a spherical array; sound source localisation and quantification by an inverse iterative method; an inverse retracted single layer formulation for acoustic holography; and underwater ambient noise analysis using wavelet transform and empirical mode decomposition methods were some of the topics covered in this session.

Structureborne vibration

Papers included the CATdB-Tren project, a model for the assessment of vibration impact from new railway infrastructures; frequency-domain source models for railway vibration impact assessment; the isolation from railway vibration of the BBC at Portland Place; vibration and damping analysis of partially damped plates; elimination of internal structural variables through explicit MacNeal modal reduction; model fitting for groundborne vibration transmission; the transmission of structural noise in buildings using a mobility method; numerical and experimental investigation of the acoustic 'black hole' effect for vibration damping in beams and elliptical plates; a topological study of segmented constrained layer damping on a three-dimensional structure and optimisation, using the Nelder-Mead simplex method; a fast-running model for determining the axial vibration of piled foundations; and the measurement of the complex bending stiffness of a flat panel covered with a viscoelastic layer, using the image source method.

Sustainable strategy and noise solutions in urban development and infrastructure

Sustainable acoustics: survive, revive and enhance was the title of Peter Rogers' presentation, which aimed to stimulate ideas for new research in a 'call to action' addressed to acousticians. The role of life cycle assessment (LCA) of thermal and sound insulating materials in the design of sustainable buildings was examined by Francesco Asdrubali, and a means of monitoring urban construction sites for noise and vibration emissions was shown by Christian Freneat. The sound transmission loss through naturally ventilated residential facades was Tim Waters-Fuller's topic, and finally, 'urbines', or urban rooftop wind turbines, were the subject of a paper by Linda Liviani, for whom Stephen Dance stood in, and a comparison between horizontal and vertical axis designs including noise emissions and electrical production ensued.

Ultrasonics

Non-contact transportation using ultrasonic wave levitation was the title of a paper by Nobuo Tanaka. Noise reduction in acoustic disdrometry by Philip Winder reported progress on the development of a novel rain disdrometer to measure the raindrop size distribution using the sound generated by raindrops landing in a tank of water. Guy Caignaert dealt with the need for a knowledge of waves' celerity in ducts with a flow of fluid, necessary in order to get an accurate interpretation of hydroacoustical phenomena or to establish experimental evaluation of pumps or valves transfer matrices. Various methods, from local to global, could be used.

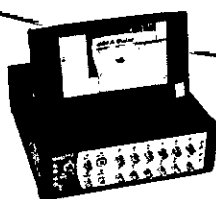
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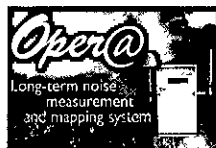
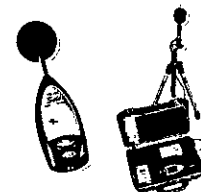
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Noise & Vibration Innovation

Euronoise 2009, Edinburgh - continued from page 19

Uncertainty in measurement and prediction

Topics included estimation of the measurement uncertainties of sound absorption coefficients; airflow resistivity measurement of porous and fibrous materials as function of temperature; analysis of 1/f noise characteristics of geo-signals; factors contributing to uncertainty with in-situ determination of outdoor noise barriers insertion loss; and attenuation of a flight customised helmet determined by Mire (ANSI 12.42) and REAT (ISO 4869-1) methods.

Urban sound propagation

Four papers fell into this classification. The importance of roof shape in the urban acoustic environment was studied by Timothy van Renterghem using a finite-difference time-domain method, and road traffic noise propagation into an inner yard, by means of measurements before and after the construction of gap-filling buildings, was presented by Jens Forssén: the noise reduction resulting from the placement of such buildings was estimated to be a maximum of 8 to 9 dB. Experimental results showing the influence of meteorological conditions on sound propagation between city canyons were also presented by Timothy van Renterghem, who found that the variation in the difference in sound pressure levels in two city canyons was linked to meteorological conditions. Gwenaél Guillaume then looked at the implementation of complex impedance conditions and absorbing layers into a transmission line matrix model for urban noise prediction applications.

Wind turbine noise

Exposure-response relationships for annoyance by wind turbine noise: a comparison with other stationary sources were explored by Sabine Anne Janssen, then acoustic propagation in variable sound speed profiles was considered by Andrew Peplow. A modelling and monitoring approach to wind turbine noise in the Netherlands was presented by Eric Schreurs, and Frits van den Berg asked why wind turbine noise is noisier than other noise. Oliver Bunk investigated daytime and night-time differences in sound emissions of high wind energy systems, and Eja Pedersen wondered how often wind turbine sound was heard by residents living nearby. Marko Horvat's paper on noise and vibration produced by a fan test facility was also presented in this session.

Matthew Harrison's presentation on comparing the regulatory constraints imposed on wind farm developments in the UK (particularly Scotland) with those commonly used and proposed in Australia and New Zealand appeared in the topic session focusing on Scottish experience and practice.

Social events

The non-technical programme is an important contributor to the success of any conference, and this was especially true of Euronoise 2009, being a large international affair. There were formal opening and closing ceremonies, each coloured by the presence of a piper in full highland regalia, and the Scottish branch played its part by arranging a celebratory dinner at a local Italian restaurant. The centrepiece of the event was the conference dinner, held at Murrayfield stadium.

The chairman's dinner at the EICC on Sunday evening was the opportunity for the organisers to ensure that all session chairmen were fully conversant with the audio-visual aids throughout the centre, as well as providing the opportunity for old friends to renew their acquaintance.

The opening ceremony, including welcoming speeches and leading to the first plenary session on Monday morning, was held in the Pentland Suite. The welcome reception (yes, there was a lot of

welcoming going on!) was held in the evening, in the exhibition hall in the basement, a large purpose-built room easily capable of accommodating the 50-odd companies and organisations taking the networking opportunities on offer. This was also the setting for the buffet lunches throughout the conference.

The closing ceremony, including the customary thanks and appreciation for a successful conference, was followed by a closing party 'Farewell to Edinburgh' held in the Strathblane Hall.

Conference dinner

On disembarking from a fleet of coaches laid on for the event, having circumnavigated the stadium about four times before the entrance was revealed, the artificial lighting on the Murrayfield pitch, maintaining grass growth in readiness for the autumn internationals, cast an eerie glow to the rather damp stadium. However, the presidential suite was warm and welcoming (the sparkling wine may have helped) and was dominated by large pictures of the last Scottish team to win the Calcutta Cup. Although rugby union football is an international - and European — sport, only France and Italy compete in the Six Nations apart from the home countries. It therefore fell to a number of English delegates to explain to those from non-rugby-playing nations exactly what the competition, and particularly the Calcutta Cup, means. When held by England, as is currently the case, the original Calcutta Cup is put on public display at Twickenham.

The banqueting suite was a particularly appropriate setting for a semi-formal function, with the two 'top tables' being piped into dinner, and the sound reproduction system meaning that the after-dinner speeches and presentations were clearly heard by everyone: a number of IOA awards were presented. The sight of Sassenachs wearing kilts may have added to the jollity of the occasion (or caused some confusion), but the ceilidh that followed was much enjoyed by delegates, many of whom had never heard of the Gay Gordons, nor stripped a willow in anger.

Acknowledgements

The efforts of the organising committee, under the chairmanship of Bernard Berry, coordinated internationally by John Hinton, are gratefully acknowledged, as are those of the technical programme coordinators, Jian Kang, Greg Watts, Jean Tourret and Joachim Scheuren. The work put in before the event and behind the scenes by the technical programme committee, consisting of Scottish branch IOA members and some from further south (Bob Craik, Bernadette McKell, Bridget Shield, Sean Smith, Jeremy Newton and Briony Williams) was evident in the quality of the final result.

Kevin Macan-Lind and Linda Canty, with the backing of the team at St Albans, kept things under control, Dennis Baylis was exhibition manager, while Penny Berry and Linda arranged the social programme. The efforts of the EAA student network, and the international advisory network of acousticians from 27 countries, should also be acknowledged.

All photographs accompanying this conference report are the work of Simon Williams, of Simon Williams Photography, Edinburgh, whose permission to publish them is gratefully acknowledged. Copies of these and around 900 more photos are available at <http://images.simonwilliamsphotography.co.uk/p45823957> and can be downloaded or printed at a modest cost.

In conclusion, we are delighted to quote Luigi Maffei again.

'On behalf of the EAA, I would like to thank you all of you for the organisational effort and for the nice atmosphere you created in Edinburgh. The EAA product Euronoise Conference, with the 2009 edition, has confirmed its growing interest among European and international acousticians and we look forward to other European outstanding events and activities in which IOA will be protagonist.'

continued on page 22

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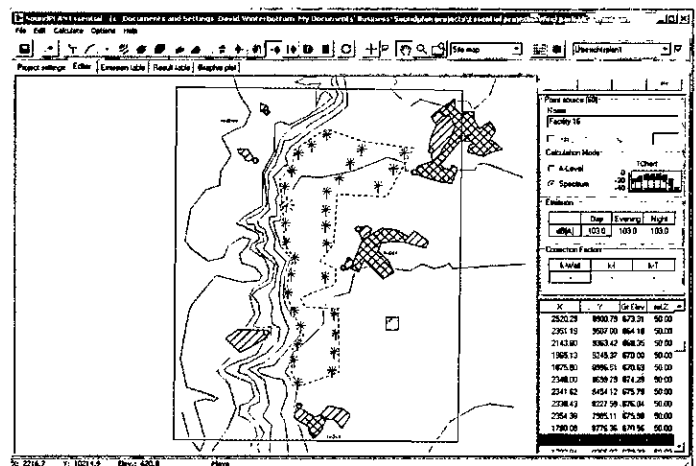
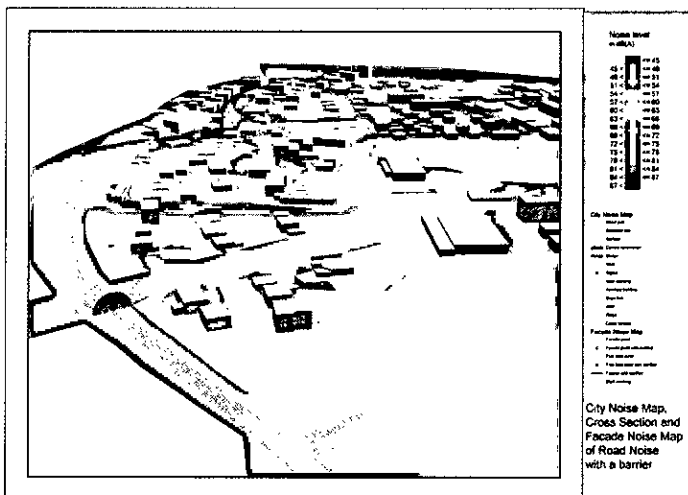
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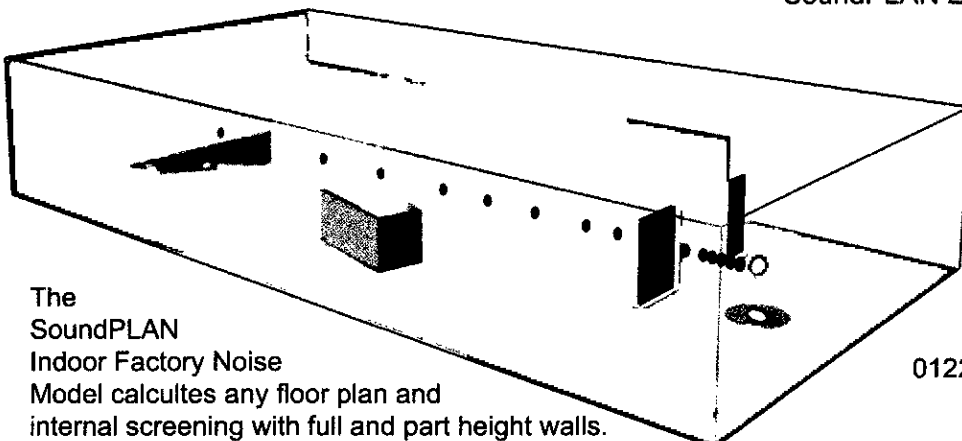
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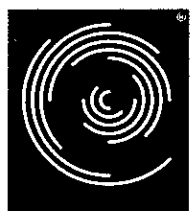


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Euronoise 2009, Edinburgh - continued from page 20



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Exhibitors

Thanks are offered to the following exhibitors for their support at Euronoise 2009.

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Acoustic Camera	www.acoustic-camera.com
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Association of Noise Consultants	www.theanc.co.uk
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Campbell Associates/ Norsonics	www.campbell-associates.co.uk
Ciprian	www.ciprian.com
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GRAS Sound & Vibration	www.gras.dk
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Citations

Presented at Euronoise 2009, Edinburgh

Bernard Berry: Honorary Fellowship

Bernard was born in Manchester and was educated at St Bede's College and Manchester University. After studying Electronic and Electrical Engineering he moved to the Institute of Sound and Vibration Research, Southampton where he gained an MSc in Human Factors in Engineering. He then won a NATO Science Fellowship and spent a year as a guest worker at the National Research Council of Canada in Ottawa investigating the effects of impulse noise on sleep, using EEG techniques.

In 1970 Bernard joined the National Physical Laboratory, the UK national standards laboratory, to work with the late Prof Douglas Robinson, and dedicated 30 years there to an extensive portfolio of activities in research, standardisation, consultancy and policy advice in the field of environmental noise and its effects on people. He excelled at his work which ranged from compiling the first ever 'Leq guide' for the Government's Noise Advisory Council in the 1970s, through directing a long-term consultancy project with the Royal Air Force during the 1980s and early 1990s, to more recent joint EC-funded team projects on the effects of noise on health. He has been a consultant to industry, UK government, the EU, and other national governments, and has collaborated in research projects with a large number of organisations.

In 2001 he left NPL and embarked on a consultancy career, establishing BEL Environmental, continuing his notable work in acoustics. His work at BEL has included an EC project on road traffic and aircraft noise and children's health, and consultancy to the World Health Organisation's European Centre for Environment and Health in Rome. Even further afield he has acted as an expert witness in an environment court hearing in New Zealand for land-use planning at the Christchurch International Airport.

Bernard is very well regarded in the acoustics community at large, having forged many good working relationships throughout his career through a keen participation in many acoustical events and groups in the UK and abroad. Bernard has significantly contributed to many national and international standards committees. He is chairman of the British Standards Institution [BSI] Technical Committee on residential and industrial noise and is a member of the main BSI Acoustics Committee. He is also a member of the ISO Working Group 45 on the revision of ISO 1996, and of WG43 on the revision of ISO 3891. He has participated in many other key noise committees. He is on the National Noise Committee of the NSCA. He represented the UK on the European Union's Future Noise Policy Working Group 2, on noise dose/effects, and is a member of Team 9 'Regulations and Standards' of the World Health Organisation's International Commission on the Biological Effects of Noise. Bernard was a member of the international Committee of Experts of the Netherlands Health Council, which produced the 1997 report 'Assessing noise exposure for public health purposes'. He also assisted the WHO task group in the production of the year 2000 edition of the WHO Guidelines on Community Noise. He was also an expert member of the recently-formed Department of Health *ad hoc* advisory group on the health effects of noise, and of the National Noise Committee of the UK's National Society for Clean Air

and Environmental Protection (NSCA). Bernard is a member of the NPL/DTI project board for a project on environmental noise, within the DTI National Measurement System NMS acoustical metrology programme 2004-2007.

Bernard has been actively involved in the Institute of Acoustics for many years. He was made a Fellow of the Institute in 1994, and was President from 1996 to 1998. He is currently the Institute's vice-president for international relations. He has been on the International Advisory Committee of a number of major conferences, including Internoise 2005 in Rio as well as chairing Internoise 1996 for the IOA in Liverpool. He is of course the chairman for Euronoise 2009.

Internationally, he is an Executive Board Director of the International Institute of Noise Control Engineering [I-INCE], and acts as European editor of the I-INCE journal *Noise News International*. He is convenor of I-INCE technical study group 2 on noise labels for consumer and industrial products, and a member of I-INCE TSG 5 on noise as a global policy issue. He is also a visiting lecturer at the Bahcesehir University in Istanbul. He was the UK nominated expert on the European Union's Future Noise Policy Working Group on noise dose/effects, and was nominated by the UK government to the replacement WG on health and socio-economic aspects. Bernard is also vice-president for Europe and Africa of the International Institute of Noise Control Engineering I-INCE, 2006-2009. He is a member of the editorial board of the international journal *Noise and Health*.

Finally Bernard has consolidated his huge contribution to the acoustics field through publishing over 100 papers in academic journals and conference proceedings, reports and book chapters. He has given more than 100 presentations at many conferences, and is well-known for his wit and his use of well-researched historical references.

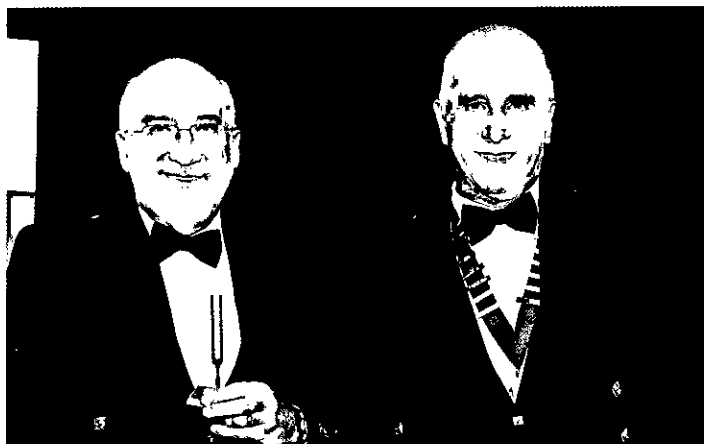
Prof Trevor Cox: Institute of Acoustics Award for Promoting Acoustics to the Public 2009

Trevor Cox is Professor of Acoustic Engineering at the University of Salford. He graduated with a degree in Physics from the University of Birmingham in 1988. He was subsequently awarded a PhD for his research into diffusers at the Acoustics Department of Salford University.

