Vol 35 No 5 SEPTEMBER/OCTOBER 2010

ACOUSTICS BULLETIN

in this issue... Proposal for a shortened environmental measurement procedure

plus... Active noise control in aircraft cabins

Supplementing noise maps

Distributed remote environmental array and monitoring system

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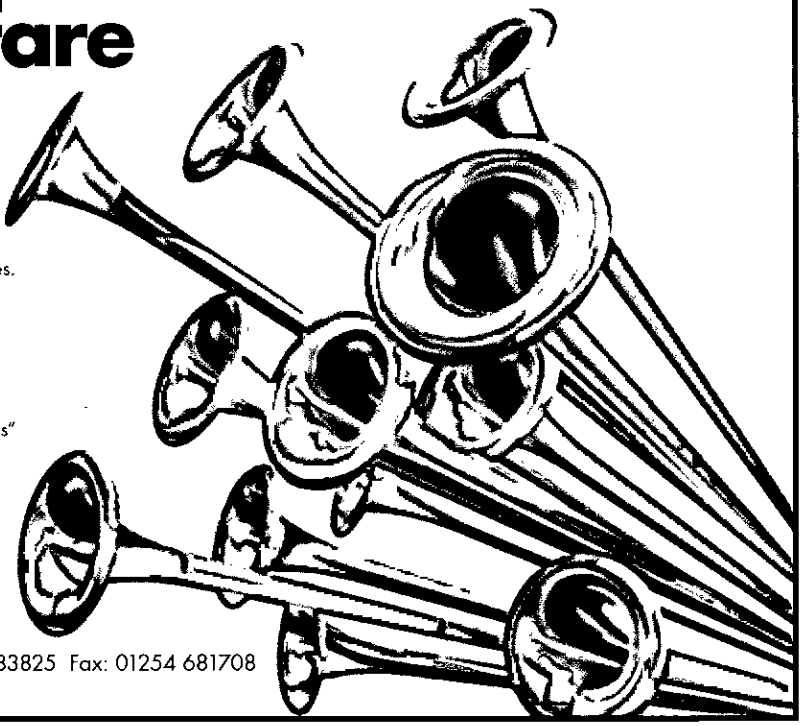

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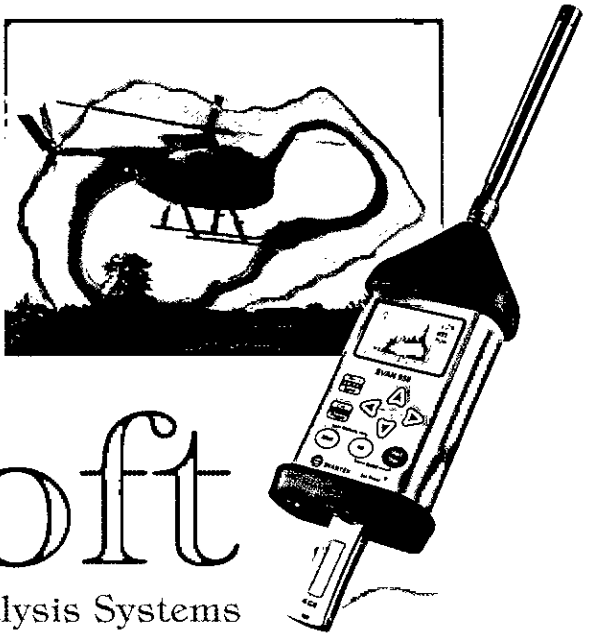

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ACOUSTICS BULLETIN

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Contents

Front cover photograph: This issue of Acoustics Bulletin includes a suggestion for shortening the procedures used to determine environmental noise levels in many situations. In many locations, the predominant noise source is road traffic, and the night-time noise indicator $L_{Aeq,8h}$ can be predicted with reasonable accuracy from a few brief measurements. Whilst it is not suggested that the method is sufficiently rigorous for all purposes, it has potential uses in situations where the nature of the night-time noise climate determines the attenuation measured to be built into a project. The author awaits reactions and comments to his suggestions with great interest.

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.

Institute of **Acoustics**

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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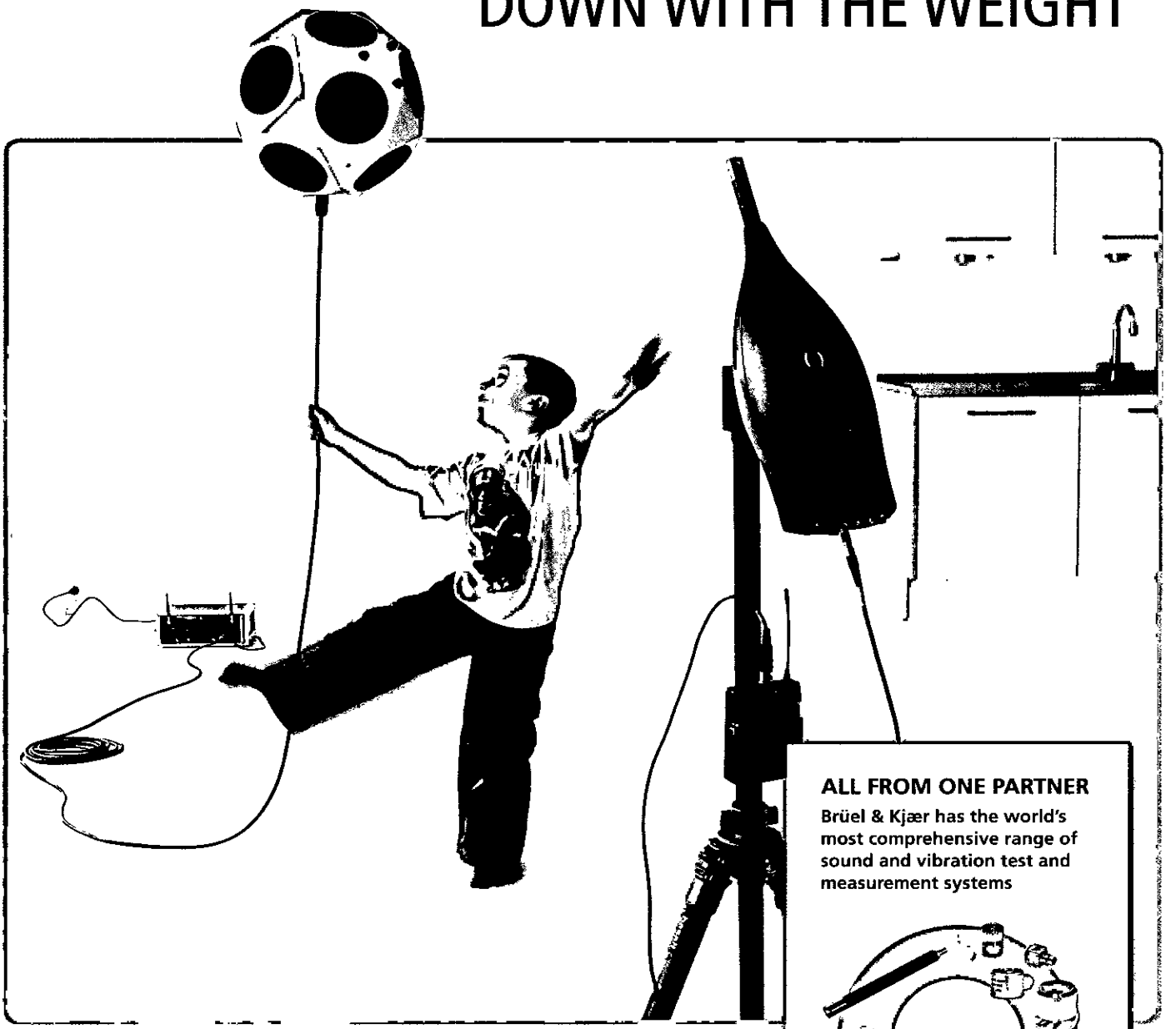

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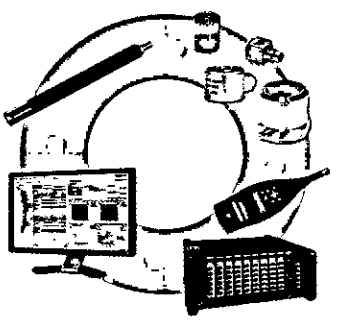

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Dear Members

At the time of going to press our esteemed President, Trevor Cox, was away on a well-deserved vacation in France. Consequently, Acoustics Bulletin's Editor has asked me to step in at the last minute to fill page 5 with the current news from Head Office. With Trevor's approval, here it is.

As you will see on page eight of this issue, the Institute has a new Publicity Officer. The previous incumbent, Debbie White, moved on in July and we are fortunate to have acquired a very experienced replacement in Charles Ellis. Charles is a highly effective communications expert – from national newspapers and television reporting to operating a busy press office. I am sure that having worked at the Sunday Times, Daily Mail, Thames Television and GMTV, Charles will prove to be well equipped in helping to promote the Institute, its meetings and other activities.

With the holiday season almost over I would like to take this opportunity to draw your attention to the programme of conferences being organised for the rest of this year and beyond. The Institute is very grateful to those who expend so much time and effort in the organisation of the meetings and I would urge members to attend them – the benefits far out way any costs involved. Details of the upcoming meetings can be found at www.ioa.org.uk/events/.

The Institute is organising two special conferences to take place next year. Always well attended, the next in the series of auditorium acoustics conferences will take place at Ireland's new world class purpose-built international conference and event centre, Convention Centre Dublin (the CCD), on 20 to 22 May 2011. This follows the highly successful conferences in Copenhagen (2006) and Oslo (2008). Next year's event will also include a visit to the Grand Canal Theatre and either a Guinness or whiskey production venue!