He then worked for two years at South Bank University where he first became interested in projects related to public understanding of science. In 1995, he and Bridget Shield accompanied the City of Birmingham Symphony Orchestra around the country giving pre-concert talks on auditorium acoustics as part of National Science Week. In 2000 they curated an exhibition on concert hall acoustics at the Royal Festival Hall funded by a Royal Society and British Association Millennium award.

Since that time Trevor has become increasingly involved in projects aimed at

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Bernard Berry receives his award from John Hinton



Trevor Cox receives his Award for promoting acoustics to the public

Citations - Euronoise 2009 - continued from page 23

raising awareness of science and engineering, in particular acoustics, among both adults and children. He appears regularly in the national and international media including radio and television.

Recognition of Trevor's energy, enthusiasm and flair for such activities came with his award, in 2006, of a Senior Media Fellowship funded by the Engineering and Physical Sciences Research Council. This allows Trevor to communicate science through various media, while continuing to pursue his teaching and research activities at Salford University. In the past three years he has presented science documentaries on BBC Radio 4 and the BBC World Service, including *The sounds of science*, *Life's soundtrack*, *Aural architecture* and *Save our sounds*. His latest documentary, *Can science master the Strad?* was broadcast on BBC Radio 4 in October 2009. Trevor has also appeared in television programmes on BBC 1 and the Discovery and National Geographic channels, and is the resident scientist at BBC Radio Manchester where he answers listeners' questions on any scientific topic.

In 2005 Trevor was a finalist for Famelab, a national competition to find the new face of science on television. He has gained worldwide coverage in press and television for popularist new stories such as *Does a duck's quack echo?*, *The hunt for the worst sound in the world* and even *What makes a whoopee cushion sound funny* for this year's Comic Relief. He celebrated Halloween 2009 by announcing the results from his search for the most blood curdling scream.

Alongside his media work, Trevor has worked on and run numerous government funded projects to improve the teaching of science and engineering, especially acoustics, in schools. Projects have included developing curriculum resources, CPD materials for teachers and programmes for Teachers TV.

Trevor regularly presents to live audiences. He delivered the Isambard Kingdom Brunel Award Lecture at the British Association Festival of Science in 2002 on Engineering Art - the science of acoustics. He presented the science show *Beautiful music - horrible sounds* to over 4000 school children at the Royal Albert Hall, for the Royal Institution. One of the stage props for the show earned him a Guinness World Record for the largest whoopee cushion in the world. The show has also been presented as a piece of street theatre outside City Hall in London.

A significant mark of Trevor's success in raising awareness of acoustics must be the appearance of Trevor and Daisy the duck (now sadly deceased) on *The News Quiz*, *Have I Got News for You* and *QI*. For this, for his ability to play a good tune on a clarinet made from a Japanese radish, and for his innumerable other activities on behalf of the scientific and acoustics community, the IOA is delighted and proud to award Trevor with the IOA Institute of Acoustics Award for Promoting Acoustics to the Public.

Birgitta Berglund: Honorary Fellowship

Birgitta Berglund has a PhD in psychology received in 1971 from Stockholm University. Her thesis, entitled *An analysis of some basic mechanisms of sensory perception with direct scaling methods*, was written under supervision of the legendary psychophysicist Gösta Ekman. After a Sloan Foundation post-doctoral period at Smith College in USA, she has held research positions at Stockholm University. In 1986 she received a personal chair as full Professor of Environmental Psychology. In 1994 she changed chair and became full professor of Perception and Psychophysics. Since 1980 she has also been affiliated to the Institute of Environmental Medicine at the Karolinska Institutet. In 1998 she founded the Gösta Ekman Laboratory for Sensory Research at Stockholm University and Karolinska Institutet. Today, the laboratory hosts graduate students and senior researchers in several fields of experimental psychology, including environmental psychology, psychophysics, perception, cognitive science and neuropsychology.

Berglund's research has its roots in psychophysics and sensory processes. She has successfully combined basic research on sensory processes with applied research targeted to solve environmental problems. Her research fields include odour perception, psychophysics and measurement, indoor air quality, pain research and the skin senses and, of course, psychoacoustics and environmental noise. She has led a vast number of Swedish research projects and she has been a partner of several international multi-centre research projects. She is currently the coordinator of the EU FP7 NEST *Measuring the impossible network*, which includes leading European researchers on soft metrology, that is, measurement of human perception, interpretation and emotion.

Berglund is the former chairman of the International Commission on Biological Effects of Noise (ICBEN) and founder and former president of the International Society for Psychophysics. She has organized 20 international conferences or symposia among which are the ICBEN congress *Noise as a Public Health Problem* in Stockholm, in 1988. Berglund have published more than 300 scientific articles or monographs, with the vast majority being written in English.

Berglund is advisor to the World Health Organisation on matters related to noise pollution, volatile organic compounds and odours. She was editor of the WHO's *Guidelines for Community Noise*, perhaps the most influential text on health effects of noise ever published. At present she is drafting WHO's forthcoming document on aircraft noise and health which will be published in 2010. Berglund was also deeply involved in the European activity on EU future noise policy and the subsequent CALM project. In Sweden she has served on the Board of Energy Development of the Swedish National Board for Industrial and Technical Developments as well as the Research Board of the Swedish Environmental Agency. Occasionally, Berglund has undertaken consultancy work as a noise health-effect expert, for example, the Terminal 5 project at Heathrow Airport, where she represented a consortium of Local Authorities. For the Goose Bay Environment Impact Statement on noise from military flight training she represented the Innu Nation.

Professor Berglund has made a truly outstanding contribution to the scientific understanding of noise and its impact on human health throughout her career.

Colin Hansen: Rayleigh Medal

The Rayleigh Gold Medal is the premier medal of the Institute of Acoustics, awarded without regard to age to persons of undoubted renown for outstanding contributions to acoustics. There can be no doubt that recipient of the 2009 award, Professor Colin Henry Hansen, amply satisfies these criteria.

Almost his entire academic life has been spent in the School of Mechanical Engineering of the University of Adelaide, but he escaped to the world of full-time consulting during a four year sojourn with Bolt Beranek and Newman in Los Angeles between 1979 and 1983 and a three year period with an Adelaide company between 1983 and 1986. In 1986, Colin returned to academe and worked his way steadily up the promotional ladder culminating in his appointment as Professor and Head of School in his alma mater in Adelaide. In spite of a heavy schedule of undergraduate teaching and postgraduate research supervision, he has run and supervised a programme of research remarkable for its intensity and diversity, which has attracted substantial sums of government and industrial support. He has published over 130 papers in refereed journals and innumerable conference papers.

His principal research activity during the past 20 years has been in the fields of active noise and vibration control in which he is recognised as a world leader.

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Birgitta Berglund receives her Honorary Fellowship

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Citations - Euronoise 2009 - continued from page 24

In the second half of the 90s, he and S D Snyder wrote a vast tome entitled *Active control of sound and vibration* which ran to 1225 pages. Since then he has supervised numerous student projects in this field including the development of innovative algorithms for the optimisation of control system performance, the design and construction of suitable transducers, the development of virtual sensing techniques, and methods for the high frequency spatial control of complex structures. While leading and developing a large and prestigious academic department, Colin has also been very active as a consultant, dealing with a wide range of problems including noise and vibration control, failure analysis, accident analysis and mechanical design.

This broad experience, together with his earlier employment as a full-time consultant, has clearly motivated and informed his concern to disseminate knowledge, understanding and method in the fields of noise and vibration control to those working at the coal face. His name is known to almost everyone who works with noise control for his series of ever-expanding editions of *Engineering noise control*, written with Dave Bies; it is now in its fourth edition of 748 pages. Dog-eared copies of earlier editions grace the shelves of a large proportion of the world's engineering acousticians. He is a keen educator and has written two books that present wide ranges of applications and case studies of noise and vibration control in an easily understood style. *Noise control - from concept to application* presents numerous worked examples to help the reader to develop an understanding of noise control in industrial settings that are valuable to health and safety engineers as well as to students. *Understanding active noise cancellation* is aimed at the non-expert and concentrates upon practical applications rather than theory and algorithms. We in the international acoustics community are privileged to have among us such a versatile, inventive and industrious colleague who, through his research, supervision of students and extensive publications, has made important contributions to the development of engineering acoustics; and a similarly important contribution by applying his skill as a communicator to assist practitioners to make the best use of the results of research.

It is with great pleasure and admiration that the Council of the Institute of Acoustics awards the Rayleigh Medal for 2009 to Professor Colin Hansen.

Paul Freeborn: Award for Distinguished Service to the Institute

Paul has worked in the field of acoustics and noise control for 35 years. He started his acoustics career with the former Greater London Council's Scientific Branch and then moved to the private sector in 1988. Since then, although he has worked for a variety of companies, he is one of a very small group who have achieved such career diversity without once having to undergo a job interview, and for the most part not having change his telephone number. During that time he has worked for LSS, Rendel Science and Environment, TBV Science, Stanger Science and Environment, and Casella Stanger. He is currently a technical director of Bureau Veritas.

Paul has been a member of the Institute for almost all its life: he became MIOA

in 1976 and a Fellow in 1992. He was one of the main organisers of the London evening meetings that started in the mid 1970s and were held initially at County Hall, and then at the LSS/Rendel offices in Southwark. He was a founder committee member of the London branch of the Institute when the branch structure was implemented. He was keeper of 'The Book' for many years (London branch committee members will recognise the reference) and he also organised several IOA one-day meetings during that time.

Paul was also instrumental in the establishment of the London tradition of adjourning to a nearby pub after the evening talk 'to continue the discussion'. On many an occasion, the Freeborn railway timetable ritual could be observed. If after the first one or two drinks, someone were to offer Paul another drink - the railway timetable would be carefully extracted from the inside pocket, scrutinised diligently, and the view taken that he did indeed have enough time for a further swift pint. No-one ever experienced his arriving at the opposite view.

In the 1990s, the opportunity arose for Paul to move his base to Manchester and what was the London branch's loss became the North-west branch's gain. He very quickly became a member of the NW branch committee, helping to organise evening and one-day meetings. He still serves on the committee today. His offices are often used as venues for the NW branch committee meetings - but that proved to be a mixed blessing. The Casella Trafford Park address was apparently a nightmare to find for the committee members since all the roads in Trafford Park look the same. However the main problem occurred on nights when Manchester's premier football team (according to one former president) were playing at home, since every approach road became clogged for hours beforehand: anyone not knowing quite where they were going could end up at Old Trafford football ground, Old Trafford cricket ground, or extremely late for the meeting. Recognising this problem, Paul supported the office move to the current Bureau Veritas premises at Didsbury. This has also presented other advantages - Paul is now able to attend the whole of the committee meetings, since at Didsbury there is a security man on the door and a coffee machine. When at Trafford Park, Paul spent most of the evening either opening the front door for the late arrivals or brewing up for them.

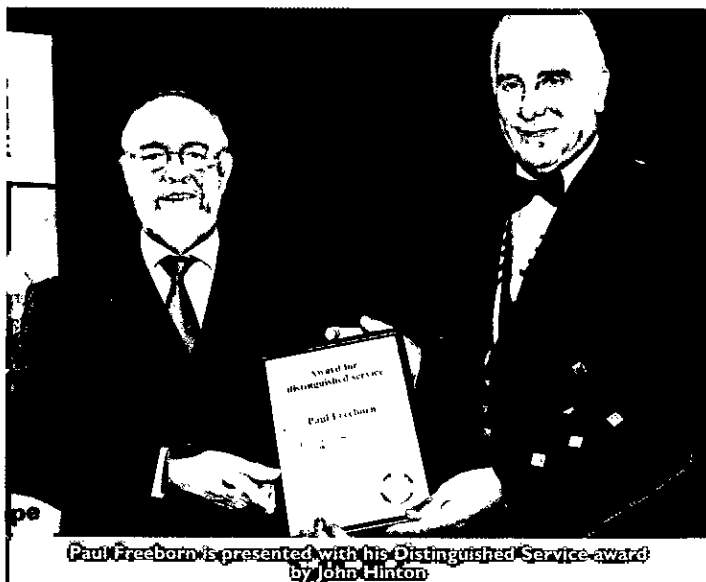
Paul has also served on the Membership committee for 'a very long time', and continues to do so.

His work goes beyond the Institute to the wider acoustical world: He is a member of the UKAS acoustic industry technical advisory committee and is a specialist adviser to the British Helicopter Advisory Board. He also sits on the BSI committee concerned with BS.5228 on construction noise and vibration.

The prosperity of the Institute relies on the goodwill and contribution of people like Paul. He has now decided that he does not have to work a full week any more, so it seems a very appropriate now to acknowledge publicly the debt of gratitude owed by the Institute to Paul. We trust that he will be prepared to continue serving the Institute for many years to come, but in the meantime it is our pleasure to present him with an Award for Distinguished Service to the Institute.



Colin Hansen, Rayleigh medalist



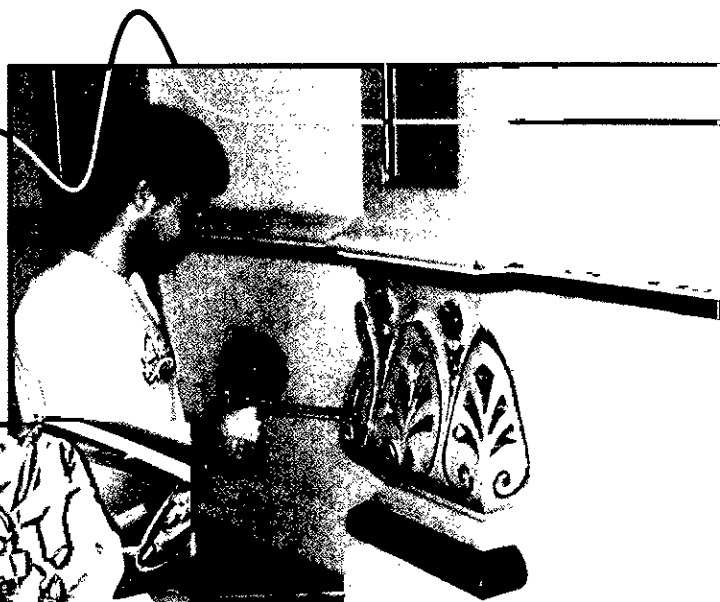
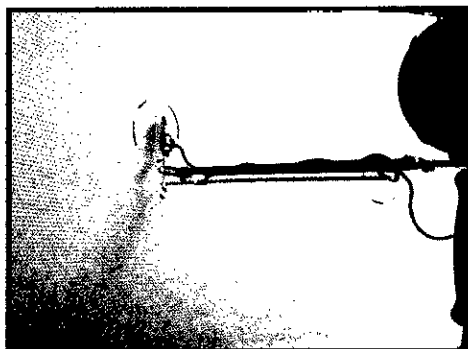
Paul Freeborn is presented with his Distinguished Service award by John Hinton

Microflown Technologies

 Charting sound fields

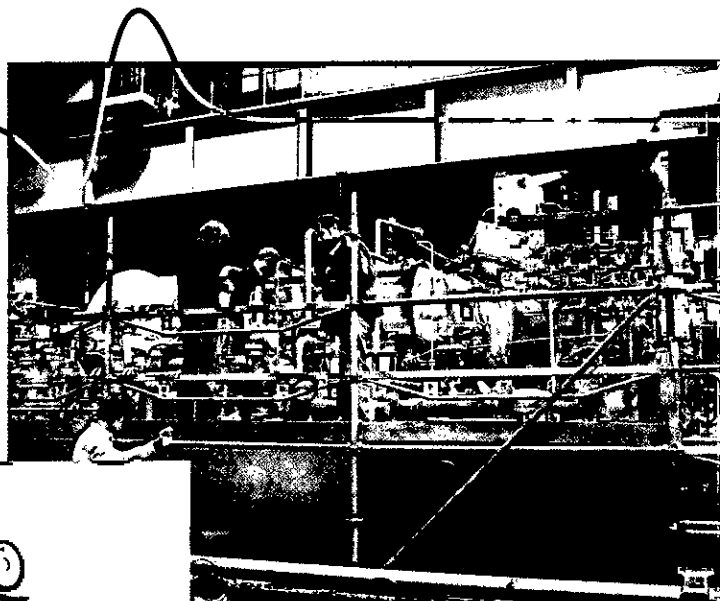
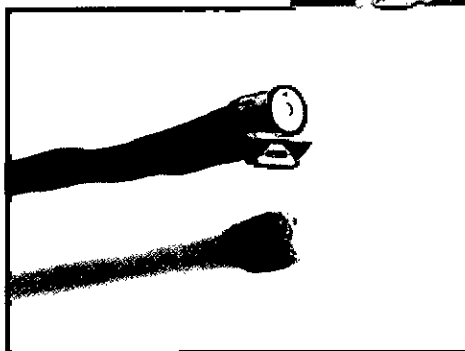
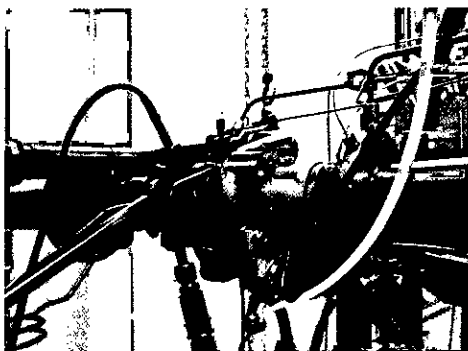
In situ impedance measurements

- ✓ In situ measurements of impedance, absorption and reflection
- ✓ 100Hz - 10kHz
- ✓ Oblique and normal angles of incidence
- ✓ On fixed and moving, flat and curved objects
- ✓ Applicable on soft porous and inhomogeneous materials



PU sound intensity measurements

- ✓ Direct measurement of particle velocity
- ✓ No need for anechoic conditions
- ✓ Low susceptibility to background noise and reflections
- ✓ First truly broad banded intensity measurement
 - Covering a frequency range of 20Hz - 20kHz
 - No need to change spacers
- ✓ Small size, so applicable on small objects



IOA response to consultation

Dr Nigel Cogger. Improving permitted development: Permitted development rights for non-domestic development

Communities and Local Government has been working on simplifications to the planning system for some time, in response to the Killian Pretty review, which recommended that the number of minor planning applications that require full planning permission should be substantially reduced. There are certain classes of development that can take place without a planning application, known as 'permitted development' and the Government is proposing to extend these rights to a number of other developments provided these would not result in significant adverse impacts on the amenity of the surroundings, or would have 'little or no impact beyond the individual property' (*Planning White Paper, Planning for a Sustainable Future*, May 2007). Last year, the Institute submitted a somewhat robust response to the proposals for including micro-turbines on residential properties as permitted development and Nigel Cogger has represented the IOA at more recent discussions on air source heat pumps.

In July 2009, CLG released a further consultation document proposing the extension of permitted development for commercial buildings, which, in addition to allowing extensions and free-standing buildings of limited size, would also permit the installation of air-cooled condensers without the need for planning applications. Consultants and local authority members will be only too aware of the issues relating to air-cooled condensers and the need to control noise from these units, preferably at the outset through planning conditions, rather than subsequent to installation using the Environmental Protection Act, and the Environmental Noise group has therefore reviewed the latest consultation document in this context and prepared the following response on behalf of the Institute.

This review has been prepared on behalf of the Institute of Acoustics (IOA) in response to the invitation to comment on the *Improving Permitted Development: Consultation* relating to non-domestic development, published by the Department for Communities and Local Government (DCLG) in July 2009. The comments are based on a review of the consultation document undertaken by the Environmental Noise group of the IOA on behalf of the IOA Council.

Executive summary

The Institute of Acoustics has reviewed the proposals for an extension to permitted development rights for non-domestic properties and specifically the issues relating to the proposals for use classes A1-A5 and B2, and the installation of air-cooled condenser units serving air-conditioning systems. The IOA agrees that the planning system should not need to regulate development that has no impact beyond the host property, but considers that the proposals to permit the building of extensions to the A3-A5 use classes and new free-standing premises for the B2 use class would lead to an increased risk of an adverse noise impact, which could be prevented by the use of appropriate planning conditions.

The Institute is particularly concerned at the proposals for air-cooled condensers and considers that the criteria to limit noise from air-cooled condensers are inappropriate for the following reasons:

- The proposed limitations are based on an absolute value and not the actual impact of the noise from air-cooled condensers;
- The Consultation Paper does not determine where the responsibility should devolve for ensuring that the installation complies with the proposed criteria;
- The developer is unlikely to know whether the proposed installation will meet the criteria specified;
- The developer has no right of access to neighbouring properties and would not, therefore, be able to determine whether the specified criteria have been met subsequent to the installation;
- The impact of the development will be dependent on existing ambient noise levels and the proposed noise limits could exceed those levels and lead to disturbance and the risk of statutory nuisance;
- There is insufficient control over cumulative effects and no criterion for acoustic character, such as tonality;
- There are unreasonable and unnecessary restrictions placed on the location of condensers that could prevent optimisation of noise mitigation; that are incompatible with the six tests in Circular 11/95 and may also be incompatible with the European Noise Directive and in particular the designation of Quiet Areas;
- The (economic) impact assessment has not taken any account of the costs of statutory nuisance claims in deriving the savings that could accrue from

the proposals, nor the loss of income to acoustic consultants, many of which are sole traders or small businesses.

The IOA concludes, therefore, that permitted development rights should not be extended to buildings in A3-A5 and B2 uses, and to air-cooled condensers, in the manner proposed in the consultation document.

Improving permitted development: Consultation

The IOA, the leading professional body in the United Kingdom concerned with acoustics, noise and vibration, also gives support to the development of legislation in the various disciplines in the field of acoustics and its response to the consultation document is based on this role. The Institute represents a wide range of members and disciplines in acoustics and the comments presented here are the consensus view of the Environmental Noise group, which is formed by members who specialise in environmental noise issues as acoustical consultants, local authority officers and academics. The comments were subsequently passed to members of the IOA Executive for approval prior to submission.

Following changes to householder permitted development rights introduced in 2008, the Government is currently extending the scope of permitted development rights to include certain development works on, or to, non-domestic properties, without requiring an application to the relevant local authority for planning consent. This review relates to extending permitted development rights to most types of commercial buildings and institutions and also to the installation of air-cooled condensers serving commercial properties including shops, offices, institutions, industry and warehousing.

The consultation document implements the *Planning White Paper, Planning for a Sustainable Future*, (May 2007), which committed the Government to reviewing permitted development rights as follows:

'We also propose to extend the impact approach to permitted development to other types of development such as industrial or commercial buildings as appropriate ... our proposals to extend permitted development rights are aimed at reducing bureaucracy for minor applications which have little or no impact beyond the individual property.'

The document also builds on the Killian Pretty review, which concluded that obtaining planning permission for some minor non-domestic development can place burdens on business that are out of proportion with potential impacts.

Of the proposals for extending permitted development rights for non-domestic premises, those relating to extensions to buildings in use classes A3-A5 and B2, and the installation of air-cooled condensers could result in potentially significant environmental noise issues and are, therefore, within the remit of the IOA.

The proposal for extending permitted development to 'shops' includes all retail, financial and professional services, food and drinking establishments, and would permit single storey extensions of up to 50m² to the rear and/or to the side of existing premises. In addition to the current permitted development rights for institutions and industrial buildings, it is proposed to permit new free-standing buildings, provided these are of less than 100m² and at least 5m from the property boundary. These proposals do have environmental noise implications and our comments are given in the following section of this document.

The proposal to permit the installation of air-cooled condensers is, potentially, the most significant of the proposals with regard to the impact from environmental noise. The consultation document proposes that, if air-conditioning units were to be included as permitted development certain limitations could apply, including:

(a) Noise arising from the operation of the unit not exceeding 40dB (L_{Aeq,5min}) at one metre from a window of a habitable room in the facade of any neighbouring property;

(b) Units would only be attached to buildings on town centre uses (as defined above), including shops, institutions, offices and industrial buildings. A limit of 40dB expressed in this way is the same as that [originally] proposed for micro wind turbines in the consultation on changes to permitted development rights for householder microgeneration in April 2007. This noise limit is considered appropriate for the established technology of air-conditioning units;

(c) Units, including any noise attenuating shrouds, would not exceed 8m³ (ie 2m × 2m × 2m);

- (d) Units would not be installed other than at the rear of a building;
- (e) Units would be 5 metres or more from a boundary;
- (f) Units would not be visible from a highway in a conservation area or World Heritage Site.

This response reviews the environmental noise implications of these proposed limitations in the context of questions 6 and 8 of the consultation document:

Question 6: Should permitted development be expanded to include air-conditioning units?

Question 8: In the event that air-conditioning units were to be made permitted development, do you agree with the limitations proposed above? If not, what would you suggest? Are there any other issues that should be considered?

IOA Response to the Consultation Document

Basis of the Response

In section 2, paragraph 4 of the consultation document it is stated that

'Changes to householder permitted development rights were introduced in October 2008, based on the principle that developments could take place as permitted development if there were no significant adverse impacts on the amenity of the immediate surroundings'.

Furthermore, at paragraph 5, the Government's 2007 White Paper Planning for a Sustainable Future is cited as committing the Government to extending the impact approach to permitted development

'... to other types of development such as industrial or commercial buildings as appropriate... our proposals to extend permitted development rights are aimed at reducing bureaucracy for minor applications which have little or no impact beyond the individual property'.

The IOA's response to the proposals is based on these fundamental policy statements that there should be no significant adverse impact, or little or no impact on the amenity of the immediate surroundings.

Extension of permitted development to commercial buildings

Extensions and new free-standing buildings

The IOA considers that the extension of permitted development to allow free-standing buildings to be added to commercial sites can increase the risk of buildings housing noise emitting plant and equipment being located close to noise-sensitive properties, without any planning conditions limiting noise emissions. It is appreciated that such development can currently occur for certain use classes within the existing permitted development rights (particularly for use class B2), although this is controlled to some extent by the restriction that such development must be attached to the existing building(s).

Extensions to restaurants, cafés, drinking establishments and hot food takeaways

We believe that the proposed change to 'shops', which is also to cover use classes A3-A5 is of greater significance and could result in an increased noise impact on nearby properties, where such extensions may be used for regulated entertainment (music and dancing), or could incorporate noisy plant, such as kitchen extract systems. The proposal could reduce the distance between noise-sensitive premises and noise emitting areas of the building, with no controls to ensure adequate sound insulation of the building envelope, or control of plant noise through planning conditions. Whilst it is recognised that the Environmental Protection Act and, where appropriate, the Licensing Act can be used to control noise from ventilation plant and premises providing regulated entertainment, we believe that such retrospective action is both more costly and less effective, to either the operator of the premises or the occupants of any nearby noise-sensitive properties, than the use of planning conditions to prevent problems arising in the first place.

The Institute believes that the proposed change should not be extended to premises such as those in use classes A3-A5 where noise emitting plant could be installed and regulated entertainment could occur, so that appropriate planning conditions can be imposed on extensions to the premises to ensure that there is no adverse impact from noise.

Air-cooled condensers

In responding to the proposals for air-cooled condensers, and in particular questions 6 and 8, the Institute has concluded that the limitations proposed do not adequately address the potential adverse impacts of the permitted development rights relating to air-cooled condensers and considers, therefore, that permitted development should not be expanded to include such equipment.

To justify this conclusion and also to answer question 8, this response deals in detail with each of the limitations proposed.

Limitations (a) and (b)

Impact based approach

The Institute is familiar with and favours an impact approach to the assessment of noise. Furthermore, it agrees with the view that the planning system should not need to regulate development that has no impact beyond the host property.

There is, however, no definition of what would or would not constitute a significant adverse impact, or of the term *little impact beyond the individual property*.

In the Institute's view, whilst assessment against absolute criteria may be appropriate in some circumstances, the impact of a development should normally take account of the change from the pre-existing situation that results from the development, at some prescribed location. In terms of noise, this is generally accepted as the difference between the noise level resulting from the development and the pre-existing noise level, often expressed as the background noise level (the noise level exceeded for 90% of a representative time period or L_{A90}), or as the energy average of the ambient noise level (the L_{Aeq}). An example methodology for such an assessment is provided in BS 4142:1997, *Method for rating industrial noise affecting mixed residential and industrial areas*.

The use of an absolute value, such as the limit of 40dB L_{Aeq} for external noise at 1 metre from a façade does not define an impact. In areas where background noise levels are low, this limit could represent a significant change in the environment at the receiver location and, hence a significant adverse impact. The specific noise limit proposed, therefore, does not address the matter of ensuring that the permitted development has no significant impact beyond the host property and is, therefore, inconsistent with the policies expressed in paragraphs 4 and 5 of Section 2. Such situations are not rare and could obtain across large areas of urban development, particularly at night.

In the Institute's view the impact of noise from external air-cooled condensers can only be derived from relative criteria that address the change in noise level resulting from the development. In fact, the noise policies of many local authorities require that the noise level resulting from any new noise generating development should be less than the pre-existing background noise level (usually by 5 or 10 dB) to ensure that the impact is not significant and that there is no perceptible change in the ambient noise levels, either as a result of that development, or, indeed any future developments.

It is well known that any character, such as tonality or impulsiveness in the noise emitted by a source, can result in the onset of disturbance or annoyance at a lower level than for bland continuous noise. This is normally accounted for by setting lower criteria for sources with such character, or by adding a correction to the specific noise level of the source. In BS 4142:1997, cited above, for example, a 5dB correction is used for aural character.

Location of receiver

The limit proposed is restricted to the window of a *habitable* room in the facade of any neighbouring property. In practice, this excludes any consideration of gardens or other outdoor amenity spaces, or, indeed commercial accommodation, such as offices, doctor's surgeries, etc, that may also be noise-sensitive. Noise levels at these locations could, therefore, be significantly higher than the proposed limit and result in a significant adverse impact.

Cumulative effects

There is no mechanism in the proposals for controlling the cumulative effect of the proliferation of air-cooled condensers on buildings in a particular locality, where property densities may be high. An example could be where a noise-sensitive property is approximately equidistant from four commercial buildings, each of which installs a unit to meet the limit of 40dB L_{Aeq} at 1m from the nearest window. The total noise level at that property is then 46dB L_{Aeq} , 6dB above the proposed limit. Similar problems would arise from multiple units installed at the host site.

Further increases in noise level could occur at the receiver property if it is also affected by noise from other permitted development, such as the installation of air-source heat pumps and/or micro-turbines.

Long term effects

The long term aspects of air-cooled condensers installation have not been considered in the consultation paper. Any mechanical deterioration could lead

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IOA response to consultation - continued from page 29

to an increase in noise levels in time and thereby cause the air-cooled condensers to exceed the specified criteria. It may be necessary to impose an accredited maintenance regime, with renewable certification if appropriate, to ensure that long term deterioration in the installation does not give rise to an unacceptable impact.

Responsibility for ensuring compliance

There is no reference in the consultation document as to who is to assume responsibility for determining whether there is any impact beyond the host property. Is this to be the local planning authority, the installer, or the occupant or owner who proposes to install the unit? It is most unlikely that the installer, occupant or owner would have either the necessary equipment or knowledge to undertake suitable measurements. Additionally, there is no right of access to a neighbouring property to undertake measurements to check whether the criteria have been met. In practice it may also be necessary to assess the impact at several neighbouring properties.

Furthermore, there is no indication of the conditions under which the measurements to determine compliance are to be undertaken. It would not be possible to determine compliance if the noise from the air-cooled condenser is less than approximately 3 to 5 dB above the ambient noise level.

The use of sound power levels for defining noise emissions from plant and machinery is now well established and labelling in accordance with EU Directives on noise enables products to be selected on the basis of noise emissions. Under such circumstances, the manufacturer could provide guidance on noise levels of air-cooled condensers at specified distances and whether or not there may be a risk of exceeding any established noise criterion. However, reflecting surfaces may increase the received noise level and obstructions may reduce it and, whilst advice on such matters can be provided in product information and the possible receiver level of the installation determined, advice from a competent person may be required. Notwithstanding the methodology used to define noise emissions and receiver levels, the matters discussed above regarding problems with absolute limits would still be applicable.

Limitation (c)

The limit on the size of units is understood to be to control the visual impact, but the suggested dimensions bear little relationship to the common sizes of condensers. The reference to 'attenuating shrouds' may be of limited value, as air-cooled condensers, particularly those likely to be relevant to these proposals, are difficult to enclose without impeding airflow or causing recirculation of air. Condensers are often located at high level and attenuating shrouds are unlikely to be practicable in these circumstances.

Limitation (d)

This limitation is presumably based on ensuring that development is not visible from the street, and disregards any acoustical implications. It may be advantageous acoustically to locate condensers other than on the rear façade of buildings, either to maximise the distance from noise-sensitive properties, or to take advantage of screening.

The rear of the property is likely to be the quietest façade, because of screening of highway and other noise, and the background noise level at any property adjacent to the rear would also be expected to benefit from this relative tranquillity. The condenser may, therefore, give rise to the maximum impact when located at the rear of a building.

These issues could outweigh any visual implications of the condenser location and limitation (d) seems unreasonably and, indeed, unnecessarily restrictive. The proposed limitation does not, therefore, comply with the six tests for the validity of planning conditions, as defined in Circular 11/95, *The Use of Conditions in Planning Permissions*.

Limitation (e)

Limitation (e) can also be unnecessarily restrictive and prevent the unit from being in the optimum location to minimise the noise impact, particularly if the 5m limit is the distance from any boundary, rather than simply the nearest boundary to a noise-sensitive property. The limitation as expressed is open to interpretation and, clearly, is ambiguous. Again, the limitation does not comply with the requirements of Circular 11/95.

Limitation (f)

Whilst not apparently an acoustics issue, this limitation appears to be based on the presumption that visibility of the unit from any other open area, public footpath, or, indeed, window that is in a conservation area or World Heritage

Site is of less importance than visibility from the highway. In acoustical terms, the highway is generally the noisiest location and the environmental noise impact of the unit is likely to be minimised if located adjacent to a highway. A unit located such that it is not visible from a highway could give rise to a greater impact to an area of relative tranquillity that may also be a Quiet Area as defined in Articles 3(l) and 3(m) of the European Noise Directive.

Impact assessment

The Institute has reviewed the impact assessment of the proposals, on the basis of question 20, in Annex B.

Question 20: Do you think that impact assessment work undertaken broadly captures the type types and levels of costs associated with the policy options?

An impact assessment has been undertaken of the proposals, which concludes that savings in the administrative burden of making planning applications of between £20m and £60m could result from extending the scope of permitted development. Notwithstanding the extremely high level of uncertainty in these estimates, it is significant that the possible costs of resolving claims of statutory nuisance under the Environmental Protection Act 1990 have not been considered, although these costs to both the local authority responsible for implementing the Act and to the operator for defending the allegation of statutory nuisance can be considerable and in the range of tens of thousands of pounds. Furthermore, it is stated in the Annex B *Summary: Analysis and evidence*, that total annual cost to the (unspecified) local organisations responsible for enforcement is unknown.

It is also of concern that in the Annex B section *Specific Impact Tests* it is stated that 'there should in general be no adverse impact on small firms from this proposal', however, the loss of income to acoustical and noise consultants who would otherwise provide advice to ensure that any adverse noise impact of installations is adequately controlled has not been considered. Such fees vary with the complexity of the installation, but can often be within the range £500 - £3000 per application.