Additionally, the Tenth International Congress on Noise as a Public Health Problem will be held between 24 and 28 July 2011 in London, on behalf of the International Commission on the Biological Effects of Noise (ICBEN). This congress aims to present the current state of the art in research on the biological effects of noise on health, and is suitable for research scientists, policy makers and industrialists concerned with the effects of noise. Further information on www.icben2011.org.

Looking further ahead, the Institute will be organising the 11th European Conference on Underwater Acoustics (ECUA) to be held in Edinburgh between 2 and 6 July 2012. ECUA provides a key international forum for the presentation of the latest research and developments in underwater science and engineering.

The main topics for the conference are: underwater acoustics, acoustical oceanography, engineering acoustics, and signal processing in acoustics. ECUA typically gathers between 300 and 600 participants from all over the world and this will be the first time the biennial conference has visited the UK. Please see www.ecua2012.com for updates.

Over 55's will be pleased to learn of the formation of the Senior Members' group and an inaugural meeting is to be arranged in the autumn. Interested parties may register their interest by emailing seniormembers@ioa.org.uk.

Finally, a reminder that the Institute offers a range of professionally-recognised courses for those interested in working in any aspect of acoustics. They cover general principles and specific applications, including building acoustics, and the management, regulation and control of noise and vibration in the workplace and environment.

The Diploma in Acoustics and Noise Control normally requires a year of (part-time) study, including coursework, written examinations and a project. For further information please contact my colleague Hansa Parmar on 01727 848195 or email education@ioa.org.uk.

Normal service will be resumed in the November/December issue of the Bulletin. I would reiterate Trevor's email address for those wanting to get in touch - president@ioa.org.uk - and of course you can follow the presidential Twitter account http://twitter.com/ioa_president.

Kevin Macan-Lind

CHIEF EXECUTIVE

Meeting report

Daniel Goodhand. London branch

On Wednesday 16 June 2010, John Pointing gave a presentation to the London branch of the Institute of Acoustics entitled *What is to be done about noise nuisance?* There were a record number (73) of attendees from a variety of backgrounds including consultants, environmental health officers and solicitors.

John Pointing is a barrister practising in environmental and regulatory law, and is senior lecturer in property law at Kingston University. He is an associate consultant of Temple Group and advises Defra on environmental law and regulatory matters. He also provides professional training and consultancy for the Chartered Institute of Environmental Health, local authorities and the professions. His publications include: *Statutory nuisance law and practice* (Oxford University Press 2002) and *Food safety enforcement* (Chadwick House Group 2005), both co-written with Rosalind Malcolm.

John began with a brief introduction to the relevant Acts of Parliament that cover noise nuisance. He highlighted the two limbs of statutory nuisance and the exclusions that would apply, before embarking on a whirlwind tour of the case history. Members were amused to hear that one of the earliest nuisance cases dated back to 1301, and involved a decision as to where one Mr William de Gartone could take his morning constitutional. His poor neighbour, Mr William de Bethune, had complained that it was so close to his stone wall that it was penetrating into his cellar. Mr de Gartone argued that he and his ancestors had been 'seised of the privy in question' long before his neighbour decided to build his cellar. But, no – it was decided that this was not a good enough defence, and so it prevails today – it doesn't matter who got there first, if it's a nuisance, it's a nuisance.

John went on to detail cases that highlighted the importance of reasonability, as well as discussing the Hackney LBC v Rottenberg case, which John coined as 'Rottenberg lousy' – a reference to the poor investigation into the noise complaint.

Members heard about the cases addressing best practicable means (BPM). John referred to the argument that enforcement officers could dismiss BPM as only a concern for the courts but he then helpfully explained why he felt that was not the case – he was clear that BPM went to the heart of reasonableness: a fundamental aspect of nuisance. Members were then guided through the case law that plays a key role in how local authorities should serve notices, highlighting cases such as Elvington Park v York DC (2009). There followed a brief discussion of public nuisance and the Licensing Act.

John rounded off the evening by sharing an amusing anecdote of his correspondence with his MP about the guidance given by the Departure of Culture, Media and Sport on public nuisance – something that he clearly thought was defective guidance. However, judging by some of the questions that followed, it was unclear if everyone agreed with John's view.

The presentation was followed by a discussion which focused on a number of issues, including whether an assessment was objective without the inclusion of noise monitoring – strong views were held by the Environmental Health contingent of the room, which were supported by John. John felt that an objective assessment for nuisance could be undertaken perfectly well without the inclusion of noise monitoring, but added that regulators might ask themselves why not undertake noise monitoring? He commented that the 'Rottenberg lousy' case had been so poorly handled that the judge presiding felt it necessary to highlight the absence of noise levels.

In addition, the terms 'noise' and 'sound' were briefly discussed, which members noted are terms that often incorrectly interchanged: an extended discussion ensured into the use of BPM as a defence, and the difference between private and public nuisance was also raised. Discussions continued in the Cittie of Yorke public house long into the night! All in all it was an enjoyable and informative evening.

The London branch would like to extend their thanks to John for taking time out of his busy schedule to join us for the evening to give a very interesting presentation, which proved to be extremely popular. The committee would also like to extend their thanks to WSP for providing the venue.

Topics and speakers for the evening meetings are generally identified and organised by the London branch committee, but we always welcome new ideas and suggestions for future presentations. If anyone has any ideas or suggestions, or may even like to offer to give a presentation, they should not hesitate to contact Nicola Stedman on **stedmann@rpsgroup.com** .

Meeting report

London branch

Proposed clarification to the Noise Insulation Regulations and the revision of Calculation of Road Traffic Noise was the snappy title of a presentation by Phil Abbott of AECOM at the London branch meeting held on Tuesday 20 October 2009. Phil is technical director of AECOM and discussed a proposal for clarification to the Noise Insulation Regulations (NIR) and revision of Calculation of Road Traffic Noise (CRTN). He had been at the Transport Research Laboratory for 37 years before moving to AECOM recently.

What followed was a comprehensive break down of the history of the two documents and a summary of research which has been carried out since CRTN was updated in 1988. The research has led to a revision in 2008 of the *Design Manual for Roads and Bridges* (DMRB) which now contains additional advice to CRTN for the prediction methodology. The new guidance was issued in order to improve consistency in procedures, adopt results from recent research and reflect advances in road design. The advice is set out in Annex 4 of DMRB, Volume 11, Section 3, Part 7 and includes:

- Dual sources for multi-lane carriageways;
- Heavy vehicle classification, traffic forecasts and speeds;
- Road surface correction;
- Extrapolated calculation over greater distances;
- Median barriers (safety barriers on central reserve);
- Sound-absorbing noise barriers;
- Reflection effects from opposite facades (this aspect was noted by Phil as also assisting in reducing processing time in traffic noise prediction software).

However, a problem arising from the guidance is that assessment for the NIR uses CRTN and a DMRB assessment uses CRTN **plus** the guidance given in Annex 4. In practice, therefore, assessments will need to be carried out twice for a road scheme: once to determine entitlement to insulation under NIR, and again for the purposes of DMRB. Possible solutions to this problem could be either to revise CRTN with subsequent revision to NIR, or revise NIR so that it refers to the current version of DMRB for determining entitlement.

Phil also offered further clarification and suggested possible revisions to the NIR with respect to the interpretation of 'altered highway' ie

changing the definition to '*a highway of which the location, width or level of the carriageway as defined by the edge of the traffic lanes has been or is to be altered (otherwise than by resurfacing)' and 'all the carriageway, after the work is completed, is sited so that at every point at least part of its width lies on land within the limits of the carriageway that existed prior to the work commencing.*' Phil then highlighted the lack of clear guidance on the application of statutory duties or discretionary powers in relation to schemes which included a combination of new highways, additional carriageways and altered highways. He then described a methodology which would assist in determining whether these types of schemes should be treated under Regulation 3 as a statutory duty, or under Regulation 4 as a discretionary power.

The meeting was well attended and some interesting questions and discussions followed the presentation. The topics included the integration of UK calculations procedures with European legislation (prediction and use of L_{den}, noise mapping etc), improvements in accuracy, problems associated with the surface correction for carriageways with mixed road surface types, and the WEB TAG consultation document on noise assessment.

The London branch committee would like to extend their thanks to Phil Abbott for sparing the time to join us and to WSP for providing the venue.

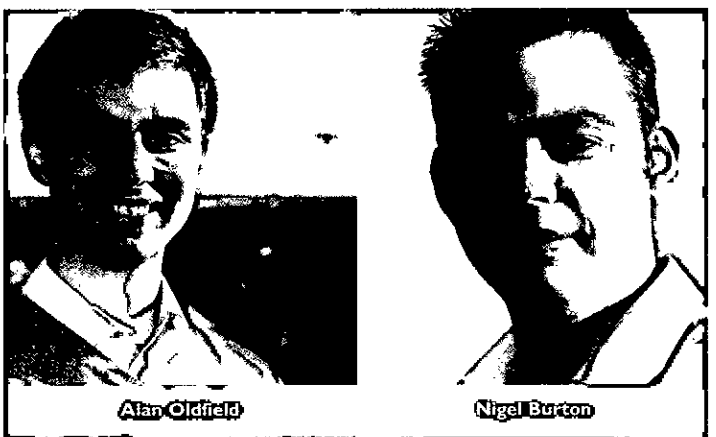
Topics and speakers for the evening meetings are generally identified and organised by the London branch committee, but we always welcome new ideas and suggestions for future presentations. If you have any ideas or suggestions, or may even like to give a presentation yourself, then please do not hesitate to contact Nicola Stedman: **stedmann@rpsgroup.com** .

Engineering Division news

Peter Wheeler. New Chartered Engineers

Congratulations to the following members who have gained Engineering Council registration as Chartered Engineers this year through the Institute.

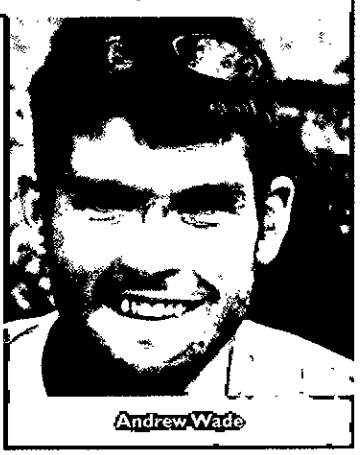
- **Alan Oldfield** is a building and architectural acoustics specialist within the acoustics group at AECOM. He joined AECOM as a graduate in 2004 and transferred within the company to Toronto, Canada, in early 2010, with current project work including the management of construction noise and vibration for a municipal trunk sewer system.
- **Nigel Burton**, who is associate director at AECOM, has over ten years' experience in acoustical consultancy. He is AECOM's representative for the Association of Noise Consultants. Nigel is currently responsible for the acoustic design of a number of school and higher education projects.
- **Jim Smith** has been with Arup Acoustics since 2001, specialising mainly in sound system design and architectural and building acoustics. Jim has also project-managed and advised on some high profile projects including the Torino 2006 Winter Olympics ice hockey arena and international airport projects such as Beijing Capital International Airport.
- **David Trew** is an associate at Bickerdike Allen Partners, where he has worked on a diverse range of acoustical projects, including airports, mixed-use developments, schools, GP surgeries and commercial developments, since graduating from the Institute of Sound and Vibration Research at the University of Southampton in 1999.
- **Andrew Wade** is from South Africa, and has been working for the past five years at Sound Research Laboratories' Suffolk office. Andrew's main specialisations are building acoustics and room acoustics modeling. He will return to South Africa to start up SRL SA. He has invited fellow IOA members to 'give him a call when you're in the area and fancy a trip to a vineyard'.


Alan Oldfield

Nigel Burton


Jim Smith


David Trew


Andrew Wade

The Engineering Council Register has three categories. These are Chartered Engineer (CEng), Incorporated Engineer (IEng), and Engineering Technician (EngTech). Applications made to the Institute for registration as CEng have grown steadily and the level of interest in IEng registration has also increased. We also expect the EngTech registration to prove popular with many of our Technician Members.

The concept of progression within these three categories of registration is being promoted by the Engineering Council, so that professional engineers may transfer within the Register as their careers develop. We see a market opportunity for IEng registration among many of our younger graduate members, who can demonstrate they have acquired the relevant engineering competencies, although they have yet to gain experience in some of the leadership and innovation areas required for CEng registration.

If you are interested in gaining registration, contact us at **acousticsengineering @ioa.org.uk** . We will be holding interviews in the autumn and in early 2011.

If you are already registered with the Engineering Council, either through IOA or another institution, and would like to play a part in our committee work, interviews and support to candidates, please contact us, as above.

Peter Wheeler CEng HonFIOA
for the Engineering Division

Meeting report

Kevin Howell. Midlands branch

Scott Wilson was again the venue for the June 2010 Midlands branch meeting. Rick Jones presented a detailed update on the noise and vibration issues related to light rail systems, and the efforts being made to produce guidance and standardisation in this field. Rick, now an independent consultant, began by outlining work he carried out whilst he was at DeltaRail.

There are light rail systems in the UK in Blackpool, Manchester, Sheffield, Nottingham, Birmingham, Croydon, Tyne and Wear and London Docklands, and also soon in Edinburgh. The industry body, UK Tram, has been addressing a number of issues that are holding back the development of new tram and light rail systems. One of these issues is noise and vibration and an activity group was established to work in this area with financial support from the Department for Transport. DeltaRail was commissioned to take the technical lead.

The work was split into two phases. Phase 1 was to establish the noise and vibration environment relating to existing schemes and the current legislation, standards and guidelines. This included gathering information via a questionnaire about existing and proposed schemes, and by means of a literature review. About 30 key items were identified for consideration. Phase 2 was to establish best practice in noise and vibration design and management through acceptability guidelines and methods of evaluation, monitoring and mitigation. This work has developed acceptable noise and vibration levels and design guidance for both system operation and individual components, and also a recommended monitoring regime and a strategy for maintenance and renewal. Rick explained these in detail. The reports covering this work can be found on the DfT website.

Rick completed his presentation with an update on developments in the standardisation of the measurement of light rail environmental noise through his work on CEN TC256 working group 3, which is responsible for the revision of EN 3095 relating to the measurement of noise emitted by railbound vehicles.

This was an excellent presentation enjoyed by the 19 people present: a fine attendance considering the near clash with the crucial (at the time) football match between England and Slovenia in the World Cup. Many thanks are owed to Rick and also to Scott Wilson. As is now customary, discussions continued in a local curry house.

New face at St Albans

IOA appoints new publicity officer

We welcome to head office Charles Ellis, the Institute of Acoustics' new publicity and information officer.

A former national newspaper and television journalist, Charles has moved from a City of London communications agency, where he spent 11 years editing a series of award-winning internal and external publications for blue-chip companies and Government departments.

He says he is delighted to have joined the Institute and is looking forward immensely to publicising its work and working closely with members to keeping everyone informed of the latest key developments across the acoustics spectrum. He hopes to meet as many members as possible over the coming months and would welcome any suggestions on how HQ could provide people with an even better information service.

Away from work, Charles is a passionate sports fan and this season for the first time he is managing a team at Harpenden Rugby Club.

Charles can be contacted at **charles.ellis@ioa.org.uk** or on **01727 848195**.

Charles Ellis

Tenth ICBEN conference

to be hosted in London by IOA

The IOA is organising the tenth ICBEN conference in the summer of next year. Inaugurated in 1968 this congress has travelled the world but will be held in the UK for the first time between 24 and 28 July 2011.

The venue will be Imperial College, London. The conference is being organised by the Institute of Acoustics on behalf of the International Commission on the Biological Effects of Noise (ICBEN). This congress aims to present the current state of the art in research on the biological effects of noise on health and is suitable for research scientists, policy makers and industrialists concerned with the effects of noise. Papers and posters will be included on topics including noise induced hearing loss, noise and communication, the non-auditory physiological effects of noise on health, the influence of noise on performance and behaviour, the effects of noise on sleep, community responses to noise, noise and animals, interactions with other agents and contextual factors, and noise policy and economics.

Sponsorship opportunities exist for organisations wishing to promote themselves to this international audience and interested parties should contact the Chief Executive, Kevin Macan-Lind, on **01727 848195**, or email **kevin.macan-lind@ioa.org.uk** for further details.

A Call for Papers has just been issued with a deadline for the submission of abtracts being 14 February 2011. Further information about the conference can be found at **www.icben2011.org** .

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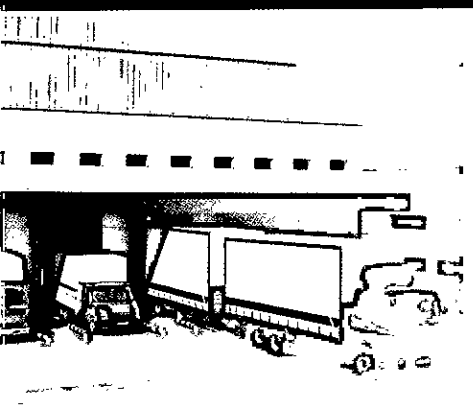

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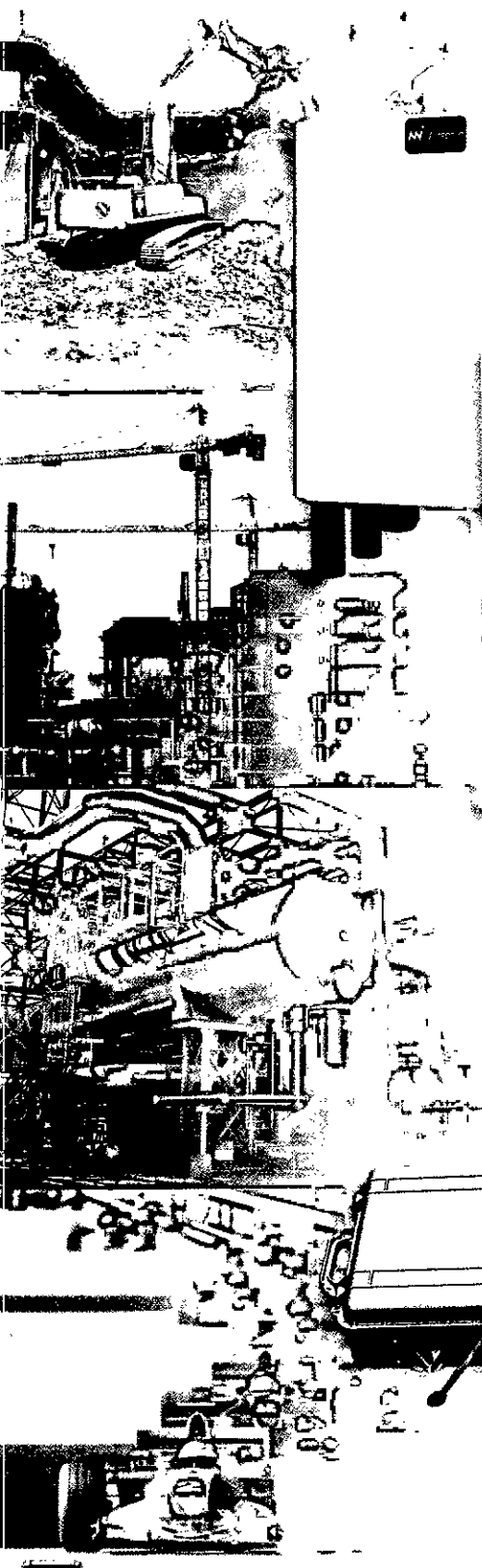