Conclusions

While the Institute appreciates the rationale for simplifying the planning system to reduce the burdens on business that are out of proportion with potential impacts, it believes that the proposals for extending permitted development to commercial properties and particularly to those in use classes A3-A5 and B2, and to air-conditioning units, are not compatible with the Government's commitment to ensuring there are no significant adverse impacts on the amenity of the immediate surroundings.

The Institute believes that the extension of permitted development for free-standing buildings in industrial use would lead to an increased risk of disturbance to neighbouring noise-sensitive properties. The proposal to permit extensions to use class A3-A5 premises without conditions to ensure adequate sound insulation and plant noise control poses a particularly high risk and we believe such premises should be excluded from the proposed changes to avoid adverse noise impacts.

The proposed limitations on air-cooled condensers are not based on impact, but simply require the unit to meet a noise limit that does not take account of the existing noise environment, nor any tonality or other character in the emitted noise.

No account has been taken of the cumulative noise effects of a proliferation of permitted developments over time in the setting of noise limits.

The consultation document does not determine where the responsibility should devolve for ensuring that the installation complies with the proposed criteria. It is, therefore, difficult to see how the proposals can be enforceable. It is, however, granted that the provision of sound power data and advice on distance and the effects of reflections could be provided to assist the operator and installer to make an informed choice of air-cooled condenser to meet any noise limits specified.

The Institute is concerned that the proposals place unnecessary restrictions on the possible location of units that appear to be based only on the visual implications at the front of premises and take no account of optimising the location to minimise noise impacts.

The IOA is also concerned that the (economic) impact assessment has not included significant cost implications arising from claims of statutory nuisance, nor the loss of fees to acoustical consultants for studies to support planning applications for condenser installations.

The Institute concludes that permitted development should not be expanded to commercial buildings in use classes A3-A5 and B2, nor to include air-cooled condensers, unless it can be demonstrated that there would be no significant adverse impacts on the amenity of the immediate surroundings. The current proposals do not provide this assurance.

Dr Nigel Cogger CEng FIOA - For and on behalf of the Institute of Acoustics

Reproduced Sound 25, Brighton

Allen Mornington-West. Conference Report: 19 and 20 November 2009

This year's Reproduced Sound conference was held at the Thistle Hotel in Brighton on 19 and 20 November. It was a special event which celebrated 25 years of contributions, papers, tutorials and discussion on the very wide range of topics which come under the scope of the electro acoustics group of the IOA. Following a format which has become highly valued we started with a tutorial session on the evening before the conference. There are awards to be made during the conference and the evenings are, as ever, a time for demonstrations of new technical achievements and for networking colleagues. This conference had it all.

The tutorial session was in two parts. The first part, presented by Helen Goddard and Paul Malpas, demonstrated and talked about the sounds which characterise audio test signals. The second part was a brilliant demonstration of the mathematics lying behind the concept of spherical wave fronts given by Dr Phil Nelson of Southampton's ISVR. The maths was graphically supported by the results of MatLab modelling courtesy of Filippo Fazi. This was good primer content for those needing to understand analytic work in acoustics.

Thursday 19 November

Allen Mornington-West opened the conference at 08:45h the next day – audio gals and guys start early! – and welcomed delegates to the 25th conference. John Hinton – the IOA president – stepped up to announce that the IOA was presenting Peter Mapp with the Institute's Distinguished Service Award, and Bob Walker read the citation. The award recognises the contribution which Peter has made to acoustics and the practice of intelligibility in particular. Peter Mapp is well known to Institute members, especially members of the electroacoustics group. He joined the Institute in 1976, only two years after its founding, and has been a member continuously for 33 years. Peter holds an honours degree in applied physics and a Masters degree in acoustics.

Peter presented two papers at the first Reproduced Sound Conference in 1985, one of only six or seven delegates from that year who still present papers regularly. He has presented or co-authored papers at nearly all of the RS conferences ever since, sometimes two or, on one occasion, three. As a measure of distinguished service there can hardly be a more impressive record. Peter served on the organising committee of the first conference and subsequently on many more and is indeed the longest serving member of the electroacoustics group committee.

In 2003 Peter became the first UK recipient of the Institute's Peter Barnett Memorial Award in recognition of his work and research in the fields of electroacoustics and speech intelligibility.

In addition to his Institute contributions, Peter is a major contributor to UK and international acoustics and is a well respected authority. He is the principal of Peter Mapp Associates and has a special interest in speech intelligibility prediction and measurement. He has presented a large number of papers on aspects of those topics in the UK, Europe and the USA. He is an internationally recognised authority in the field. Peter is also the author of the Audio System Designer, an acoustic and electroacoustics reference book and is a contributing author of several other international reference books including The Loudspeaker Handbook, Handbook for Sound Engineers, The Audio Electronics

Reference Handbook and Acoustics in the Built Environment. He has authored or co-authored over 100 papers and articles on acoustics, sound systems design and speech intelligibility.

The Institute is indeed fortunate to have such a distinguished and expert contributor to its activities and the award for distinguished service to the Institute is made in recognition of his substantial contributions over many years. It is fully deserved.

Paul Malpas chaired the first session, *Assessing audio quality*, which set off with a review of measurement of reproduced sound from Peter Mapp.

Peter's presentation was punctuated by some well chosen humorous slides which helped to bring the many points home. Perhaps you have a problem with hearing birdsong and wind in the trees? Well, it may be that your iPod earpieces have fallen out! It is time to start to listen. From early times intelligibility has been an issue. Resonances and variability in frequency response in a space give rise to poor intelligibility assessed by STI. This prompts the question of what factors do affect quality, and timbre, loudness and spatial distribution are included amongst the factors which are considered relevant. The hearing range of humans has been often measured and the average response is incorporated into standards. Other animals have a response which can be greatly different though it is not clear how the measurements might have been achieved. But measurements may not relate to what we perceive. Our sense of frequency is time-dependent and reverberation – not echo – is essential. Measurements which measure similarly may have greatly different perceptual effects and reflections may result in deep nulls for which equalisation can not compensate. Designers need to have the target use of a space in mind before being prescriptive. In response to a question from the floor Peter noted that Mozart was never writing music for 2500-seat auditoria. The task of bringing architects and clients to understand about the physics and reality of space for its intended function is a tough and ongoing one with which acousticians must work.

John Taylor continued the theme of audio quality in his presentation on theatre sound design. He discussed a project he carried out using a stereo dummy head to capture sound and to investigate the way in which our perception of direction was dependent on an accompanying video image. He reviewed the underlying physics of binaural hearing and demonstrated the reliance of vision to complete the audio effect. The same effect can be achieved but it may require closing the eyes to remove visual stimulus until the brain asserts the audio image.

The third paper in this session came from Steve Fenton who talked about an objective measurement of audio using a multi-band dynamic range analysis. These days reproduced music is highly manipulated at the production stage in order to achieve what is referred to as 'release quality'. If there is a valid measure for perceived evaluation of audio quality (PEAQ) then it would need to return valid answers in the face of ever-increasing amounts of dynamic range compression. Steve showed how dynamic range in released recordings had become progressively reduced from 1985 to the current day and noted that

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Kevin Macan-Lind assisting Peter Mapp in his demonstration
(it sounds a bit tinny)...



RS25 audience

Reproduced Sound 25 - continued from page 31

none of the dynamic range meters in the market place adequately assessed this. He has started an initiative to have record companies label their releases with the dynamic range so that listeners may have some idea of what to listen to. He looked at how compression styles might affect the PEAQ using a commonly used compressor system. He noted that some anomalous results arose because, on compression, some musical items showed an increase in HF content. This pilot study prompted him to look at that relationship between LF, MF and HF bands in the compressed musical samples. This suggested that greater subjective quality in compressed music might arise where there was greater deviation between the frequency bands, very much an area for future work, he noted. In questions he clarified that the Orban loudness meter was used to set the music samples. Neville Thiele noted that since the earliest days - in this case the late 1950s - record companies had imposed a policy of overall compression though some early releases were almost clear of such manipulation.

Reproduced Sound conferences have always hosted a small exhibition - nothing too grand, perhaps at most a dozen stands. Exhibitors gain highly valued access to decision makers and consultants in the industry and it allows delegates to discuss the preceding presentations and network others over a coffee. Helen Goddard opened the second session entitled *Assessing audio quality* and introduced Tony Andrews to talk on audio focus.

Tony's premise is the thought that professional audio has perhaps lost its sense of direction. Its practitioners produce sounds which suffer from poor transient response and this results in an auditory experience which he describes as smeared and lacking focus. The core argument is this: a poor transient response will result in a poor subjective experience. He notes work suggesting that the human hearing can resolve sounds separated by two degrees of arc in the horizontal frontal plane — an interaural difference which may be equated to some 18µs. This, he suggests, should guide the placement of loudspeakers in multi-unit arrays, as multiple deliveries of the same transient will lead to defocusing the sound image. He comments that in many cases he has observed professionals setting up large systems using MP3 music files and being immune to the low sound quality that these may produce. Without accurately recorded sound sources, lining up a system is unlikely to be optimum. Frequency response, he argued, was not the arbiter of reproduced transient quality.

Traditionally the RS conference is the time when the Institute presents the Peter Barnett Memorial Award. In some years this is done during the conference dinner and at others it forms a simple ceremony followed by a lecture by the recipient. This year's recipient was Neville Thiele and his fellow countryman from Sydney (Australia), Glenn Leembruggen, read the citation. Neville, he said, should be amongst the first of those technologists and scientists whom Australia should start to celebrate perhaps before sportsmen — noting, perhaps, that Australia had relinquished the Ashes to England. Neville is perhaps best known in the audio world for his work on loudspeakers back in the days when there appeared to be too little science applied to the

challenge of quality. His work with Dick Small gave rise to the Thiele-Small loudspeaker parameters. These allow loudspeaker driver electroacoustic performance to be predicted after performing a few simple electrical measurements. Neville's career spans much more than this: from time spent in the Indonesian jungle during WW2, formative time with EMI in the UK right through to being a Fellow at the Faculty of Architecture Design and Planning at the University of Sydney, one of the first universities to institute an audio faculty. John Hinton presented the Peter Barnett Award to a very warm round of appreciative applause.

Appropriately, Neville's presentation centred on the derivation and use of the Thiele-Small parameters and on their many ramifications. Neville noted the founding work on matters acoustical of those such as Leo Beranek who identified the use of electrical analogues in acoustics. The full detail of his talk is well laid out in the paper, a very worthwhile read. He concluded with the observations that the Q_T of a loudspeaker driver and the volume of the loudspeaker enclosure - vented or unvented - can be manipulated to achieve a range of responses with roll-off characteristics which could be engineered to be Butterworth (maximally flat) or Tchebchev (maximum frequency response). He also noted that the sensitivity of a system to loudspeaker driver ageing was very low due to the counteraction within the elements which composed the Q_T parameter. Neville paid tribute to his long-time colleague Dick Small, now working in USA, noting that they had enjoyed a lifetime of collaboration and friendship over many decades.

His was a hard act to follow, so what better than to introduce yet another award winner. Peter Mapp read the citation for the Peter Barnett Student Award which was presented to Emma Greenland by John Hinton. Since graduating Emma has focused on the acoustics of classrooms and schools and has rapidly become recognised as a specialist in this area. She works with national standards bodies setting standards and determining strategy and notes the recent document from the DCSF (the UK government department of children, schools and families) which sets out a mandatory acoustic performance which will be applied in Building Control.

Emma introduced the topic as arising from work which she had carried out in the course of her PhD. It followed a paper which she had heard in 2003 as a student at RS19. Classically, speech intelligibility is concerned with imparting emergency information in situations where the ambient noise may impede intelligibility. These criteria are not necessarily those required of all types of pupils or in all teaching situations. The current criterion for classrooms is an STI rating of at least 0.6 and this may be compared with the target value for adult listeners of between 0.6 and 0.75. In schools, however, other STI values may be more relevant. Some 80% of children with hearing difficulties are now taught in mainstream schooling and intelligibility does depend on age and message complexity. Although children in the 11 to 15 year age group can achieve 95% intelligibility scores in an environment with only 1dB SNR (equivalent to an STI value of 0.5) there is a benefit in increasing the SNR as this reduces the effort needed. Evaluation with younger children requires better test materials. What makes evaluation and implementation more tricky is that some 18 modalities of learning

can be identified: intelligibility in the classroom is not the same as emergency message intelligibility. Each modality has its tolerance to noise. Emma discussed some of the measurement work she carried out and this suggested that for secondary schools (in the UK these are schools which cater for 11 to 15 years age group) an STI rating of at least 0.6 is perhaps about right, but for primary schools (age groups from 5 to 11) higher values of STI are needed. Some variation is needed within a space in order to accommodate learning modalities and counselling modalities. Following questions she explained that there were conflicts between the acoustical performance and environmental performance requirements, and that in classrooms where English is not the first language of those attending, higher STI values would be beneficial.

Lunchtime, and the opportunity to discuss the impact of the two award papers can be taken. A particular thought is that investment in good acoustical performance in schools should have a long-term beneficial effect on the economy and on the cost of social deprivation. RS covers much more than just the sound.

Sam Wise - the chairman of the IOA's electroacoustics group which establishes the RS conference - chaired the first session after lunch. The first paper in the topic area, *Low frequency room acoustics*, was from Matthew Wankling who discussed his studies into modal density and its effect at low frequencies. The initial observation is that the higher the modal density the more even is the response at low frequencies, and the question then arises as to what is the room size at which the perceptual ideal is reached. Matthew used auralisation in his procedure

and selected as his largest room one of 100,000m³. All of his rooms had the same reverberant field decay time which, he acknowledged in questions later, was not natural. His initial finding was that room volume is not the single perceptual issue at low frequencies as an increase in modality did not relate to an increase in perceived improvement. Future work, he acknowledged, might look at the spacing of low frequency room modes.

Adam Hill's paper was co-authored with Malcolm Hawksford who has been a frequent presenter at RS conferences. Adam's sights were set on providing a set of visual tools to allow LF room modes and room shapes to be investigated. Non-rectangular room shapes were included though some features such as frequency dependence of absorption was not included. He noted the impracticality of restoring a null response due to a cancelling room mode by adding equalisation. Adam noted that the use of a sub-woofer in anti-phase to create a cardioid LF response had been found to be useful for orchestras because of the increased clarity it provided for the players.

Philip Newell is a frequent presenter at RS conferences and, at this conference, he talked about the room-to-room consistency at LF of mixes for cinema release. The idea was to evaluate the performance of cinema spaces at LF by asking a number of experienced sound engineers to establish a satisfactory mix primarily involving a bass drum and a bass guitar with a simple acoustic guitar accompaniment to be

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mixed into the background. Evaluation would be a comparison of the relative levels used for the bass drum and the bass guitar. The hypothesis is that rooms vary significantly in their LF performance and thus a mix established at the production stage may often be judged lacking when it is finally presented. The target was to try this out in some 42 English cinemas but there was a hitch: most cinemas wished on the one hand to be able to say they had achieved a satisfactory result, but on the other, they could not permit such work in case it failed! Luckily some 15 cinemas accepted the anonymous challenge and seven sound engineers were found to take part. Most cinemas are certified to achieve performance criteria established by Dolby Laboratories and so should achieve some uniformity. The first results indicated that the engineers' view of a satisfactory balance in any one space was very consistent. Defects seem to arise because equalisation had been used, possibly after certification, and that this had an impact on the intelligibility of the theatre sound. Philip noted that the findings were consistent with the lessons he had learnt 30 years ago or more. He had recognised that the custom at that time of inserting third-octave graphic equalisers made it next to impossible to transfer work from one studio to another and achieve a consistent result. The answer was to remove all the equalisers from the signal chain. The mix down was done into mono and that an acoustic guitar element was simply there to provide a musical reference.

After tea Allen Mornington-West introduced the first of the conference's sessions on *Intelligibility*. David Gilfillan's company has been working on train announcement systems on Sydney city's railway network with Glenn Leembruggen's team of associates. It has been a project which has spanned a number of years and required their companies to investigate novel approaches to solutions. It has also led them to question some of the commonly held notions which underlie STI based speech intelligibility ratings. In a talk entitled 'What did they just announce?' David explained that the rail network handles some one million passenger movements daily and that the brief they were given was truly brief: they were to provide intelligible announcements and provide passengers with a sense that all was under control. David reviewed the performance of available announcement systems and the two main contenders showed broadly similar technical performance. Both delivered STI ratings in the region of 0.8 for noiseless background and 0.6 under conditions of usual noise. However, there was a clear subjective preference for one of the systems and the client accepted the recommendation. A loudspeaker driver was selected to meet the exacting criteria and some novel adjustments made to its enclosure. The overall cost over-run compared with a more conventional approach reflected the balance between the cost of DSP against the cost of simpler cabling, fewer loudspeaker units and greater system flexibility. An ongoing challenge for rail service announcement systems is that of managing to produce a voice signal which is adequately greater than the prevailing background noise at the time. Ideally real-time noise cancellation would be used and the hunt is on for a suitable working approach for this which will doubtless be a topic for a future paper.

Christopher Nicolaides is one of AMS Acoustics' young staff members and in his spare time he has been investigating the spectral balance of male and female voices used in the standard Harvard phonetically balanced word score tests. The Harvard suite of sentences consists of 100 sets of ten sentences in which each phoneme is represented in the same proportion as is found in common English speech. Christopher recorded a series of male and female speakers, taking great care over microphone distance and placement, rate of delivery and, perhaps most importantly, flatness and traceability of the recording signal chain. Comparing the results showed a consistent difference in his recordings between the male and female spectra in the 8kHz region. Comparison with the BS EN 60268 spectra showed a greater difference with the male and female voice spectra specified in the Standard being significantly lower in the mid-frequency and high-frequency range. In response to a question he reckoned that future work would benefit from a larger sample and some experimental work to show how speech spectrum shape affected STI evaluation. He also acknowledged

that voice accents may make a difference in evaluation particularly for those for whom English is not the primary language.

The final speaker on the first day of the conference was Wolfgang Ahnert who talked about the importance of achieving a correct impulse response assessment, essential for intelligibility prediction and for auralisation. Wolfgang has had a long interest in the ever-increasing power of computers to take the guesswork out of acoustic design. The increase in speed has allowed a number of acoustical features to be incorporated including absorption values greater than unity, frequency dependent scattering coefficients, and evaluation at low frequencies. In the early days — Wolfgang reminded us that computing power was hard to obtain in East Germany until 1989 — it was relatively easy to compute the acoustic performance of simple square boxes. More modern challenges require the evaluation of acoustic spaces in which there may more than 1500 individual surface elements each with absorption and reflection behaviour. Some simplifying assumptions are possible, ignoring dead space for example, but the most recent progress has come from using multi-processor computers and, eventually, networks of inter-communicating computers. Concluding, he pointed out that this power has enabled more accurate auralisation in which fewer assumptions and estimates must be made. Responding to a query he noted that the challenge has not been the accuracy of computation - there will always be improvements - but the sheer fact that it is possible to make the calculation.

A Reproduced Sound conference would not be the same without demonstrations of some advance in the electroacoustic field. Such demonstrations come after the conference dinner, naturally! The conference dinner is the only formal event and it is usual to present IOA awards during the dinner. This night it was the turn of John Hinton to announce the Institute's Distinguished Service Award to Tony Garton. Tony has worked in the field of acoustics and noise control for 36 years and spent much of his career working in local government becoming the technical expert for the London Borough of Lambeth and then Southwark. Tony has been a member of the Institute for many years, having been MIOA since 1991. He is the longest serving committee member of the London branch of the Institute, for which he has seemingly served for a lifetime as secretary keeping everyone under control and ensuring the correct procedures are followed. He was keeper of The Book for many years (London branch committee members will recognise the reference) and he also helped organise many of the branch evening meetings and IOA one-day meetings. He was one of the first branch secretaries to use email as a way of keeping members informed of meeting dates, dinners and half-day visits. His enthusiasm for the work of the Institute over the decades has been astounding and is an example for all the younger members of the branch. His enthusiasm not only extends to the branch meetings but also to the continued discussions after the talk in the nearby pub, a longstanding tradition of the London branch. He is often first in and has been known on most occasions to be one of the last out.

At the end of the dinner Mark Dodd and Jack Oclee-Brown, both of KEF, gave a brief presentation about the pair of KEF Blade loudspeakers. These had been set up and could be heard in one of the Thistle's meeting rooms. They are a mighty fine pair of loudspeakers, being the fruit of more than three years' effort incorporating a number of KEF patented advances on loudspeaker driver design. These, the only ones in existence, were due to be shipped to an exhibition in China later that evening so it was certainly a 'you must hear this' occasion.

Time to repair to the bar to 'network': it is one of the key features of a Reproduced Sound conference.

Friday 20 November

Day Two of the conference opened with Jamie Angus chairing the second session on *Intelligibility*. First to speak was Glenn Leembruggen who talked about exploring ways to improve STI's recognition of the effects of poor spectral balance on subjective intelligibility. Glenn noted that problems had arisen when installing systems in public buildings such as law courts. The voices of the talkers used in intelligibility tests have spectral properties which cause self masking. He hypothesised that this might be due to weighting and masking in the STI model.

Following this through he examined the effect on STI of the outer and middle ear response and showed that the resulting self masking levels might be some 6dB greater than hitherto recognised. A comparison of STI evaluations predicted by six masking models using the IEC speech spectrum showed a variation of around 0.06 STI. He concluded that none of the masking models reflected the perceived STI masking and commented that it was likely that steady-state masking models were not the best to use when modelling STI. Glenn accepted the comment that the IEC standard speech spectrum was a necessary approximation but that this did not remove the problem that the current approach to STI modelling does not properly reflect the level, spectra and masking effects which he has experienced.

Reuben Ditchburn had an interesting challenge: the suitability of STIPA to evaluate intelligibility on systems with limited bandwidth. Unlike railway stations, where Glenn had noted that the more full the announcement frequency response, the greater the subjective impression, Reuben faced the challenge of evaluating intelligibility on challenging environments such as oil rigs. Here the noise levels can readily exceed 90dB(A) and reverberation times may be lengthy. Loudspeakers have to meet stringent explosion and fire hazard requirements first. Acoustical performance will suffer and bandwidths are typically 400Hz to 4kHz. The target is to achieve an STI value of 0.45 at muster stations in line with the requirements of BS EN 60489. In practice the subjective experience was greater than the STI value would indicate and to provide some insight, Reuben played some samples of announcements where the STI ranged from 0.19 to 0.44. STIPA uses a wider range of carrier and modulation frequencies than does STI and this points in a direction for future work.

It had been noted earlier that automated noise cancellation would be highly valued and Xavier Babington presented some initial findings of his work on this topic. Ambient noise sensing for announcement systems has as its goal the target of achieving a fixed s/n ratio for announcements. There are many challenges to be faced including the relationship between of varying and wide range of ambient noise levels found in the transport environment. Xavier's approach in this pilot trial was to take the intended announcement signal and convolute it with the known reverberation response of the target environment. The ambient sensing microphone provides a signal which can be compared with this and the result fed to the announcement loudspeakers. In practice the cancellation was fair at LF but, over time, the cancellation worsened partly because during a 20s announcement the convolution time had expanded by 15ms. Future directions for the work have been identified and, in an answer to a question from the floor, he commented that he thought some manufacturers might wish to take this topic further.

After a coffee break Bob Walker launched the session on *Loudspeaker design* and introduced Hessam Alavi to talk about his investigations into loudspeaker cabinet vibrations and their contribution to the sound field. An evaluation of the acoustical contribution might guide the production of rigid cabinets and their design. Measurements with a single driver were made in an anechoic chamber over the range 50Hz to 3.2kHz, and a cancellation of up to 4dB of the direct radiation was noted and could be considered significant in overall loudspeaker performance. Hessam confirmed that the box volume was around 40 litres, conventionally scaled, and was made from 18mm plywood.

Mark Dodd and Jack Oclee-Brown together presented a detailed review of the technology used in the acoustic design of a compression drive phase plug using radial channels. Compression driven tweeters present some design and manufacturing challenges. Rigidity and freedom from parasitic resonances combine with accurate placement of the driver cone and the phase plug surface of only micrometres. Finite element modelling (FEM) was the modelling technique used, with a recent advance being the ability to use a self searching optimisation. The result was a radial phase plug whose width is not simply straight or conical but shaped subtly. The shaping confers a number of advantages including extended frequency response and some 5dB of gain. Mark dryly noted that the response does extend beyond 20kHz,

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but then that was all that professional audio engineers (should) really need!

Patrick Macey has long been a champion of the use of FEM in acoustics and his presentation recounted the success in using the technique to optimise the cone profile of a loudspeaker in order to extend the frequency response. Conventionally loudspeaker cones have either straight sides or are a simple curved conical shape. There are two attachment points: the spider situated around the voice coil and the roll surround at the outer perimeter. Patrick explained the virtues of virtual prototyping which included a deeper insight into the underlying physics with more science and less alchemy. The target loudspeaker was a 165mm diameter unit for which on cost grounds only changes to the cone profile could be accepted. The FEM identified the spider resonances and, as it happened, not much could be done about these. The FEM also identified an impedance mismatch in the roll surround and here some change to the tooling was required. The greatest change came when the FEM was set up to optimise the shape of the cone. The result is a shape which is not a form which would be intuitive but which delivered an improved LF response and an extended HF response.

Martin Audio is a well-established professional manufacturer of loudspeaker systems and Ambrose Thompson is its chief engineer. Demonstrating once more that modelling is an essential stage prior to manufacture, Ambrose took the audience through the design of a hybrid line array system. Later that evening, after dinner, the system had been set up so that its performance could be heard. The 'hybrid' term arises because the installations where it has been used have been combined with a horn-loaded HF unit. The resulting unit is compact and, as Ambrose pointed out, lends itself to installation in ceiling voids.

The topic of acoustics in small rooms is always of interest. Nick Screen chaired the session on *Room acoustics* in which Julian Romero talked about the characterisation of room acoustics for audio production use. Julian's starting point is the use of a sound field microphone for capturing the sound field within a room so that the spatial and temporal aspects can be analysed. There are a small number of sound field microphone systems available. Some of the more recent approaches use a large number of microphones but the one with the most rigorous mathematical support is the B format sound field microphone, which has two manufacturers. The experimental measurement work was carried out in a room built of MDF panels some of whose surfaces had been covered with absorbers. The outputs of the sound field processor are captured and analysis starts with a 512 point FFT.

Trevor Roberts was interested to measure the direction of early reflections in a room. His view was that it would be useful to have a tool which was more accurate in analysing the location of a sound than the human ear. There are clear disadvantages to approaching this problem by setting up a parabolic microphone and moving it to each position within the room. Trevor considered current microphone arrays but even a 32-microphone array could not deliver the detail for which he was searching. A four-microphone tetrahedral array claimed three degrees of resolution though it did require some prior knowledge of the space in order to remove location ambiguities. Modelling this limitation led Trevor to believe that he could resolve about 1 degree at 100kHz. He carried out some measurements in a semi-anechoic chamber to show that the approach had promise and this has helped to identify future work.

Bob Walker has a deep experience of making acoustical measurements deriving from his immersion in the topic during his time with the BBC. In his talk he wished to revisit the common misunderstandings of making time and frequency measurements in small rooms. A re-statement of basic principles is always welcome and it is important to understand the interdependency of time and frequency when making measurements involving Fourier transforms, energy time curves or time domain spectra (TDS). One key aspect is the choice of measurement window - the shaping of the raw data points before processing and analysis. The principle is that from a mathematical viewpoint a signal containing a continuous frequency is for ever: it is just that being human we need to consider it as though it stopped and

started at our will. Windowing is a tool which is necessary to make the captured data behave as if it consisted of frequencies which had begun at negative infinity and were continuing to positive infinity. Bob noted a classic 1980s error, where in the era of TDS measurements, the default analyser setting was 30kHz. This led many consultants to conclude erroneously that some early reflections were more than 20dB below the direct level. A more appropriate bandwidth setting would have correctly identified these reflections as being as little as 4dB below the direct sound.

Jamie Angus had been wondering how much absorption might be appropriate. Jamie started with a review of the ways in which we perceive direction in a stereo sound field. For HF elements of a sound - those above 1.4kHz - we sense direction using level difference, this being caused primarily by the acoustic shading of the head. At low frequencies - up to around 500Hz - the inter-aural time difference is effective. In the region between the two our ability to localise is poor. The formation of phantom images and the effect on audio localisation was well understood by A D Blumlein, the father of stereo sound. Jamie's brief review shows that the humble pan-pot does a fair job at manipulating our sense of direction. Concluding, accounting for the effect of absorption in a room suggests that the phantom images may shift our perception of localisation by 3°.

Keith Holland chaired RS25's final session on the topic of *Immersive audio*. Bruce Wiggins started the session with a review of the performance of the Mark 5 and ST350 sound field microphones. Those who attended Dr Phil Nelson's introductory talk on spherical harmonics on the Wednesday evening would recognise their significance. In the ambisonic microphone, distance cues are based on pressure difference, and the proximity effect can be a useful distance cue. In practice the reproduction loudspeakers may need compensation to complete the experience. Bruce set out to check that the predicted performance could be delivered by the two microphone types. Differences can arise because a practical ambisonic microphone must take the figure-of-eight response of four capsules and matrix them to provide the four ambisonic B format outputs. Using a large lecture theatre Bruce evaluated the calibration distance of both microphones and noted that they were not the same. The conclusion is that a recording engineer should check this calibration so that later changes may be made correctly. The result is important for those who use sound field microphones for analytical purposes.

Simon Kahn had the privilege of presenting the last paper of the conference. His interest is with the formation of noise narratives. Essentially this is working out what it is in a performance space that the audio is meant to achieve. In practice there are a number of factors which warrant consideration. Simon considered that the way that human hearing has evolved - a need to detect the direction of threat or opportunity - suggests that one criterion is that the listener should feel safe: safe from being some other animal's dinner, and safe in the knowledge that there may be food to capture. In order to be satisfying the overall audio experience requires relevant lighting, and sound signals that support our cognitive perception of the space and of its contents. Sound in theatre is about supporting the narrative: allowing the sound to support the action and not to overrun it.

Sam Wise closed the 25th Reproduced Sound conference and exhorted all those present to join us in 2010, when we anticipate holding RS26 at the Wales Millennium Centre in Cardiff. As a note for future diarists we plan to be back in Brighton for 2011. Watch this space for the notice of the primary topics which we think will be of interest at forthcoming conferences. We hope to see you at them!

Thanks are due to the committee and its departing chairman, Sam Wise, for establishing a fine event. Thanks also to our committee stalwart Ken Dibble for organising the sound system and to Linda, Kevin and the staff at the IOA for handling the marketing, housekeeping, registration and the hundred and one items which together shape a successful conference. The general opinion was that the Thistle was an excellent venue, with good facilities and helpful staff and one to which RS hopes to return.

The author wishes to apologise in advance should any of these summaries be in error. Full details of the papers are in the conference proceedings.

Citations

Presented at Reproduced Sound 25, Brighton

Emma Greenland: Peter Barnett Student Award

Emma Greenland is an acoustics consultant with WSP Acoustics. She graduated in Music Technology from the University of York and went on to read for a PhD in classroom acoustics at London South Bank University, whilst being a Senior Engineer at Sandy Brown Associates. She was awarded a PhD in January this year for her research with a thesis entitled Acoustics of open plan classrooms in primary schools.

Based on this research, Emma has presented several papers at a number of national and international conferences on the subject of classroom acoustics and speech intelligibility.

Emma has taken an active role in the Institute of Acoustics and is currently chair of the Speech and Hearing group. She also sits on the review panel for the revision of Building Bulletin 93: Acoustic Design of Schools which contains the acoustic performance standards to achieve Compliance with Approved Document E of the Building Regulations. Her research into speech intelligibility in classrooms and continuing activity and interest in this area make Dr Emma Greenland an ideal recipient of the Peter Barnett Student Award.



Emma Greenland receives the Peter Barnett Student Award from John Hinton

Neville Thiele: Peter Barnett Memorial Award 2009

Neville Thiele is best known as the inventor of the Thiele-Small parameters. The parameters were originally published in 1961 and, after re-publication by the Audio Engineering Society in 1971 and subsequent extension of the work by Richard Small in his influential papers of 1972, are now universally accepted as the standard means of characterising loudspeaker components. This work has had a direct and lasting effect on the loudspeaker industry in many ways. It provided a means by which loudspeaker component manufacturers could measure and provide specifications for their products, which in turn allowed

loudspeaker designers to make accurate predictions of the response of those components in complete loudspeakers.

Thiele has written many papers on electro-acoustics, network theory, testing methods and sound and vision broadcasting which have been published in *Electronic Engineering (UK)*, *Proceedings of the Institute of Radio and Electronics Engineers (Aus)* and the *Journal of the Audio Engineering Society*, as well as many contributions to the conventions of the Institute of Radio and Electronics Engineers (Aus), the Audio Engineering Society, the Institute of Electrical Engineers and the Institute of Electrical and Electronics Engineers. Some of his publications, most notably on loudspeaker parameters, television testing and coaxial cable equalisation, have become accepted internationally as reference works, and he has received a number of awards over the years in recognition.

Since 1969, he has been a member of a number of influential standards committees and working parties involved in many aspects of electro-acoustics and the broadcast of audio and vision, including advising the Australian Broadcasting Control Board, the International Radio Consultative Committee, the International Electrotechnical Commission and the Audio Engineering Society.

Neville Thiele is a Member of the Society of Motion Picture and Television Engineers, Vice-president of the Australian Sound Recording Association, Fellow of the Institute of Engineers Australia and Fellow of the Audio Engineering Society. He has been Vice-president - international region of the Audio Engineering Society from 1991 to 1993 and from 2001 to date. He was President of the Institute of Radio and Electronics Engineers Australia from 1986 to 1988.

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Neville Thiele is presented with the Peter Barnett Memorial Award by John Hinton

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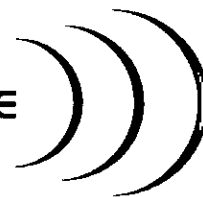
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His work on loudspeakers includes more than just the parameters. He has been actively (no pun intended) involved in crossover and other filter design, being perhaps the first person to describe all-pass crossovers in 1975. He published his first paper on active filters in the *Electronic Engineering* journal in 1956. He is the holder of a number of patents including one on the NTM (Neville Thiele Method) notched crossovers.

Neville Thiele is currently an Honorary Associate of the University of Sydney where he teaches loudspeaker design in their graduate audio programme. He also narrated the soundtrack to the well-received film *The Mad Century 1900-2000*.

After an interview with Neville Thiele in 2006 for Voice Coil, Steve Mowry commented: 'Having met Mr Thiele for the first time, I found him to be an amazing man and an inspiration ... to best describe Mr Thiele in three words is no easy task. But perhaps they would be competence, attitude, and kindness, all at the highest standards'.

The Peter Barnett Memorial Award recognises advancements and technical excellence in the fields of electro-acoustics, speech intelligibility, and education in acoustics and electro-acoustics, and, although it is mainly the first of these for which Neville Thiele would normally be associated, his work has had, and continues to have, great impact on all three fields.

Peter Mapp: Award for Distinguished Service to the Institute of Acoustics

Peter Mapp is well known to Institute members, especially members of the Electro-acoustics group. He joined the Institute in 1976, only two years after its founding, and has been a member continuously for 33 years. Peter holds an Honours degree in applied physics and a Masters degree in acoustics.