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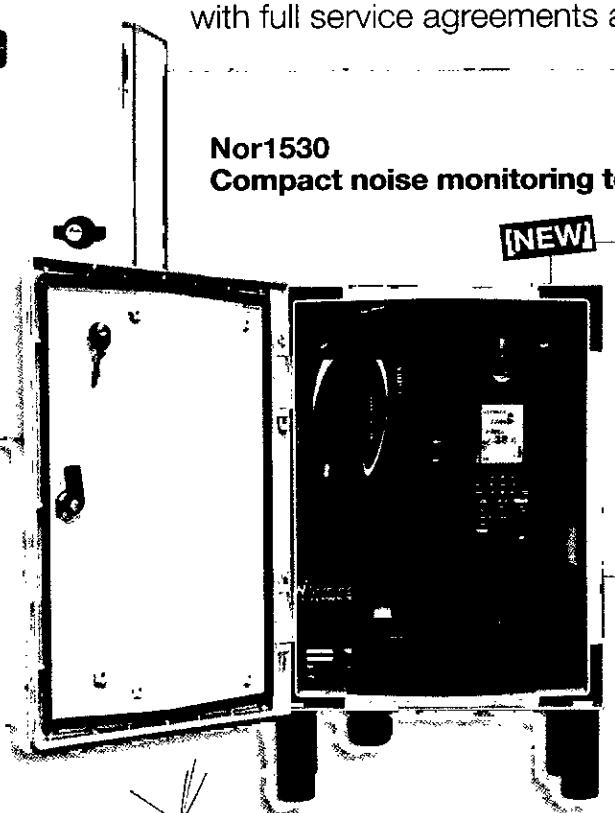

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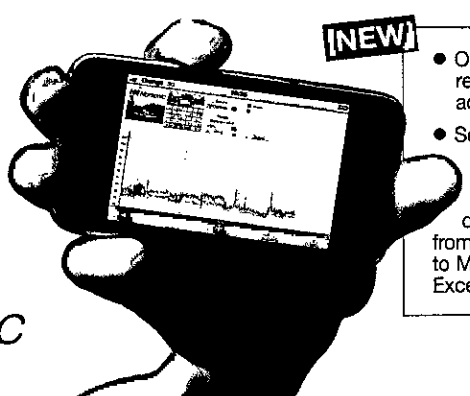

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Norsonic

Y' canna change the laws of physics!

Andrew Ramsey. Reflections on 30 years in professional engineering bodies

Andrew Ramsey retired as Chief Executive Officer of the Engineering Council in June 2010. He took the opportunity to reflect on how the profession has progressed in recent decades, and his remarks on his experience in the post, and as a longstanding professional engineer, will strike an immediate chord with many Acoustical Engineer members.

Andrew Ramsey

Introduction

Engineering is generally taken for granted in modern society. Despite our best efforts, most of the population does not wish to know the extraordinary - to us - developments in design, manufacture and project management that underpin their blissful expectation that their aeroplane will arrive at its destination and their mobile will connect seamlessly with a new network.

My entry in 1979 into the professional staff community was in building services engineering - an obscure discipline even to other engineers. When they do think about it, most connect the idea of heating, ventilating, lighting and air-conditioning with their own DIY efforts and wonder how practitioners could ever achieve professional status.

A refugee from the rapidly privatising electricity supply industry, I was also bemused to discover a thriving sector of the economy, grappling with the problems of architect designed buildings that behaved like greenhouses, developments in theatre design, and ensuring shoppers and staff were comfortable and safe in giant retail centres.

Their institution, CIBSE, was a campaigning institution. Long used to underdog status, the institution had taken on ministers, lawmakers, the Privy Council and the engineering establishment - and generally won. The battle I engaged in, almost immediately, was the fight to gain CEng recognition for the undoubtedly competent core of the profession. This involved a lawyerly series of arguments with the newly formed Engineering Council, a public relations campaign, demonstration of rigour and fearless engagement with key opponents.

There I learned the nuances and defects of the professional standards of the day - SARTOR - eventually gaining a sufficient reputation for unwillingness to compromise that I was invited to become, in turn, the first CEO of the Construction Industry Council, and then the 'Convenor' of the Group of 12 - the CEOs of the biggest PEIs of the day. This latter group helped needle the ponderous Engineering Council into a complete reorganisation – but not a happy one, unfortunately.

Nevertheless, perhaps over-impressed with my own achievements, I accepted in 1997 a job as Director for Engineers' Regulation at the newly reformed body, and hence began another long journey to lead, eventually, one of the more successful creations of the engineering profession (although there were times when this would have seemed a most unlikely outcome).

Changes

The biggest changes I have seen have been in attitudes and influence. Certainly I have lived through a period when the Engineering Council could do nothing right. The professional community saw it as an external imposition, a diversion from the business of promoting engineering properly, coddling tiny learned societies (forgetting where most had started), and generally creating unnecessary bureaucracy. Somehow we have become for the profession a source of added value, of pride, and of wisdom - I am not foolish enough to believe this is all my own work as I have been privileged to work for a sensitive and intelligent Board and supported by a thoughtful, dedicated and experienced staff.

These changes have arrived at a good time for the profession. I believe that UK society is starting to rediscover the contribution the professions make to our national wellbeing – not particularly in economic terms (though the £2bn surplus on trade in engineering services is quite handy) - but rather in making sense of the miasma of qualifications and courses, providing external verification of their value, ratified by the willingness of employers and clients to trust the results.

Not only that, but we are now in the era of the NGO. Lobbying has got a bad name, but modern democracy thrives on the research and advice that professional bodies can provide. Untainted by profit, but crucial to economic and social progress, the professional societies are recovering from a period when they were seen by both major political parties as self-interested rent-seeking private groupings. I sense in recent actions and pronouncements by governments (the Fair Access to the Professions inquiry, the creation of a Technician Council), a grudging acceptance that the professions have a key role to play in the skills agenda.

Another great sea change I have seen is the widespread acceptance of outcome-based standards. In the UK the engineering profession led much of the development. The National Council for Vocational Qualifications tried to embed the changes, but met huge resistance, apathy, and – it had to be said – caused many expensive, painful and ultimately unsuccessful experiments to be visited on particularly the Further Education community during the 1980s and 1990s. The ill-fated professional engineering standard, SARTOR 3, got it right, but was shot down because, lacking the courage to promote this, the Engineering Council got involved in an ultimately self-destructive attempt to influence university admissions.

It was part of the new Engineering Council's success to recognise this and draw out of the bonfire the attractively slim UK-SPEC - which hit the spot so successfully that it has formed the basis for professional standards in allied professions.

Nobody born after 1970 would recognise the changes that IT has caused

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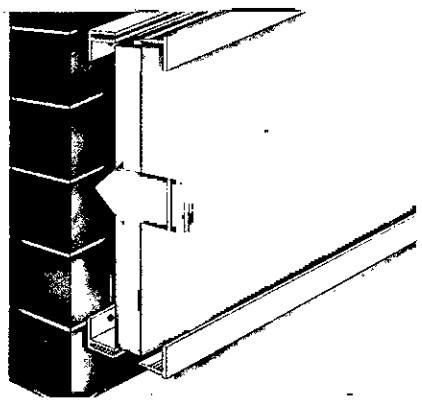

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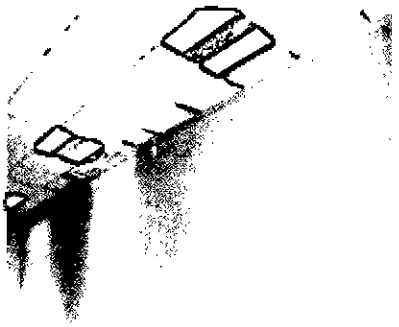

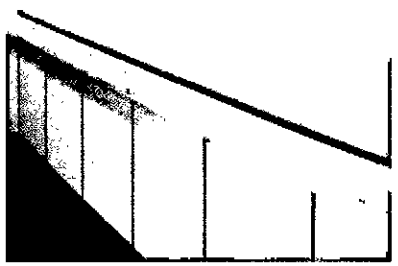

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in the utility and significance of professional bodies. Always the recipients and co-ordinators of developments related to practice, professional bodies were restricted in what they could readily disseminate. Everything centred on the library, the conference and the evening lecture – demanding physical presence, or at least delay, and often constraining valuable developments because of the difficulty of identifying who might be interested. The world wide web broke open those boundaries, and introduced today's professions to the role of providing authority to information ubiquitously available in ways our forefathers could not conceive. My belief is that we have only started on a journey where the sourcing and sharing of knowledge becomes a more and more important part of the work of professional societies.

If sex was discovered in the 1960s (according to Philip Larkin), globalisation was the discovery for the engineering profession in the noughties. Engineers from the British Isles had built factories, ports and railways all over the world from Victorian times, but this was a globalisation built on the ease of purchasing components and designs from all over the world, and assembling or creating finished products somewhere else. Purchasers, employers and governments suddenly needed reassurance about the credentials of the professionals involved - and then to demonstrate their own people measured up. The cosy Washington Accord and FEANI agreements needed to become more rigorous – not only to show they worked, but also to provide meaningful criteria to be met by the orderly queue of national engineering bodies seeking recognition. The UK engineering profession, with its newly restated standard, UK-SPEC, has been in a good position to profit from these developments.

For many years the profession paid lip-service to the role of the technician. The three tiered hierarchy was good in theory, unless you were in the bottom tier. Besotted by status considerations, the profession spent more time worrying about their chartered members and regarded engineering technicians as, at best, 'chartered engineer-lite', mainly looked after by the smaller societies who had - in the eyes of the bigger ones - no status anyway.

2002 saw a resolution by the new Board of the Engineering Council (UK) to address this issue. A separate, and refocused standard within the UK-SPEC was published, and the more conservative PEIs urged to look carefully at the importance of the technician. A separate political campaign was waged to persuade DTI (now BIS) to recognise the deficit in recognition compared with our competitor nations. 2009 was a culmination of our efforts - with all but two PEIs licensed for EngTech, and a White Paper calling for 'recognition of a technician class'. There is a long way to go, but the new government has reiterated the call, and the former Science Minister, Lord Sainsbury has indicated that creation of a Technician Council to promote this has the backing of his substantial Gatsby Foundation. After years of decline, the Engineering Technician register has experienced five straight years of growth.