Peter presented two papers at the first Reproduced Sound conference in 1985, one of only six or seven delegates from that year who still present papers regularly. He has presented or co-authored papers at nearly all of the RS conferences ever since, sometimes two, and on one occasion, three. As a measure of distinguished service there can hardly be a more impressive record. However, in addition to that, Peter served on the organising committee of the first conference and subsequently on many more, and is indeed the longest serving member of the Electro-acoustics group committee, at least in terms of time.

In 2003 Peter became the first UK recipient of the Institute's Peter Barnett Memorial Award in recognition of his work and research in the fields of electro-acoustics and speech intelligibility.

In addition to his Institute contributions, Peter is a major contributor to UK and international acoustics and is a well-respected authority. He is the principal of Peter Mapp Associates and has a special interest in speech intelligibility prediction and measurement. He has presented a large number of papers on aspects of those topics in the UK, Europe and the USA.

Peter is also the author of *The audio system designer*, an acoustics and electro-acoustics reference book, and is a contributing author of several other international reference books including *The loudspeaker handbook*, *Handbook for sound engineers*, *The audio electronics reference handbook* and *Acoustics in the built environment*. He has authored or co-authored over 100 papers and articles on acoustics, sound systems design and speech intelligibility.

The Institute is indeed fortunate to have such a distinguished and expert contributor to its activities and the Award for Distinguished Service to the Institute is made in recognition of his substantial contributions over many years. It is fully deserved.

Tony Garton: Award for Distinguished Service to the Institute

Tony has worked in the field of acoustics and noise control for 36 years and spent much of his career working in local government becoming the technical expert for the London Borough of Lambeth and then Southwark. Tony has been a member of the Institute for many years and



Peter Mapp receives his Distinguished Services to the Institute Award from the President, John Hinton.

received his MIOA in 1991. He is the longest-serving committee member of the London branch of the Institute, and has seemingly served for a lifetime as the secretary, keeping everyone under control and ensuring that the correct procedures are followed. He was keeper of 'The Book' for many years (London branch committee members will recognise the reference) and he also helped organise many of the branch evening meetings and IOA one-day meetings.

Moving with the times, Tony was one of the first branch secretaries to use email as a way of keeping branch members informed of meeting dates, dinners and half-day visits. His enthusiasm for the work of the Institute over the years, or rather decades, has been astounding and is an example to all the younger members of the branch. His enthusiasm not only extends to the branch meetings but also to the continued discussions after the talk in the nearby pub - a longstanding tradition of the London branch. He is often first in and has been known on most occasions to be one of the last out.

In 2001 he joined the Membership committee, which meets four times a year in St Albans to review applications for membership. Early in 2009 he volunteered to become minutes secretary for the committee. Because of his work background Tony is able to advise the committee on the viewpoint of local authorities especially with respect to code of conduct discussions.



Tony Garton receives the Award for Distinguished Services to the Institute from John Hinton.

Instrumentation corner

Susan Dowson.
International specification standards for acoustical instruments

Procedure documents, for example those published by ISO, often require the use of an acoustical instrument meeting specification standard IEC XXXXX class Y or Z, but what is the standardisation process? Why are the standards important, how are the specifications agreed and how can you contribute to the production of international standards for acoustical instruments?

The leading global organisation that prepares and publishes international standards for all electrical, electronic and related technologies is the International Electrotechnical Commission, IEC, founded in 1906. Currently there are 76 full or associate member countries of the IEC, and one of the key benefits is international equivalence and hence the removal of technical barriers to trade. The documents produced by IEC are also used as the basis for national standardisation. In the UK for acoustical instruments, IEC standards are accepted by our standards body, the British Standards Institution (BSI), and generally re-published without change as BS EN documents.

IEC has 179 Technical Committees (TCs) for different subject areas. The relevant one for acoustical devices is TC29 Electroacoustics. Ultrasonics and underwater acoustics are covered by TC87, and BSI has national committees that parallel both of these, EPL29 and EPL87.

Within each TC there are Working Groups/Maintenance Teams (WG/MT) which cover different instruments. In general a MT works solely on the revision of current standards, whereas a WG will also consider new items. WGs and MTs are truly international with members appointed from many different countries. Nomination is via an individual's own national committee, BSI in the UK, and all nominated members belong to the parallel BSI committee.

IEC TCs meet every 18 months, with a different country acting as host on each occasion. For TC29 these main 'plenary' meetings run for five days and include meetings of all the active WGs/MTs, who quite often also meet separately between the plenary meetings. The last meeting of TC29 was in November 2009 in Tokyo, Japan. The UK parallel committee, EPL29, meets about once a year, carrying out most of its business, for example, agreeing comments and votes on circulated documents, through email.

The remit of TC29 is standardisation in the field of electroacoustics. The specification standard documents therefore include performance requirements which must be met for a manufacturer to claim that an instrument conforms to a particular standard and class, and also increasingly they include testing protocols. Consequently, whether you are about to purchase a new instrument or are the user of equipment you have owned for some years, design and subsequent testing to show conformance with these international specification standards is key and very relevant to the measurements performed. In addition, conformance tests allow a clear demonstration that the instrument really does meet class Y or Z of IEC XXXXX. Unless otherwise specified in a referencing document or test code, the latest version of an instrument specification standard should be used.

The table lists the current WGs/ MTs within TC29. Information on the current published standards and the documents currently in process for each is given on the IEC website www.iec.ch.

IEC TC29 Working Groups and Maintenance Teams

IEC TC29 WG/MT	Title
MT4	Sound level meters
WG5	Measurement microphones
WG10	Audiometric equipment
WG13	Hearing aids
WG17	Sound calibrators
MT18	EMC requirements and updates of relevant IEC TC29 standards
MT19	Filters, revision of IEC 61260
MT20	Revision of IEC 60118-4, Induction loop systems
WG21	Head and ear simulators
WG22	Audio-frequency induction-loop systems and equipment for assisted hearing
MT23	Revision of IEC 61265:1995, Instruments for measurement of aircraft noise – Performance requirements for systems to measure one-third-octave-band sound pressure levels in noise certification of transport-category aeroplanes

The standardisation process itself is well defined by IEC, including timescales to be met, and documents must progress through various stages from preliminary to publication stage. Recently, both IEC and ISO have both been tightening up the timescales permitted and applying these criteria more rigorously to ensure standards are produced within a reasonable timeframe. More details of the process are available on the IEC website: the same principles apply for revision of existing standards.

At each stage there are detailed discussions on the content of the document. The key specifications for the instrument need to be agreed, together with the tolerances and the maximum permitted

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Instrumentation Corner - continued from page 39

uncertainties of measurement for laboratories verifying that the instrument conforms to the specifications given in the standard. The standard will be used by manufacturers to inform their design processes, by any laboratories performing pattern evaluation tests of new models or designs, and by those performing periodic testing of particular instruments, such as UKAS-accredited laboratories, ensuring that the end user can have continuing confidence in the results obtained and functions performed by their instruments.

The WG/MT needs to reach consensus as far as possible for the standard to be successfully approved, and ensure that the specifications are clear and not open to differing interpretations. Another challenge in recent years for periodic testing has been to prescribe tests that are sufficiently extensive to be effective in checking ongoing performance, whilst ensuring that the cost burden for users is not excessive. Documents evolve via discussions and comments raised either by the WG/MT members, or in the later stages as submitted through national committees. Membership of a WG/MT gives early visibility of the documents, and an opportunity to discuss key technical issues with international peers, so giving real input to the finally approved published documents.

The key stages for an international specification standard with IEC are:

Preliminary: This encompasses projects envisaged for the future but not yet ready for immediate development, or preliminary work prior to a formal proposal.

Proposal: A proposal for new work generally originates from industry via a national committee. There is a vote and criteria for acceptance. If successful the work is allocated to an existing or new WG, and this signifies the starting point for the overall IEC timescale for producing the final draft standard.

Preparatory: Working Drafts (WD) are prepared by the convenor/project leader within the WG. There are often several iterations, and drafts are only available to WG members.

Committee: When the WG members are comfortable with the content of the document it is submitted to national committees as a formal committee draft (CD) for comment (two to four months). **There may be several iterations of CDs.**

Enquiry: A Committee Draft for Vote (CDV), now in English and French, is submitted to all national committees for a five-month voting period. This is the last stage at which technical comments can be taken into consideration. Usually at this stage, if not at the previous stage, BSI publishes a Draft for Public Comment (DPC), available to all for comment. Approval criteria are applied. If successful, a revised version of the document is sent to IEC central office within four months for Final Draft International Standard (FDIS) processing. If approval is not obtained the document is referred back to the WG or MT.

Approval: The FDIS, which must be available within 33 months of the approval of the project, is circulated to the national committees for a two-month voting period. Each national committee's vote must be explicit: positive, negative or abstention. Approval criteria are applied. If the document is approved, it is published. If not it is referred back to the WG or MT to be reconsidered.

Publication: The document is published by IEC central office, normally within two months, and becomes available for purchase. A date is also agreed before which the standard will not be revised.

If you are interested in participating in the work of BSI and IEC, initial contact should be made with Customer Services at BSI (www.bsigroup.com) who can put you in touch with the relevant person to discuss how this can be achieved. Each national committee is made up of representatives of the interests of users, manufacturers, government departments and other bodies concerned with the work, and we are keen for new members to join the committees.

One word of caution - these international specification standard documents should not be confused with a *measurement standard artefact* - for example, a calibrated microphone or calibrated sound calibrator from which measurements traceable to national measurement standards can be obtained.

For acoustics, standards that give measurement procedures and methods and those on vibration, shock and condition monitoring are generally covered by the International Organisation for Standardisation (ISO) under TC43 and TC108. Similar standard development routes are followed by those committees. The national committee is still BSI, so any enquiries about joining ISO or the parallel BSI committees can also be made via BSI.

Susan Dowson is at the National Physical Laboratory Teddington, and is currently chairman of both IEC TC29 and EPL 29.

Consultation response

Environmental Noise (England) Regulations 2006, as amended: Consultation on the draft Noise Action Plans

This review has been prepared on behalf of the Institute of Acoustics (IOA) by the committee of the IOA Environmental Noise Group (ENG), in response to the invitation to comment on the *Environmental Noise (England) Regulations 2006, as amended: Consultation on Draft Noise Action Plans*, published by the Department for Environment Food and Rural Affairs (Defra) in July 2009. The comments presented here are based on the views of members of the Institute, who were notified by e-mail and invited to respond and, in particular those members who attended a series of meetings, including:

- the Defra launch on 15 July 2009;
- the six Defra/EPuk stakeholder events;
- debates at various IOA local branch meetings, including the London and Central branches;
- an IOA workshop at the Royal Society, London, attended by 30 members.

In addition to these meetings, the ENG has held a series of committee meetings to review the consultation documents and to compile this response.

The Institute of Acoustics

The IOA is the leading professional body in the United Kingdom concerned with acoustics, noise and vibration and is active in research, educational, environmental and industrial organisations. The Institute is a nominated body of the Engineering Council, a member of the International Institute of Noise Control Engineering and the International Commission on Acoustics and a founding member of the European Acoustics Association. Members of the IOA are active in the development of UK, European and International Standards.

The IOA also gives support to the development of legislation in the various disciplines in the field of acoustics and its response to the Consultation Paper is based on this role. The IOA, however, represents a wide range of members and disciplines in acoustics and the comments presented here are the consensus of views held by those IOA members who attended the meetings listed above, or who commented by e-mail. The comments were subsequently passed to members of the IOA Council for approval prior to submission.

Consultation on draft Noise Action Plans

The Government is currently seeking the views of stakeholders on the draft Noise Actions Plans (NAPs) for agglomerations and major roads and railways outside agglomerations, which have been prepared to fulfil the Environmental Noise (England) Regulations 2006, as amended and which implement the Environmental Noise Directive (Directive 2002/49/EC). The draft NAPs identify important areas from the strategic noise maps and describe the process to be followed to determine any noise mitigation measures that may be carried out in the context of sustainable development in those areas. Templates for the NAPs have been prepared for agglomerations which provide details of:

- the scope of the action plan;
- the authority responsible for preparing the action plan and its legal context;
- the issues covered by the action plan (noise from road traffic, railways and industry);
- the actions which the Competent Authority intends to take in the next five years to control and mitigate noise, as appropriate, in the agglomeration.

This consultation response is based around three key questions, presented in section 1.10 of the Consultation Document.

Q1) Do you agree with the overall approach being proposed for identifying important areas and first priority locations? If not, what alternative approach would you advocate?

Q2) Do you agree with the overall approach being proposed for implementing the necessary procedures for identifying what further measures, if any, might be taken to mitigate the noise in important areas? If not, what alternative approach would you advocate?

Q3) Do you agree with the overall approach being proposed for identifying and managing quiet areas in agglomerations with the aim of protecting the quietness of these areas and avoiding increases in noise? If not, what alternative approach would you advocate?

IOA response to consultation

This document provides the IOA's responses to these questions and also more general considerations that the IOA believes will improve the effectiveness of the NAPs in meeting the broader aims of the END for both the first round agglomerations and in the longer term (five year) reviews.

Question 1: Identifying important areas and locations

The IOA welcomes the overall approach adopted and considers it appropriate to meet the objectives of the END. We endorse the statement at paragraph 1.07 of the NAP template that the action plans should contribute to the aims and objectives of the National Noise Strategy and advocate a commitment to use the plans to develop effective and wider-ranging approaches to strategic environmental noise issues in the medium to long terms.

The stated intention that the NAPs, to help deliver good health and good quality of life, in the sections relating to identification of important areas (sections 5.05 and 11.05) is welcomed, although

the IOA believes that whilst further research is needed to establish the extent of the relationship between noise and health, greater emphasis on the role of the NAPs to deliver this objective in a strategic way would be appropriate. An overarching statement on this objective, either in the Introduction to the template, or under 'General issues', would embed the concept within the NAP process by highlighting the link between excessive noise and health and quality of life issues. Specific actions await agreed dose-response relationships, and better understanding of causal relationships, which will be vital to achieving effective remedial action.

Europe and in particular the UK have invested significant resources in research into soundscapes in the last five years. Whilst it is recognised to be an aspirational goal, it is suggested that outcomes from the soundscapes research be incorporated in the long-term plans to evolve the methodology for identifying important areas and locations. Specific suggestions include the requirement for new objective parameters to describe environmental noise in both positive and negative terms.

Question 2: Implementation

The IOA welcomes the overall approach adopted to implement the procedures and identify measures that might be taken to mitigate noise, and considers it generally appropriate to meet the objectives of the END. There are, however, additional issues that we believe should be implemented to provide a more robust and effective strategy to deliver those objectives.

Peer review

We note that to date a relatively small core group has been responsible for much of the preparation of templates for the NAPs and that the progress of the NAPs is to be monitored by the Competent Authority (section 2.06). However, we consider that it would be advantageous for the implementation process to be reviewed by an independent and expert steering group to check procedures and the end results, and believe that early and regular peer review of the plans would ensure that appropriate solutions to problems identified are adopted and future activities defined. This consultation process is considered no substitute for a paid peer review or an expert steering group. Such a steering group would need to be properly funded and the terms of reference and the members identified.

Night-time noise

The emphasis on daytime noise is considered to be a significant shortcoming in the implementation of the NAP process. The prevention of noise induced sleep disturbance is a key factor in limiting adverse health effects and the NAPs should be instrumental in identifying those areas where night-time noise is of particular concern. We appreciate the constraints that the END and WG-AEN good practice guides impose in regards to methodologies that can be used for strategic noise mapping and the historical reasons for

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Consultation response - Noise Action Plans - continued from page 41

road traffic noise to be assessed as an 18 hour average in this country, and the fact that there is often a simple relationship between 18 hour and 8 hour night-time noise levels. However, there is evidence (National Noise Incidence Surveys 2000) that this relationship may not be as widely applicable now compared to when CRTN was conceived and may now vary more than was expected at that time. Furthermore, with regard to the more recently developed back end corrections used to derive L_{night} from $L_{A10,18hr}$ there will always be local situations that depart significantly from these 'typical' day/night rules of thumb as a result of such factors as HGV movements at night, effects of congestion charging, highly daytime-congested roads displacing traffic to night-time, etc. For railways the divergence can also be significant and can be dependent on varying passenger demands, night-time freight movements etc. For airports, the pattern of night noise is unique to each airport and can be quantified by mapping L_{night} , although we consider that the number of movements at night can also be important. Paragraph 4 of Annex V of the END specifically identified sleep disturbance as a topic for reporting the benefit of the proposed measures, and we believe there is a clear and urgent need for the inclusion of night-time noise in the NAPs. The use of suitably quality assured supplementary third party noise exposure information to augment the strategic noise maps could help address this.

Thresholds identifying important areas

The Impact Assessment gives us an indication of the likely extent of noise mitigation for road traffic noise that is likely to be delivered by first round action plans. Of the 122,500 people (57,500 dwellings) identified as first priority, it estimates that about 2% will be delivered some form of mitigation, ie only about 1150 dwellings. To put this in perspective, we note that noise mapping has quantified noise exposure for about 32 million people. The IOA appreciates the constraints on implementation of mitigation measures, but feels that, whilst the first round plans can be considered pragmatic, they are somewhat unambitious and we would like later rounds of noise action planning to take a bolder approach.

Clearly the data identifying priority areas will need to be checked and validated to confirm their accuracy. In the section of the action plan identifying problems and solutions that need to be investigated (sections 5.01 and 11.01 of the template), the IOA believes there should be an initial assessment of the accuracy of the noise mapping before addressing the scope for implementing additional noise management measures. It would be appropriate for the noise receiving authority to confirm and validate important areas and first priority locations identified through strategic noise mapping by the Competent Authority within their areas, before the noise generating authority identifies and implements any noise mitigation measures.