Things that still need fixing

It is perhaps inevitable that social organisations built on pride, commitment and companionship find sharing with other similar organisations quite hard. And of course much engineering is practised in a very competitive environment. Nevertheless one of the greatest frustrations in working for this great profession has been unwillingness on the part of the PEIs to co-operate for the good of the profession, and the concomitant lack of leadership within the profession. During 2008/9 the imminence of public castigation for the lack of co-ordination on policy matters resulted in a rare flash of recognition that this might be a disadvantage. Nevertheless the agreement to support the Royal Academy of Engineering as a representative body for the profession, welcomed by the Select Committee of Inquiry looking into Engineering and Engineers, remains delicate. In addition to publishing a joint manifesto under the 'Engineering the future' banner, the profession also published multiple overlapping 'manifestos' for the May 2010 election,

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Y' canna change the laws of physics - *continued from page 11*

and is still having difficulty finding common ground on the great issues of the day - energy, environment, and skills.

Equally frustrating has been the reluctance of PEIs to recognise publicly the importance of registration of engineers and technicians. This is not just a private gripe for the Engineering Council, but undermines the standing of their own members, by suggesting that membership is unreferenced to any national standard, and introduces a hurdle for those seeking registration, who can search PEI websites in vain for the doors marked CEng, IEng or EngTech. We have worked hard at the Engineering Council over the past couple of years to address the previous poor marketing of our national standards for engineering, and I am hopeful that PEI promotion of these valuable assets is improving.

Development of the profession faces another threat in the slow demise of employer-sponsored 'initial professional development'. The UK's traditional strengths of the guilds, which became the apprenticeship system, and eventually graduate training schemes and sandwich courses, is gradually evaporating with the changing structure of UK industry. SMEs and profit centres within major corporations have no incentive to invest in training - it is almost always cheaper to poach experienced engineers and technicians. Perhaps accelerated by the privatisations of the 70s and 80s, and reinforced by globalisation releasing UK-based companies from the restrictions of local recruitment, the assumption of employer commitment on which the UK formation processes are based is looking decidedly threadbare. While there remain a large number of organisations that do still train, we need to recognise that it is increasingly up to the individual to seek relevant experience and training. That is the reason I have been committed to developing work-based higher education that links with PEI mentoring and employer interests - our Engineering Gateways scheme. Although still small scale, it has the potential to restore the balance.

Relationships with IT and science are a third concern. Both sectors have found it necessary to redefine their relationship with engineering, but in differing, and possibly damaging ways. IT has developed a gung ho anything-is-possible approach to projects that is far removed from the risk-based evaluations of engineers. It has become almost de rigueur for IT 'professionals' not to belong to a professional body, and the consequences are all around us (and documented by the Royal Academy of Engineering and the Public Accounts Committee, amongst others). We very much need to bring the IT profession back into register with the engineering profession, who after all make great use of its products and ideas.

Science is different. The UK has been enormously successful in developing much of the science on which our lives and industries depend. Science consumes large amounts of public money and constantly needs to demonstrate the value everyone gains from its output. Engineered products are easy examples to illustrate this. However, in recent years science has increasingly sought to suggest that engineering is a subset of science. This is nowhere better illustrated than in the Government's own organisation of science and engineering advice – led by a single 'Head of Profession', with no acknowledgement of the differing approaches of the scientist and engineer to problem-solving, or indeed the differing training and development needs of scientists and engineers. The concern is that the cheerleaders for science are distorting the public understanding of engineering - and the perception of engineering careers. There is no space between the blue collar artisan and the white-coated theoretician. This leads on to my next point.

Things that never change

The past 30 years have demonstrated to me that engineers hunger after public acknowledgement to an enormous extent. The most constant feature of my postbag over the years has been the accusation that the PEIs or the Engineering Council (usually both) are involved in a conspiracy to suppress statutory regulation of the profession and other forms of public recognition of engineers. Countless inquiries, reviews and reports have had professional recognition as a theme. My personal view is that this will never change. Notwithstanding the views of my correspondents, the lack of acknowledgement is probably inevitable. The first President of the Institution of Civil Engineers, Thomas Telford, wrote...

'It is unnecessary to remark to you on the business of an Engineer; all admit the difficulties of it, and the indefinite character of it; and that by the want of definition its respectability is less than its due, that public confidence which is indispensable is much weakened by the presumption of unskilful and illiterate persons taking upon themselves the name.'[2]

The number of PEIs is a second complaint. This has reinforced a view that the effectiveness of the profession has been hindered by the existence of multiple bodies with overlapping claims to expertise and influence. The creation of the CEI was a response to this, but failed to distinguish between current strength and future clout. Who, today, would challenge the likelihood that the Nuclear Institute will grow in size and influence, or be surprised that the two Institutes concerned with mining had coalesced and joined the Institute of Materials. The Engineering Council currently licenses 36 PEIs - rather fewer than the 44 originally 'nominated' by the Engineering Council, but commensurate with the 31 members of the Accreditation Board for Engineering and Technology (USA), or the 42 members of the French Conseil National Des Ingénieurs et des Scientifiques de France (CNISF] that are not schools of higher education.

Engineering will generate further new societies as new technologies and economic engines emerge. Our current structure of 30+ licensed bodies, 20 professional affiliate societies, and, probably, 30 more aspiring societies seems fairly stable and allows for growth and redistribution of emphasis as time goes by. Any lack of a coherent voice for engineering must be placed fairly and squarely on the leadership of the major institutions, the Royal Academy and the Engineering Council.

The third complaint is the difficulty of gaining registration. This falls into two categories - firstly those who suddenly realise the value of registration and expect to achieve it instantaneously. I have little sympathy with them - a volunteer-fuelled organisation must operate at the pace of committees and individuals within them, who usually have many other calls on their time. The second category is about the bureaucracy of membership processes. Here there is scope for change - and a real wish on the part of CEOs to do more. Some of the processes lend themselves to IT solutions: more could. Others require modern management techniques to wrestle the obstacles to the ground.

Things I will miss

The thousands of volunteers who populate our profession, giving their time freely to assess, mentor, share and promote engineering good practice are the profession's greatest asset. Working with them has made coming to work a joy and a privilege. Hopefully my relationship with them will not change too much as I join their ranks in the future.

I will miss working with the staff of the organisations I have served: sharing many of my quotidian satisfactions and frustrations. The *esprit de corps* and goodwill will be difficult to replace. We have shared common enemies, guilty pleasures, but most of all a belief that what we are doing is valuable, misunderstood and right.

Our contributions to society as a profession are immense. The unique nature of engineering requires regular breakthroughs and checks to the natural decay of an essentially hostile universe.

As engineers we learn early on that entropy (*aka* chaos) is our natural enemy. Our profession fights to create order and value out of the materials and resources we have. Being part of the struggle has been important to me.

Maybe Scotty was too pessimistic. Engineers can't change the laws of physics, but we can for a time at least deny their supremacy.

Andrew Ramsay, CEO Engineering Council, June 2010

References

1. Scotty - Star Trek: The Original Series *The Naked Time* first broadcast 29 September 1966
2. Thomas Telford's letter of acceptance of the office of first President of the Institution of Civil Engineers. 1820

IOA certificate pass list

Certificate Name: Certificate of competence
Environmental noise assessment
Exam Date: 14 May 2010

Bel Educational Noise Courses
Burns A
Cassidy M J
Coletto C
Hamilton P
Hamilton E K
Johnston A N
Joyes K
McIntosh H
Reid P
Reynolds P
Strawson D G
Villoria Dominguez M E
Will L A

University of Birmingham
Bennett N
Cain J
Danks A
Harvey G E
Riley E H

Colchester Institute
Azizkhan Z
Darlaston H
Long S J
McElvenny Z
Nicholl J R
Parsad Addy V
Toba D
Webb A K
Wrinch S G

University of Derby
Bolton D J
Girvan C L
Moulton M J
Rowan N J
Suschitzky K S
Swankie G N

EEF Sheffield
Armstrong C E
Revill L
Wilson P J

Liverpool University
Curlis D
Dowker G I
Lewis W
Neale W R
Postlethwaite S
Reynolds J M
Rice J
Satukijchai K
Stoddart C
Stykuc D
Swan S
Thompson P

NESCOT
Cooke A J
Pullen M
Rankin M A
Taylor S P

Shorcontrol Safety Ltd
Duffy D
Fitzmaurice J A
Maleady P
Malone D
Molloy S
O'Keeffe T J
Walker J

Certificate Name: Certificate of competence
Workplace Noise Risk Assessment
Exam Date: 5 March 2010

EEF Sheffield
Burnett R
Fisher G I
Malia R
Taylor I
Thompson M
Tranter P

Leeds Metropolitan University
Barnes C R
Bhanabhai A
Clark A D
Gordon F
Guy S E
Heslam M
Marples R

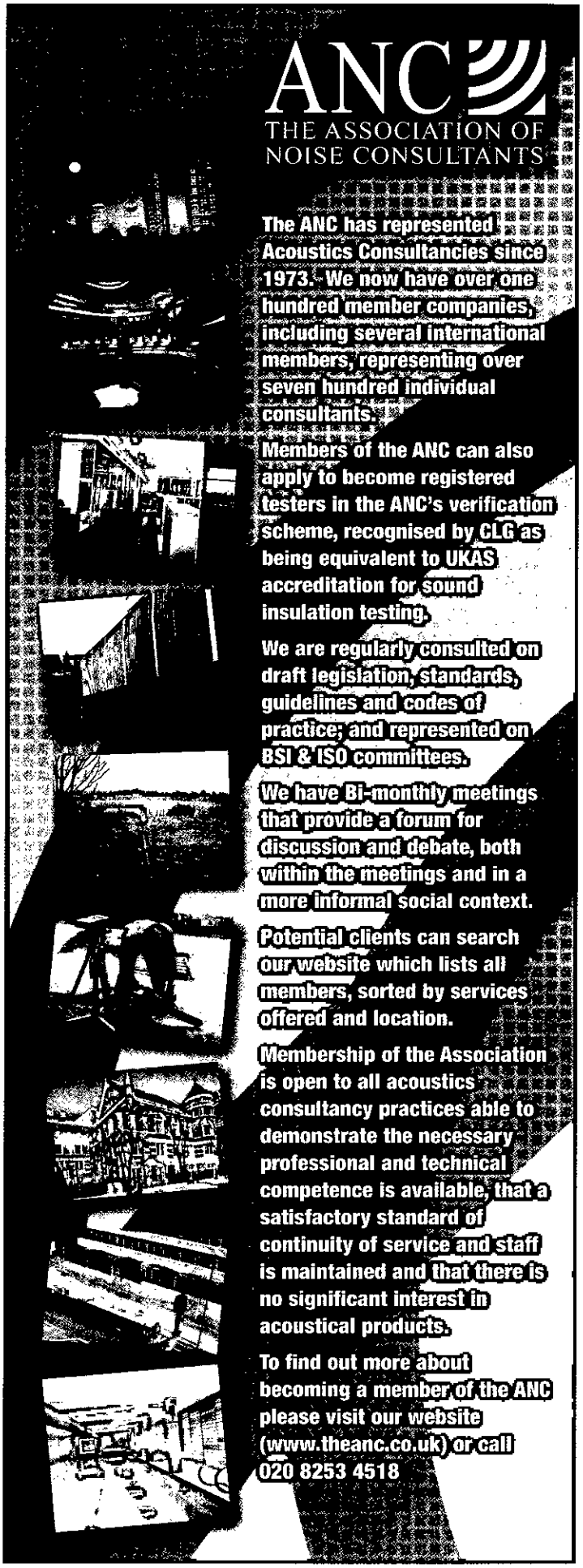
Moloney & Associates
McEnroe K
Murphy J V
O'Sullivan S

Shorcontrol Safety Ltd
Loy S
Reaney E
Winnicka M
Barrett J
Ciepierski J
Fox S
O'Dowda C

Certificate Name: Certificate of competence
Hand Arm Vibration
Exam Date: 23 April 2010

EEF Sheffield
Ambler A S
Bruce T
Coates B
Duff P
Judd M
Taylor D
Wyllie M A

Institute of Naval Medicine
Evans W A
Holland R B
Keith E
Miller A P
Paling A



Instrumentation Corner

Simon Bull. DREAMSys – a product development journey

I sit and look in wonder at my iPhone, gleaming on the desk in front of me - and it's not even the new, flashy iPhone 4 - not that I'm jealous when I see someone using one - who, me? The reason I gaze upon it in such awe is not because I like it or feel it could improve my life to any great extent (actually it just means I'm more accessible, which can never be a good thing): the real reason is the understanding that only someone in a position like mine could possibly have. This is the knowledge that achieving what they did, when they did it, Apple managed to break the mould creating a truly iconic design, years ahead of its rivals, that set the market alight - wow!

To dream up the idea for a device that really does almost everything, to specify the performance and styling in such a way that would make people drool and then to actually achieve it, even with all the resources available to someone like Apple, is quite astounding because it meant getting everyone involved to buy into the idea that this was completely achievable right from the start. If you have ever tried designing a product and then making it a reality, you will realise just how much of an achievement this really was.

This little background is relevant because I am going to take you on a development journey for a new type of sound measuring device, and while I would actually say we did really well to produce what we did, I still can't help but look at my iPhone and cry a little.

I am good at diving headlong into things and signing us at Castle Group up for all manner of weird and wonderful schemes, so when we received a call from the NPL (National Physical Laboratory) asking if we would like to be involved in a project to produce a new kind of measuring system for producing 'real' noise maps, I naturally said yes.

The project did not have a proper name, so I dreamt up the glamorous title of DREAMSys (Distributed Remote Environmental Array and Monitoring System) and then we had to set about deciding what this thing actually was. The whole point was to put 100 sensors in an area and use the combined results to produce a noise map showing variability for time of day, seasonality and effects not picked up by predictive noise maps. This led to the natural conclusion that the hardware needed to be cheap, small and perhaps would not need to be up to Class 1 (or Class 2) standards.

Part of the overall project was to finish off the development of a new MEMS microphone by QINETIQ and use this as the front end of the hardware. From that point it was Castle's responsibility to design the electronics and physical enclosure, which is what I intend to detail here.

Just for roundness, before I begin; the project was funded by the TSB (that's the Technology Strategy Board, not the bank), formerly part of the DTI, and the partners were NPL (lead partner), QinetiQ, Hoare Lea consulting engineers, AVI Ltd (Richard Tyler) and Castle Group Ltd (my company).

This is where the iPhone analogy comes to life. I have just re-read the original desired specification from the project outset and it is quite illuminating. The concept started life as an array of matchbox-sized devices capable of measuring noise for at least three weeks and communicating with each other wirelessly to send data to the user. This was clearly optimistic from the start (or would it have been to those boys at Apple, I wonder?) but it gave us a good start. Here are some of the bullet points from the initial specification:

- Electrical noise floor below 20dB in third octave bands (desirable);
- Internal recharging capability (essential);

Figure 1

Airport noise monitoring, a typical potential application for DREAMSys

Figure 2

iPhone in standard configuration

- Can be charged in-situ or with external charger (essential);
- Last for at least three weeks of data collection (essential);
- Four (or six) interchangeable AA size batteries (desirable);
- L_{eq} (user-specified interval) (desirable);
- User-specified frequency weighting (desirable);
- Third-octave band analysis (100Hz – 10kHz) (desirable);
- Statistical data (desirable);
- 100 metres wireless range (essential);
- Two-way communication with central computer hub (essential);
- Peer-to-peer mesh networking (desirable);
- Synchronous timing between all the devices (essential);

- Average temperature with every derived value (eg L_{eq} measure) (desirable);
- Capacity for other data stream, eg wind speed (desirable);
- Facility to store three weeks of one-hour L_{eq} and third octave data (essential);
- Weatherproofed from wind and rain (essential);
- Flexible mounting system (essential);
- IP66 (essential); IP68 (desirable).

The reality of measuring sound is that it is a very intensive process which uses a lot of power. You cannot put a sound meter to sleep because monitoring is a continuous process. Even the iPhone largely goes to sleep, and that still runs out of battery power very regularly. This was certainly going to be an issue, so we thought of a minimalist functional specification without a display (who really needs a display on a sound meter?) and we were going to need big batteries (AA size were not going to be up to it).

The measurement specification also had to come under question as the request for third octaves was clearly going to take us into major processing power and battery consumption, not to mention issues of data storage and download bandwidth. Again I find myself considering if those nice people at Apple questioned the need for GPS and a compass – hmmm? Anyway, we were going to have to be very careful about the level of complexity of this hardware. What was more, we then asked the question 'What is actually needed for environmental monitoring?'. The answer seemed to be that 95% of environmental monitoring tasks probably only ever need L_{eq} and L_{90}, so that immediately simplifies everything.

There are actually quite a few things that the iPhone does not do, and when you look into it, there are very good reasons why. For example, true multi-tasking is not done because it 'eats' batteries. There are also quite a few things you cannot set as a user, unlike lots of regular phones. The reason: it makes the user interface so much simpler for the sake of a few frivolous features. Maybe on that score, simply loading a new development with features for the sake of it is not necessarily the way to go. The final functional specification we arrived at was as follows:

- L_{Aeq}
- L_{Ceq} (would give a key advantage over calculated noise maps)
- L_{max} during each 10-minute period
- Overload and under-range
- Three L_n values, two fixed as L_{10} and L_{90} and one user-definable as L_1 to L_{99}
- Time history intervals from 1 second to 1 hour.

This selection of measurements can actually be achieved quite simply, with minimum processing power, and therefore minimal power consumption. Other than frequency analysis, I have not yet found a mainstream environmental application that cannot be covered with these parameters.

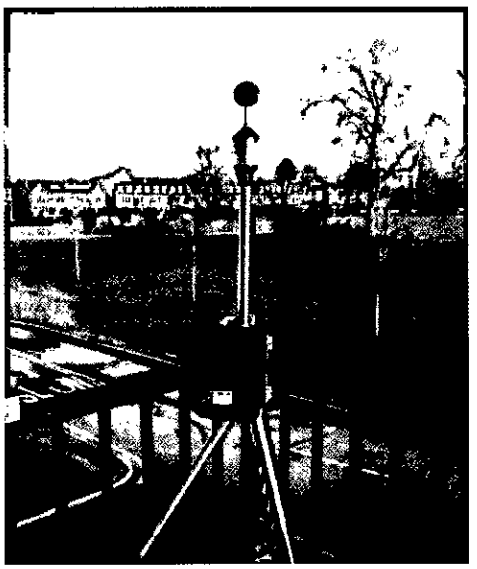


Figure 3

Prototype DREAMSys

We still had the issue of wireless communication to consider and the initial concept was to have a system of Bluetooth (or similar) links to a central data-collection station, which would then communicate with the internet through a GSM modem link. At this point, I have to say, even I got cold feet. If you have ever used either Bluetooth or GSM, you will know that they can both be a bit shaky, so the thought of putting both into one system brought reliability screaming into my mind – not such a good idea perhaps. As we now had to have a fairly large enclosure to house the batteries, it seems to make sense simply to add the GSM modem into each unit and have them all connect directly to our web site for the purposes of transferring data. Apart from some signal issues and a problem with the connector on the actual modem board, this has proved to be a successful approach.