The IOA understands that Defra will be consulting Local Authorities on the agglomeration action plans in early 2010, following the results of the Bristol and Leeds pilot studies. We consider it vital that all the Local Authorities within each of the 23 agglomerations have appropriate input to the action plans for the areas they cover. For example, Local Authorities should draft the majority of the relevant sections setting the scene for the history of the area, the background to plans and local conditions and policies that have been developed and used in their areas (eg the Mayor's London Noise Strategy).

The IOA appreciates that there has been much discussion about the metrics used to assess important areas to be investigated for

potential action, but is concerned that there has been less on the values chosen to define them. We acknowledge that the first round of noise action planning has broken new ground and has had to take place without the benefit of experience gained from previous similar work. Judgement will therefore always be an element in proposing thresholds used for identifying important areas and the first priority areas in the first round. However, thresholds are vital in setting the scope of the actions plans and expressing the level of ambition portrayed and ultimately the effectiveness of the action plans. We would therefore wish to see for later rounds of noise action planning a more developed and quantified approach to selection of thresholds than appears to have taken place so far.

Whilst Defra has made it clear that the NAPs will state clearly that the thresholds are for the purposes of action planning only and must not be used for other purposes, our experience is that any threshold stated in national policy will, in practice, be taken out of context. In our view a clear justification, with a robust assessment incorporating links to impact trigger levels, is needed to defend any criterion for mitigation based on a noise level threshold. We note that such justification is not provided for the thresholds currently proposed. An alternative, preferable to fixing a noise level threshold, would be to identify the number of properties or size of population within an agglomeration that can be treated within the available resources, and then identifying the lowest noise level that triggers this identified number of properties or size of population for consideration for remedial mitigation.

Whilst we anticipate that cost benefit analysis will be incorporated into the process, we feel that the NAPs should give guidance on the target reductions for locations where consideration for mitigation is identified. Our view is that an imperceptible reduction of noise (by, for example, 1 or 2 dB using means other than reducing the number of noise events or their temporal distribution) for a large population may not be a cost-effective use of resources, while a significant and clearly perceptible change (greater than, for example, 5dB) affecting a smaller population could make a real difference and be a more efficient use of resources.

We also feel there is value in measuring noise levels at the stage of implementing mitigation, to add certainty to the benefits that are delivered.

Question 3: Quiet Areas

The IOA supports the qualitative and integrated approach suggested for identifying Quiet Areas and emphasises the value of *relative* quiet, where noise levels that may be considered high in an absolute sense can still be valued as quiet areas. We also support the inclusion of noise levels as a means of managing Quiet Areas once they have been established.

The IOA is, however, concerned that the delivery of protection for a defined Quiet Area may not be effective where noise sources are outside the control of the Local Authority; aircraft noise and nearby trunk roads are examples. We doubt that a stated Local Authority planning policy to conserve a Quiet Area would be effective in the control of an airport that adjusts flight paths so that they overfly a Quiet Area, or to mitigate against trunk road traffic flows increasing over time. This could be a major issue, and paragraph 16.05 of the agglomerations draft NAP may not be strong enough to prevent the deterioration of designated Quiet Areas. Additionally a statement in the NAP templates of how the Secretary of State may view this issue when deciding on NAPs from airports or highways authorities would bring greater clarity to this concern.

Consultation response

Environmental Noise (England) Regulations 2006, as amended: Consultation on the draft Noise Action Plans for airports

Background

The IOA is the leading professional body in the United Kingdom concerned with acoustics, noise and vibration and is active in research, educational, environmental and industrial organisations. The Institute is a nominated body of the Engineering Council, a member of the International Institute of Noise Control Engineering and the International Commission on Acoustics and a founding member of the European Acoustics Association. Members of the IOA are active in the development of UK, European and International Standards. The IOA gives support to the development of legislation in the various disciplines in the field of acoustics and its response to the consultation on draft Noise Action Plans for airports is based on this role.

The Institute of Acoustics represents professionals involved in the management of environmental noise across the UK. Whilst some of our members will be responding to airport consultations particularly in their local capacity, this response represents the Institute's views on strategic issues for airport Noise Action Plans (NAPs). It does not seek to comment on any particular airport plans except in this context. It has been prepared by discussion amongst our members on the various draft Action Plans and a review of the published draft Action Plans of which we were aware on 11 October 2009: these are for Birmingham, Blackpool, Bournemouth, Bristol, East Midlands, Liverpool, London City, London Gatwick, London Heathrow, Luton, London Stansted, Luton, Manchester and Southampton. We are aware that other airports have published draft NAPs since.

In studying the Noise Action Plans for these 13 airports, it becomes clear that a comprehensive benchmarking of all the major UK airports would be a major task, and impossible at this stage of a consultation. Whilst the draft NAPs provide a powerful source of information for such a task, the nuances behind some of the noise control measures are not always apparent, and further research would be needed to make a comprehensive and fair comparison. Our first recommendation to Defra and DfT is therefore to fund and publish a full

and independent benchmarking exercise of existing NAPs to show how well each has met the defined objectives and criteria. In doing this, we would hope that the airports would be encouraged to perform well, and further improve their performance by learning from other airports' best practices.

However, we can make some general comments on the published NAPs based on a preliminary analysis. The draft guidance on airport Noise Action Plans appears to have been largely followed, but there are some areas of missing data (eg on costs and night noise contour exposure data) and inevitable inconsistencies in reporting (eg choice of L_{night} contour values). It is not the purpose of this response to determine whether or not the Defra guidance has been followed - we would expect Defra to do that - but rather to make some overriding comments on the suite of draft NAPs, to help identify inconsistencies of approach and omissions that should be addressed.

It is recognised that each airport should manage its noise burden according to its local conditions. At the same time it can be argued that every individual exposed to noise should be treated fairly. Whilst there are numerous similarities between the ways in which comparable airports address noise, there are also differences that the regulator could be asked to address. We provide comments on this issue.

This response has been sent to Defra, DfT, and all 18 airports listed in the Defra guidance as requiring Noise Action Plans, ie the 13 airports listed above plus Coventry, Newcastle, Shoreham and Southend.

The Competent Authority

In May 2005 the IOA response to the Defra consultation on the transposition

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Consultation response - Noise Action Plans for airports - continued from page 43

of the Environmental Noise Directive (END) replied to question 7.3 as follows. (see box 1)

Paragraph 1.03 of the Defra guidance on airport Noise Action Plans reminds us of the objectives on the action plans where it states:

'The Government's aim - as set out in The Future of Air Transport White Paper (2003) (ATWP) - is to limit and where possible reduce the number of people in the UK significantly affected by aircraft noise.'

The IOA's concern remains that each of the 18 commercial airport operating companies will find it difficult to address this objective whilst meeting the demands of their shareholders. We remain of the view that Defra or DfT (or both) have a responsibility to get more directly involved in the drafting and enforcement of airport NAPs, rather than just deciding on their approval.

The IOA is concerned that there may be confusion resulting from the definition of 'competent authority' in the draft Noise Action Plan agglomeration template and the NAPs. At paragraph 16.07 of the agglomeration template, it is stated that *'...the Competent Authority will liaise with the relevant airport operator ...'* with the latter **also** being defined as the Competent Authority, giving rise to some ambiguity in the chain of responsibility. The definitions of the appropriate competent authorities should be clarified to avoid confusion.

Judging acceptability

Section 3 of the Defra guidance addresses the determination of actions to be implemented including the following. (see box 2)

The reference to the context of sustainable development is common to the draft Action Plans for agglomerations, major roads and railways. The IOA's response to the Defra consultation on those plans gives details of our views.

Paragraph 3.07 of the airports guidance refers to the 'most important areas'. The draft Action Plans for agglomerations, major roads and railways define 'important areas' where action is considered necessary. This is not defined in the guidance to airports, or the airport draft NAPs. The guidance gives two references, discussed as follows.

First, airports are referred to the ATWP. Most draft NAPs summarise the key noise requirements of the ATWP. The key noise level above which the ATWP requires action, in the form of relocation, is 69dB LAeq, 16 hr. Of the 13 draft NAPs we have reviewed, only three have any populations in this very high noise exposure band, and only Heathrow has more than 100 people in the band. Other airports may therefore take this as an indication that they have no important areas to consider for noise action. As the Competent Authority, an airport operating company is asked to judge if the current noise situation is acceptable. Again, referring to this guidance, many conclude that it is. From our understanding of the adverse effects of noise, these start to arise at much lower levels than 69dB LAeq, 16 hr, and if such an approach is taken, we believe there will be a major weakness in the noise action planning process.

Second, reference is made to PPG24. Most draft NAPs ignore the guidance offered in PPG24.

Most draft NAPs refer to the ANASE study, but then dismiss it. The IOA understands the reasons why the government does not feel able to determine new policy in regard to aviation noise based solely on this study. Nevertheless, the IOA strongly believes that the evidential basis on which national policy in regard to aviation noise is made deserves further in-depth consideration, as alluded to in the Chief Economist's reasons for not adopting the ANASE study. Consequently, we do not believe that some of the issues raised by the ANASE research should be so readily dismissed and, whilst it may be too late for the current round of airport NAPs, we would like to see a review of the existing and emerging evidence, supplemented by further robust research in the UK, funded by Defra, DfT and the industry, in time for the next round of NAPs.

All in all, the subject of acceptability is poorly addressed, and the need for action to address problem areas is neatly sidestepped by reference to statutory relocation requirements, ignoring the fact that noise has obvious effects well below the levels at which a person should be re-housed to another area. It is no surprise that the draft NAPs suggest almost no new actions to address noise, over and above the actions already required of each airport under its local planning agreements, as the guidance does not encourage them to do so. All airports operate under some local planning agreement, but these are fixed and can only be amended to reflect advances in quieter aircraft and airport operations, or changes in our understanding of the impacts of noise, as and when an airport voluntarily chooses to do so, or the airport seeks to change its use. Additionally the terms of airports' local planning agreements vary

Question 7.3: Are you satisfied that airport operators should be the competent authorities of the production of Action Plans for relevant airports?

Response: No. The aims of the END include public transparency, accountability and confidence in the outcomes. This will not be achieved by the airport operator being the competent authority. The Secretary of State for EFRA should be the competent authority for all airports.

Box 1

IOA response to END transposition consultation

How to determine the acceptability or otherwise of the current noise impact

3.06 The government intends that END Action Plans will assist the management of environmental noise in the context of sustainable development.

3.07 The END and the Regulations require that Action Plans apply in particular to the most important areas as established by the strategic noise maps.

3.08 When identifying possible actions, account should be taken of the principles that are to be found in current legislation and guidance, and of any relevant local planning conditions that exist.

3.09 Within the aviation sector, the current key document is The Future of Air Transport, published in December 2003 and generally known as the Air Transport White Paper (ATWP). Some additional guidance is also contained in PPG 24 Planning and Noise, published in 1994.

3.10 The ATWP required airport operators with immediate effect to offer households subject to high levels of noise (69dB LAeq or more) assistance with the costs of relocating.

3.11 Furthermore, with regard to mitigation when capacity enhancement proposals are brought forward, the ATWP expects airport operators to offer to purchase those properties suffering from both a high level of noise (69dB LAeq or more) and a large increase in noise (3dB or more in terms of LAeq).

Box 2

Defra guidance

greatly. Whilst it is right that an airport's noise management should reflect its local conditions, the fact that airport noise management is completely decentralised (apart from the three designated airports), and will continue to be under the NAPs process, creates a number of risks, including the following.

1. Inconsistencies between airports may lead to differences and unfairness in the way affected residents are treated.
2. In seeking to remain competitive, airports may not take opportunities to reduce noise that could be taken unilaterally with no loss of competitiveness.
3. Government will exert no strategic planning to the distribution of airport noise - it may allow an airport serving a given area to grow when another airport serving the same area could supply the growth with a far smaller noise burden.

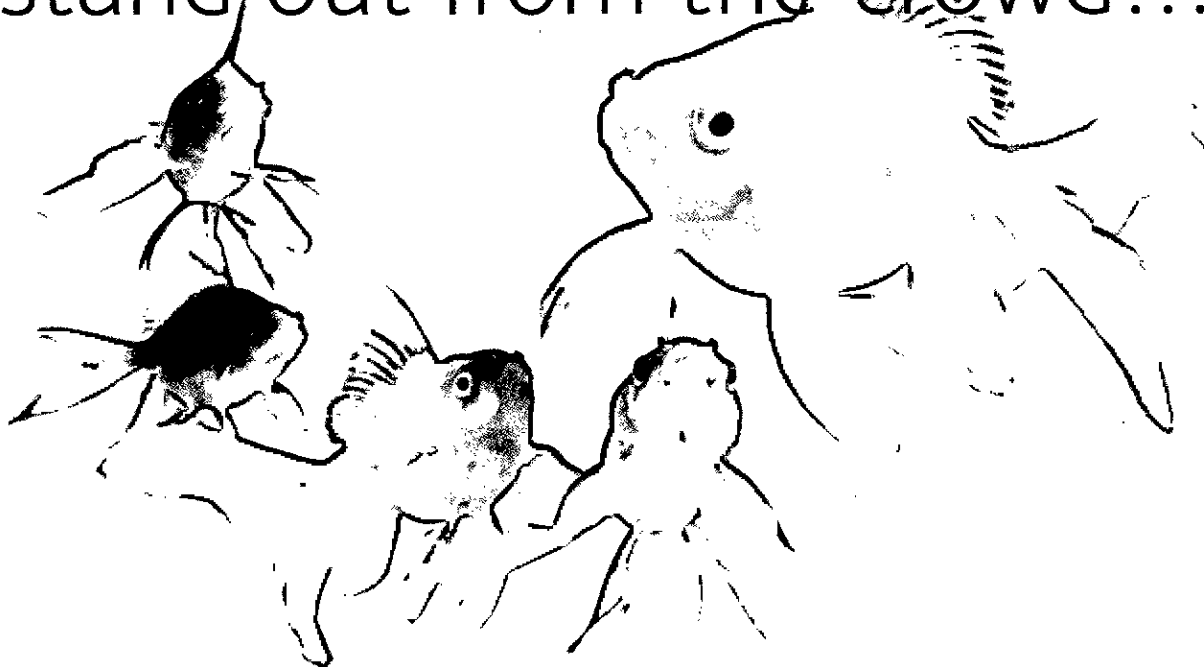
These three topics are addressed in the following sections.

Inconsistencies

The IOA welcomes the publications of the results of strategic noise mapping for airports because it provides for consistent information. Figure 1 shows the published populations within the L_{den} 55dB contour for the 13 NAPs we reviewed.

continued on page 46

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Consultation response - Noise Action Plans for airports - continued from page 44

We believe that the noise mapping and population exposure data are considerably more accurate than those for roads and railways referred to in other Action Plans. The consistency of the data provides a clear picture of the relative noise burden for each airport, in this case referring to L_{den} , which may be difficult to interpret, but is an overall indicator of noise disturbance, daytime, evening and night.

The IOA understands the health effects caused by sleep disturbance at night. Traditionally airports have addressed this important issue in terms of a night-time period from 23:30h to 06:00h, or some other period defined locally. We welcome the requirements to publish full eight-hour night-time noise contours, and we note that several airports have not followed these requirements. Ten have published L_{night} 48dB contours. A few have published L_{night} 50dB contours, and Southampton has failed to publish night-time contours below 55dB L_{night} . For these reasons we do not include a graph of populations in L_{night} contours. Notwithstanding the limitations imposed by the END in regard to approved modelling methodologies and the inherent problems in accurately predicting aircraft noise below about 55dB(A), the IOA believes that L_{night} contours should be produced down to 45dB, to include the base level in accordance with PPG 24 and provided for under Article 11 and 2.6 of Annex VI of the END, which regrettably was not transposed into the Environmental Noise Regulations.

It is not the IOA's intention to point out bad practice at given airports, but we do feel that Defra needs to address possible inconsistencies between airports to ensure fairness to individuals. In a very general sense we can summarise our review of the 13 draft NAPs into three groups.

The 'big 5': London airports and Manchester

These airports operate an extensive suite of noise management activities, involving a substantial staff and other costs. They strive for best practice - eg Heathrow is a world leader in noise management.

Small airports

Small airports affect small numbers of people, and operate a minimal suite of noise management activities.

Medium airports

These airports operate a range of noise management activities, but some do not appear to provide as much noise protections as others. This is particularly apparent for night-time noise management.

Defra should address the risk of inconsistency in the medium sized airports.

Most of the draft NAPs point out that there are many parties involved in noise management around an airport; airlines, air traffic control (NATS, CAA) etc. The airport operator, even as the Competent Authority, has limited powers to influence these other parties. In at least one draft NAP, the reason given for over-flying National Parks is simply that it is out of the Competent Authority's powers because NATS decides. However, there are some noise management activities that are entirely within the airport's control: one is noise insulation.

There may be an argument that airports should offer noise insulation at consistent levels, perhaps as a remedy for sleep disturbance at night. Indeed this appears to be recognised by DfT in the ATWVP. We believe noise insulation is an effective tool to address night-time noise, and there is inconsistency in its application, broadly summarised in Box 3.

We believe noise insulation is an effective tool to address night noise, and there should be consistency in its application, albeit there may be a need for local flexibility to cope with factors such variable non-aircraft ambient noise levels.