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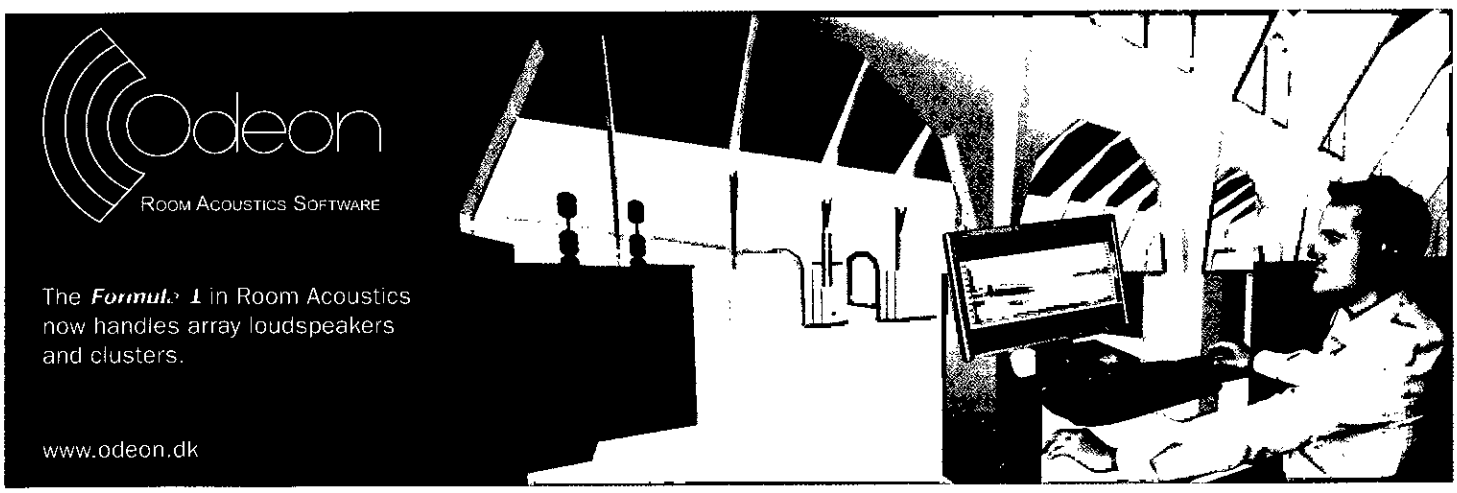

Instrumentation Corner - *continued from page 15*

Once again, as power requirements were crucial, we opted for a one-way communication protocol so that the modem could be switched off for most of the operation time, and only activated by the data-logger when needed for data-transfer. The download interval is user-selectable through the setup software.

Housing our solution offered a raft of new problems. Initially, we intended to place the battery box on the floor for stability. But that would mean putting the modem at the masthead, which would then likely cause noise on the sound meter. That then meant putting the modem on the floor, but if you put your mobile on the floor (at ground level) you will see that there is probably no signal! The only other alternative would be to have three enclosures, which then starts getting silly, so we opted for a larger box mounted half way up a tripod and then a small mast-head unit where all the measuring and data-collection takes place. At this point, the liberation afforded by not having buttons or displays was very useful, allowing for a really small masthead unit (not that far removed from the matchbox idea) and then all the electronically noisy bits mounted a safe distance away. Figure 3 shows the result.

The final hardware featured lead-acid batteries, a GSM modem, a data-logging sound meter capable of measuring L_{eq} and percentiles for two weeks on internal batteries, and the ability to transmit the data to a web site at a chosen interval. The legs were also developed especially for this project and have the facility to be anchored at the feet or from an eyelet underneath the main unit.

The microphone story is not quite such a success as the specifications of the final units from QinetiQ were not very stable in testing, so a commercially available MEMS microphone was used in the field trials.

It was possible to commission 90 units in the end, and we have achieved some excellent results, which have been overlaid onto noise maps. You can see a live demonstration on the DREAMSys website at **www.dreamsys.org**. The results were also compared with measurements taken using a Class 1 sound monitoring system with remarkable correlation to the DREAMSys findings, suggesting that cheap MEMS microphones may well be perfectly adequate for applications such as this. The graph in Figure 4 shows this correlation for the L_{90} measurements.

Figures 5 and 6 show some of the results. The first image shows L_{day} measurements taken and compared with the predictive noise map data, with reasonable correlation, although the measurements did highlight a noise source that had been missed by the model.

The second image shows the night-time measurements and highlights the fact that there is a large error in the predictive map compared with the measurements, mainly due to distant noise sources not included in the software model.

You may have gathered that I was being a little flippant about the iPhone analogy although it would be interesting to see if Apple could have done this all in a matchbox!

The author, **Simon Bull**, is managing director of Castle Group Ltd, a company involved in health and safety and environmental compliance solutions including the design and manufacture of sound measuring instrumentation. Simon has spent the past 18 years heavily involved in the development of new products for the company. He is a member of the Institute of Acoustics and an active committee member for the Measurement and Instrumentation group.

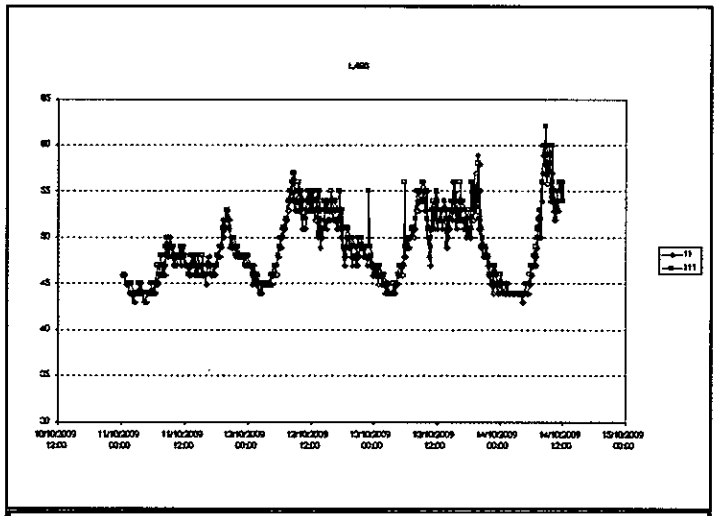

Figure 4

Comparison of DREAMSys and conventional noise measurement results

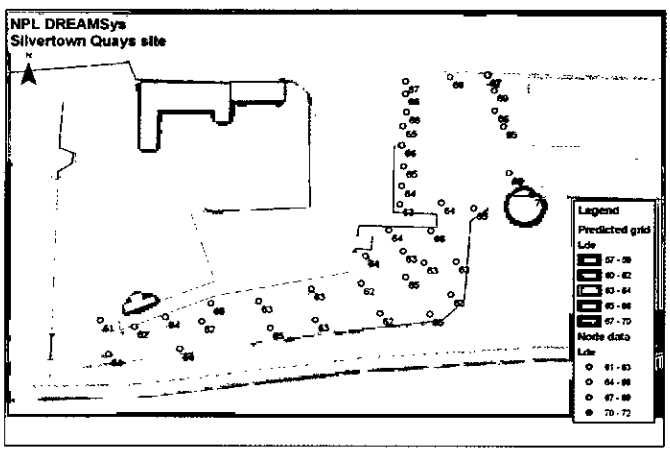

Figure 5

Comparison between noise map (predicted) and DREAMSys (actual) noise data for daytime

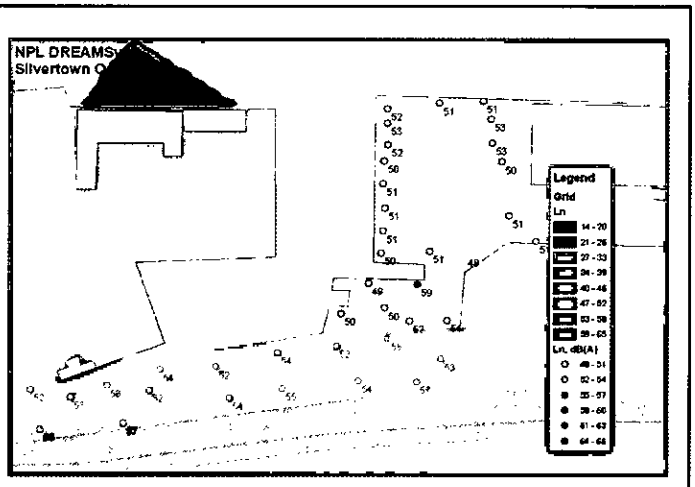

Figure 6

Comparison between noise map (predicted) and DREAMSys (actual) noise data for night-time

ANC consultancy spotlight

Adrian James. AGM and new Board

The new Board was elected at a crowded Annual General Meeting at the RIBA in May 2010. In a move reminiscent of recent labour party reshuffles, the long-standing Chancellor of the Exchequer has moved from no.11 to no.10, although his predecessor has so far not been offered any non-executive directorships or peacemaking roles in the Middle East. Steve Gosling, who remains chairman of the membership steering committee, joins the Board for the first time and Phil Dunbavin re-joins the Board after several years on the backbenches. Russell Richardson moves from secretary to treasurer, while the president, Rupert Thornely-Taylor, remains in post until the conclusion of his five-year term in 2012. Iain Critchley has stood down after two years as vice-chairman and Ed Clarke after five years as, variously, secretary, chairman and past chairman. The retiring chairman expressed his heartfelt thanks to them and indeed to all of the Board members for their hard work, support and unvarying good humour during a busy and occasionally difficult two years.

The new-look Board is as follows :

chairman	Rob Adnitt	Adnitt Acoustics
vice chairman	Steve Gosling	24 Acoustics
treasurer	Russell Richardson	RBA Acoustics
secretary	Phil Dunbavin	Philip Dunbavin Acoustics
past chairman	Adrian James	Adrian James Acoustics

It is worth noting that again, the Board members are all principals of relatively small practices. The larger member companies remain under-represented both on the Board and, with a few honourable exceptions, on committees and at company meetings.