Another noise management activity that is mostly in the airport's control is the choice of which aircraft use an airport, such as noisier types not being allowed, or only allowed in restricted numbers, day or night. Many of the larger airports operate quota counts and differential charges to encourage quieter aircraft types, particularly at night, but there may be a reluctance to apply strict operating restrictions because of fear that airlines will move to another airport. EC Directive 2002/30 allowed for airports to apply stricter operating restrictions, under the 'balanced approach', provided that the process of banning the noisier, marginal Chapter 3 aircraft types was managed fairly over a period of time. However, the European Commission's review of this Directive⁽¹⁾ in 2007 showed that few airports were using this provision. This review also quantified the benefit to be had from phasing out marginal Chapter 3 types. It estimated that if the European aircraft fleet was changed to be entirely Chapter 4 compliant (or equivalent) then the populations exposed to noise would drop by 5% for L_{den} 55dB (from 2.7 to 2.5 million) and by 3% for L_{night} 45dB (from 3.2 to 3.1 million). Whilst these benefits may seem small in L_{eq} terms, there is a feeling in the IOA that phasing out noisier types of aircraft

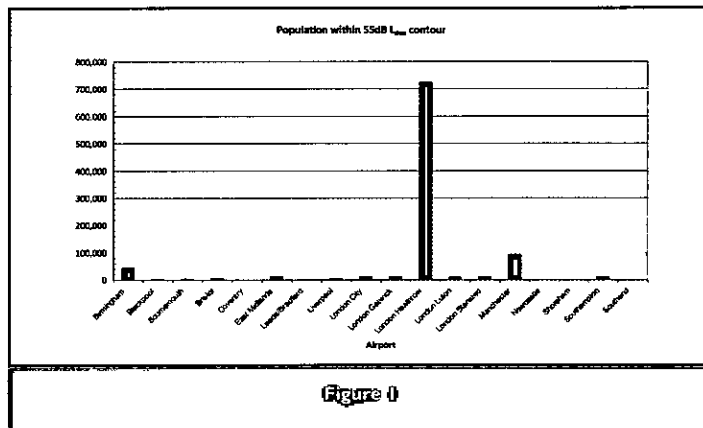


Figure 1
 L_{den} 55dB populations in 2006

- Most airports offer Noise Insulation Grant Schemes (NIGS).
- Biggest cost for most airports: Heathrow estimates £8 million/year.
- Bristol was based on SEL 90dB, and cancelled it when noisier aircraft types retired.
- Some offer more than ATWVP minimum.
- East Midlands (30% flights are at night) has an L_{night} threshold of 55dB. Above SEL 90dB (tbc) a grant of £3,000 per house is available.
- Liverpool: L_{night} 59dB, dropping to 55dB in future.
- London City: L_{Aeq} 16 hr 57dB (no night flights).

Box 3

Noise insulation at English airports

offers real benefits. It is a real action that can be taken, but is not being adopted as widely as it could be because there is no statutory requirement to do so. We appreciate that competition between airports around the UK and across Europe is complex, but would urge DfT to consider further incentives to ensure all airports are phasing out noisier types as quickly as is practicable. We are aware of the limitations of the degree of control that Defra and DfT have, owing to international codes and treaties, but we would like to see the Government applying a firmer hand in directing the control of, as well as reducing, aircraft noise.

Strategic noise planning

The third noise management method in the list, which may be lost by decentralised control over airport noise action planning, is the possibility of strategically managing aviation noise effects by encouraging those airports to grow whose noise impact is lowest (where there may be a choice of airports to serve a region).

Figure 2 shows the annual number of passengers per year at the 13 airports, as reported in the draft NAPs reviewed, generally for the year 2008, but in some cases for 2006 (the differences would tend to be small due to a generally slowing of growth in air traffic in the last few years in comparison with the historic average of about 5% per year).

Clearly airports serving more passengers will tend to produce more noise, with bigger contours covering larger areas. The same airport in a less populated area will tend to have a lesser impact. One of the many ways of considering how efficient an airport is in noise impact terms is to judge the number of people affected by its noise, as a function of airport size. In this way one could define an airport's 'noise efficiency' as the ratio of its annual passenger throughput to the population within its L_{den} 55dB contour. Figure 3 provides this.

This gives some perhaps surprising results. The airport whose noise affects the fewest number of people (in terms of being within L_{den} 55dB) for the level of passengers it moves per year is Gatwick, followed by Stansted. These are

continued on page 48



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Consultation response - Noise Action Plans for airports - continued from page 46

London airports situated in relatively rural settings. Heathrow, by comparison, is the least noise efficient airport in England, affecting roughly 30 times as many people per passenger as Gatwick. On this basis, increasing air traffic capacity serving London would produce lower noise impacts if the increased capacity were provided by any airport other than Heathrow.

This analysis is one way of looking strategically at the effects of aviation noise, and potentially suffers from the drawback of not considering the degree of change in noise level for the populations affected. However, because there are many means of assessing the impacts of aviation noise, each with its own pros and cons, the IOA believes that it is important for the Government to retain more direct involvement in the drafting of airport NAPs to prevent airport operators from seeming to 'cherry-pick' methods to suit an agenda that does not give priority to the objectives of the END and the legislation transposing its requirements to England.

The planning of environmental noise management across English airports should consider this type of strategic noise planning.

Quiet areas

The Defra guidance requires consideration of Quiet Areas inside and outside agglomerations.

For Quiet Areas within agglomerations (as defined in the Regulations), few draft NAPs address their responsibilities well. Most airport operating companies defer responsibility to local authorities and await further guidance. Some draft NAPs imply that a Quiet Area only concerns them if it is within the L_{den} 55dB contour. The IOA has a concern that even after Quiet Areas are agreed and designated in Local Plans, airports will take no meaningful action to protect them: over-flights will increase and new routeings may over-fly them. We appreciate that the definition of Quiet Areas is still emerging, but airport NAPs should acknowledge their responsibility to protect them from increasing noise, potentially at any baseline noise level, and to take measures to do so.

Outside agglomerations, the Defra guidance (paragraph 2.08) notes the need to consider and where possible avoid over-flights affecting National Parks and AONBs. Most draft NAPs dismiss effects, do not mention over-flights below 7,000ft over designated areas, or pass on responsibility to CAA, NATS etc. Airport NAPs should address this responsibility and state the actions they propose to address it.

Cost of noise management

Most, but not all, airports give information on how much they spend on noise management per year, as required by the Defra guidance. At least five airports are expecting to be spending over £¼ million per year, with a total expenditure (including £8 million for insulation at Heathrow) of at least £12 million. Figure 4 shows the expected annual expenditure at each reporting airport, per person in the L_{den} 55dB contour.

There are several airports reporting they are planning to spend between £10 and £85 annually for each person within their L_{den} 55dB contour. If these sums are spent this equates to a considerable outlay. Whilst this cost cannot be attributed to NAPs, being almost entirely due to existing commitments to manage noise under local planning agreements, and perhaps in response to local stakeholder pressure, Defra and DfT may consider these sums in the context of equivalent sums spent on managing noise in agglomerations, from roads, and from major railways. However, we recognise that an airport is run as a business, and the choice and hence the costs of noise management control are taken within a broader overall context for that business.

Best practice

It is our strong belief that the airports should be following best practice when developing and implementing effective noise action plans. However, owing to the variability of the complexity, character and size of the airports, the problem has been tackled in a variety of ways. Furthermore, as the Competent Authority is the airport operator, this leaves the whole process open to criticism with an issue of who is making sure the community is receiving a fair deal. To overcome this, we recommend three main actions for developing effective noise action plans for airports.

1. Defra should fund and publish a full and independent benchmarking exercise of existing NAPs to show how well an airport's NAP has met defined objectives and criteria.
2. Defra should facilitate the development of a joint code of conduct on

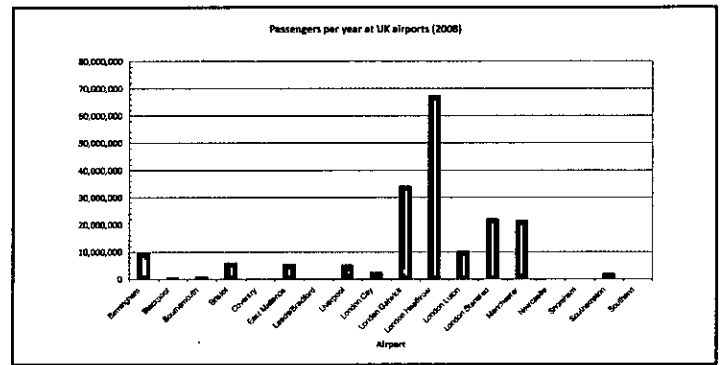


Figure 2

Annual passengers per year

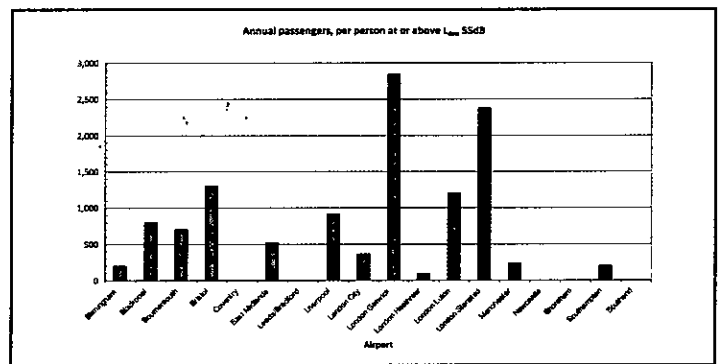


Figure 3

Airport 'noise efficiency'

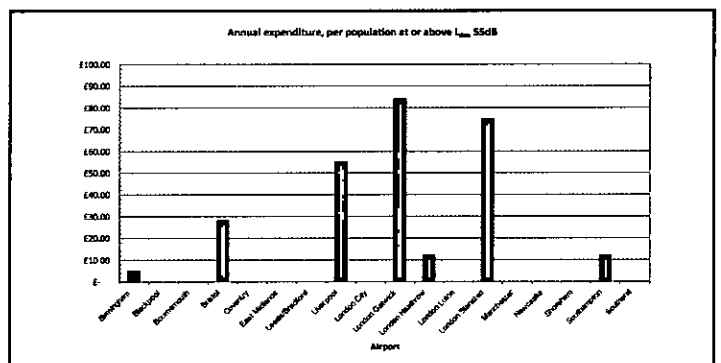


Figure 4

Expenditure on noise management per person

noise action planning for airports, which could be used to audit airport NAPs independently. This would ensure a minimum level of actions.

3. Defra should encourage and fund a forum for presentation and discussion of best practice at airports in developing and implementing NAPs. Defra may also like to consider leading by example at the 'designated airports', through dialogue with BAA, and disseminating good practice at the forum.

Reference

- [1] Study of aircraft noise exposure at and around community airports : Evaluation of the effect of measures to reduce noise, European Commission TREN/F3/15-2006

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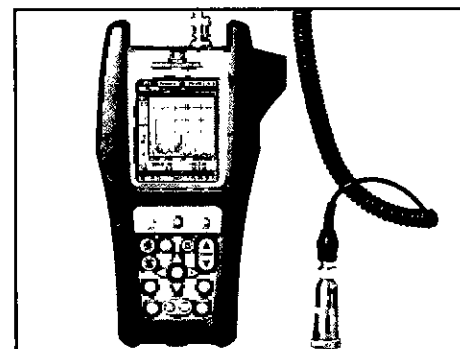
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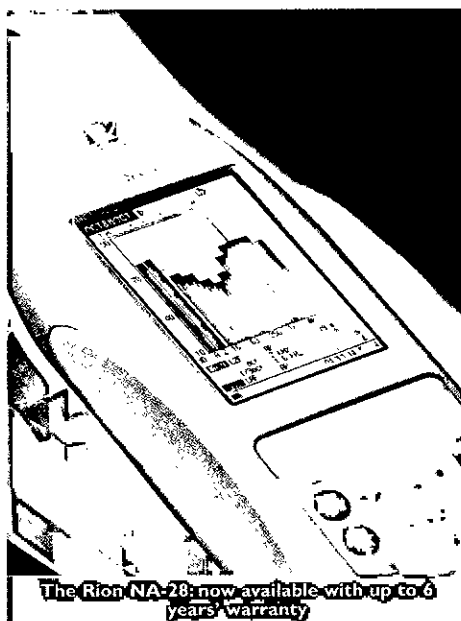
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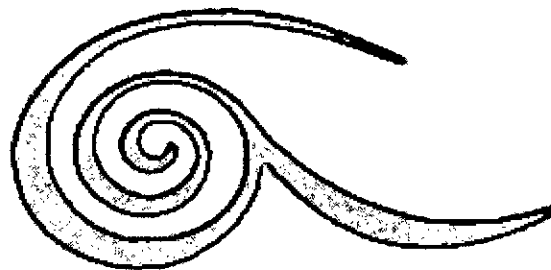
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Committee meetings 2010

DAY	DATE	TIME	MEETING
Thursday	21 January	10.30	Diploma Tutors and Examiners
Thursday	21 January	1.30	Education
Thursday	28 January	10.30	Membership
Thursday	11 February	11.00	Publications
Thursday	18 February	11.00	Medals & Awards
Thursday	18 February	1.30	Executive
Thursday	4 March	10.30	Engineering Division
Tuesday	9 March	10.30	Diploma Examiners
Thursday	11 March	11.00	Council
Tuesday	6 April	11.00	Research Co-ordination
Tuesday	7 April	10.30	CCWPNA Examiners
Tuesday	7 April	1.30	CCWPNA Committee
Thursday	15 April	10.00	Meetings
Thursday	6 May	10.30	Membership
Thursday	20 May	11.00	Publications
Tuesday	26 May	10.30	CMOHAV Examiners
Tuesday	26 May	1.30	CMOHAV Committee
Thursday	3 June	11.00	Executive
Thursday	17 June	11.00	Council
Wednesday	16 June	10.30	CCENM Examiners
Wednesday	16 June	1.30	CCENM Committee
Thursday	24 June	10.30	Distance Learning Tutors WG
Thursday	24 June	1.30	Education
Thursday	1 July	10.30	Engineering Division
Tuesday	6 July	10.30	ASBA Examiners
Tuesday	6 July	1.30	ASBA Committee
Thursday	8 July	10.00	Meetings
Tuesday	3 August	10.30	Diploma Moderators Meeting
Thursday	2 September	10.30	Membership
Thursday	9 September	11.00	Executive
Thursday	16 September	11.00	Publications
Thursday	23 September	11.00	Council
Thursday	30 September	10.30	Diploma Tutors and Examiners
Thursday	30 September	1.30	Education
Thursday	7 October	11.00	Research Co-ordination
Thursday	14 October	10.30	Engineering Division
Thursday	4 November	10.30	Membership
Tuesday	9 November	10.30	ASBA Examiners
Tuesday	9 November	1.30	ASBA Committee
Thursday	11 November	10.00	Meetings
Thursday	18 November	11.00	Executive
Wednesday	24 November	10.30	CCENM Examiners
Wednesday	24 November	1.30	CCENM Committee
Thursday	25 November	11.00	Publications
Thursday	2 December	11.00	Council
Tuesday	7 December	10.30	CCWPNA Examiners
Tuesday	7 December	1.30	CCWPNA Committee

Refreshments will be served after or before all meetings. In order to facilitate the catering arrangements it would be appreciated if those members unable to attend meetings would send apologies at least 24 hours before the meeting.

Examination dates

CCENM - 14 May and 22 October **CCWPNA** - 5 March and 5 November
CCHAV - 23 April **ABSA** - to be confirmed
Diploma - 10 and 11 June

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Our ISO 9001 compliant laboratory is audited by BSI so our meters, microphones, accelerometers, etc., are delivered with current calibration certificates, traceable to UKAS.

We offer an accredited Calibration Service traceable to UKAS reference sources.

For more details and 500+ pages of information visit our web site,

www.gracey.com



Campbell Associates

Sonitus House
5b Chelmsford Road
Industrial Estate
Great Dunmow
Essex CM6 1HD

T 01371 871030
F 01371 879106
e hotline@campbell-associates.co.uk
w www.acoustic-hire.com
w www.campbell-associates.co.uk



Leading and innovating sound and vibration measurement solutions

UKAS calibration
of all makes of
instrumentation



Sound and vibration instrumentation hire

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SOUND & VIBRATION

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The UK Distributor of

RION
sales - hire - calibration

AND
Measurement Systems

Long-Term Monitors

RELIABLE • SITE-PROVEN • QUICK & EASY TO USE



Microphone Technology

Pre-polarised microphones are standard on **RION** meters
No Polarisation Voltage required
Inherently more tolerant of damp and/or cold conditions



WS-03 Outdoor Microphone Protection

Practical, simple and effective
Site proven - years of continuous use at some sites
No requirement for dehumidifier
No complicated additional calibration procedures
Standard Tripod Mount or any 25mm outer diameter pole



Weather Resistant Cases

'Standard' supplied with 5 or 10m extension
'Enhanced' with integral steel pole
Gel-Cell batteries give 10 days battery life (NL Series)
Longer battery life, mains & solar options available



NL-31/32 (Class 1) NL-21/22 (Class 2)

Overall A-weighted sound pressure levels
Up to 99,999 measurement periods
 L_{Aeq} , L_{Amax} , L_{Amin} , SEL plus 5 statistical indices
Audio recording option available



Remote Control & Download Software (RCDS)

In daily use on many sites
Download data and control the meter using the GSM Network
See the meter display in 'Real Time' across the GSM Network
Send alarm text messages to multiple mobile phones
Automatically download up to 30 meters with Auto Scheduler (ARDS)



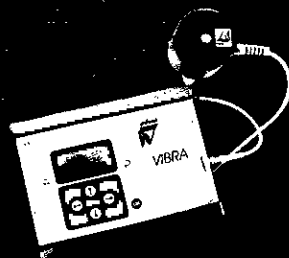
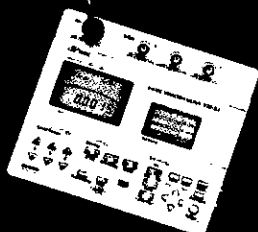
NA-28 (Class 1)

- Octaves & Third Octaves
- Audio Recording Option



VM-54

- Measures and Logs VDV's
- Perfect for Train Vibration
- FFT Option Available



Vibra/Vibra+

- Logs PPVs for up to 28 Days
- Designed for Construction & Demolition
- Sends Alarms and Data via GPRS (Vibra+)



Data Handling

- You can always get the data from a **RION**
- Data stored as CSV files to Compact Flash
- Specialist download leads/software not needed



01908 642846



info@noise-and-vibration.co.uk



www.noise-and-vibration.co.uk