Following the AGM, the annual dinner was held in the acoustically challenged surroundings of the RIBA Lutyens Room, allowing the retiring board members to undertake some informal research into the Lombard effect using a wineglass, a fork and an i-Phone. Geoff Leventhall, however, had no difficulty in commanding a respectfully low ambient noise level during an entertaining and informative after-dinner speech.

Committees

The request for volunteers to join both the registration committee and schools committee has resulted in unprecedented numbers of applicants. Robin Hall of Scott Wilson has now taken over from Phil Dunbavin as chairman of the registration scheme committee, which is undertaking a detailed review of all of the scheme documentation. The schools acoustics committee, chaired by Andy Parkin of RPS, meets with great regularity and enthusiasm, and is already most of the way through writing a good practice guide for acoustic commissioning of schools. Within 24 hours of the announcement that there would be no minimum acoustic standards for the proposed new 'free schools' the committee's rapid response unit co-ordinated a joint press release with the IOA, and is lobbying for a commitment to good acoustics in all schools, whether academies, free schools or conventionally procured buildings

Membership

The association now has 110 member companies and new applications continue to roll in. The application process consists of a written

continued on page 18

ANC consultancy spotlight - *continued from page 17*

submission to demonstrate compliance with the technical and administrative requirements of the association, followed by a review of recent written reports and an interview with members of the Board. Recent survivors of this process are SC Acoustics, MRL Acoustics, and SB Consulting Engineering and Acoustics, all of whom were welcomed to the company meeting in July. A list of all member companies can be found on the ANC web site **www.theanc.co.uk**, along with details of the application process and a great deal of other information. The members-only area of the web site and the technical discussion forum have proved popular additions to the services offered to members.

Meetings open to all members take place every two months, normally on Mondays. Remaining dates for 2010 are 20 September and 15 November.

Secretariat and contact details

Over the past year the Board has undertaken a detailed review of the association's requirements and budgets for administration and as of 1 May the ANC's secretariat services have been provided by Association Services Ltd. This coincides with a change of office location, email and telephone numbers as follows :

Address: The Old Pump House, 1A Stonecross, St Albans AL1 4AA

telephone **020 8253 4518**, email: **info@theanc.co.uk**

Senior Members' group

Ralph Weston. An introduction

This is the first of what I hope will be a regular feature in the bulletin about us senior members. First I must thank you for completing the survey of potential members. Over 100 members have responded; however there are plenty more who could join us.

Secondly, I want to warn you that this section of the Bulletin will be written informally, now that we have retired, I tend to write as I talk and I do not want to keep to the 'why, what, where and when' formula. I also hope that many of the younger members will read this section. I have already had an email from a SM remembering afternoon visits that were 'fun' and hoped that we could conjure a sense of 'adventure'. I'm not sure about the adventure and I'm not going to go in for extreme sports at my age but I hope we can arrange some interesting visits even if there is a small cost for entry or a guide.

One of the things that I want to include in this section of the Bulletin is your reminiscences. For instance I was remembering my first boss in acoustics, Len Wheeler, who was a member of the British Acoustical Society, the forerunner of the IOA. Our laboratory was in the basement of Kelvin House, an RAF building sandwiched between the Middlesex Hospital and the Post Office Tower. He introduced me to my office that had a window looking onto an inner courtyard which, he told me, was probably a plague pit from the time of the London Plague. My first task was to test the attenuation of ear defenders (hearing protectors, both muffs and plugs) for use by ground crew in the RAF. We used a home designed but efficient 'plane wave chamber'. This was years before the British and European standards for testing hearing protectors, and much cheaper too. The method was similar to using an audiometer except that it was all manual and the signal tones were fed to a loudspeaker at one end of the chamber and the subject was tested for hearing levels both with and without the hearing protection.

This probably enough from me for now but it is interesting to note that having been involved in RAF audiometers of all shapes and sizes I am still carrying out the occasional Bekesey audiometric test using an automated system.

I am also looking for your pictures, which is something I do not have many of from the distant past. I have included the picture of Franklin's Armonica that I have already reported in an earlier issue of Acoustics Bulletin as the sort of visit that you may like to participate in. Franklin invented this so that he could play the 'wine glasses' with both hands!

Conference 2010

The IOA and ANC will be jointly organising a conference on Practical Building Acoustics, to be held on 2-3 November 2010 at Austin Court, Birmingham. Details are on both the IOA and ANC web sites, and we look forward to seeing you there.

Peter Allaway FIOA

We were greatly saddened to hear of the death on 17 July 2010 of Peter Allaway, founder of Allaway Acoustics Ltd and later of Grootenhuis Allaway Associates, a long-time member of the Association of Noise Consultants. Peter served at various times as treasurer, vice-chairman, chairman and twice as honorary secretary of the association. On his retirement he was made an honorary member, a mark of esteem which is not lightly awarded, there never having been more that four honorary members at any time. Peter later became president of the association, a role which he took very seriously, and many of our longer-established members will remember his gentle, polite and invariably valuable contributions to discussions on all aspects of the ANC's work.

Peter leaves a wife Lyria, two children, six grandchildren, two great-grandchildren and a great many friends.

Adrian James
Immediate past chairman

Survey responses

Thanks are owed to Salford University for designing and hosting this survey. It has given us the basis from which we can extract senior member's interests in and willingness to help the Institute. This means we can target our future programme and not fill up your 'in boxes' with rubbish. At the same time please be reassured that, as a result of this survey, commercial advertising will not target you. Our age range is 55 to over 90, so we have a wealth of experience and 71% still do the odd job to help pay for holidays! All the Institute's specialist groups are represented, with environmental noise coming out on top, followed by building acoustics. The London branch has, unsurprisingly, the most SM's. My own Central branch has only three so I shall have to get them together with a cosy meeting. We have also had a number of additional emails from SM's who for a number of reasons such as health or distance cannot travel to meetings, particularly evening meetings. Our first idea was to try and get local branches to promote the senior members in their area. Up till now the response from branches has been slow but now that the survey has been completed we can think again how best to meet. To me it seems that daytime meetings with a visit would be the best approach.

The majority (over 70%) said that they were prepared to contribute to the group and the IOA. Thank you: this is encouraging. We will come back to these willing volunteers as and when necessary. Thank you also for your responses to the social gathering section, which we will put to good use.

Next steps

Now that we are 'up and running' there is a need to formalise the Senior Members' group with a meeting to elect a chairman and committee. It has been proposed to attach the inaugural meeting onto the Autumn Conference in

November and the practicalities of this are being explored. The Institute would not wish to over-commit any member, especially those who may just want to remain on the mailing list.

It is also realised that the IOA cannot offer the group financial support to any extent and that retired members no longer have the same access to sponsored funds. Therefore, most communication will be via email, but some 50 people have expressed the opinion that they would attend a half-day seminar coupled to a dinner plus overnight stay. The plan is to have a speaker as well as the group meeting. An alternative is to have an afternoon meeting in London preceded by a pub lunch. Please let me have your ideas. Volunteers to get first meeting under way would also be appreciated.

Geoff Kerry is starting his research into the history of the IOA and will communicate with SMG members in due course.

Nothing with this group is going to move too fast. Being retired means we are busier than ever and everything takes longer - please be patient! Thank you for your emailed comments and we will analyse the results in more detail and produce a programme that will include you all.

Comments or enquiries to: **Seniormembersgroup@ioa.org.uk**

Membership

The following were accepted by Council for membership of the Institute of Acoustics in the grades mentioned following the recommendations of the Membership Committee on 17 June 2010.

Fellows (FIOA)
Miller, S
Parkin, A J

Members (MIOA)
Bird, A F
Byrne, I
Clare, D
Davies, M R
Dowie, M
Durup, N D
Fenech, B
Finfer, D C
Fisk, J H C
Fitzgerald, C
Gil, J
Gilfillan, D
Hawkins, N C
Johnson, P S
Kingan, M J
Lamacraft, A
Long, P J
Paris, J A E
Parkinson, D B
Parr, S M
Reid, M
Robertson, L A
Robertson, N A
Trim OBE, R M
Ural, O
Wright, C M
Zheng, F

Associate Members (AMIOA)
Clucas, D
Cockcroft, S G
Curlis, D
Goodfellow, M P
Grimes, J R
Haigh, N J
Hedges, M
McAlister, M P
McVay, M J
McVeigh, S C J
Pugh, H J
Rickard, M A
Scott, R
Simms, M
Tipping, R
Troullinos, I
Webb, C M W
West, I

Affiliates
Nurse, G
Rush, C A
Woolcock, J F
Wyke, A N

Technician members
Barrow, N J
Fitzmaurice, J A
Hutchinson, M
Sharples, J
Stevenson, P R

Student members
Apostoli, A
Flood, D
Gaffney, J
Griffiths, T A B
Jones, J
Leach, T
Logie, S
Salgado Perez, A M
Taylor, P

Sponsor members
RBA Acoustics
Darchem Engineering Ltd

Institute of Acoustics Medals & Awards Programme 2011

The Institute of Acoustics annually honours people whose contributions to acoustics or to the Institute have been particularly noteworthy. The medals and awards programme has evolved over the years and is now quite wide ranging in its acknowledgment of academic achievement, practical engineering applications and innovations, student achievement and contributions to the Institute and to the world of science and technology.

The medals and awards programme is overseen on behalf of Council by the Medals and Awards Committee, which is chaired by the President. Nominations may be made at any time either on standard forms available through the Institute's office or by writing direct to the President.

For more information or to download a nomination form, please visit the IOA web site:
http://www.ioa.org.uk/medals-and-awards/

2011 nominations deadline is 31st January 2011

Active noise control in aircraft cabins

Thomas Kletschkowski and Delf Sachau. State of the art and combination with audio entertainment

Introduction

In order to support passive noise treatments effectively with lower additional payloads, active control of aircraft interior noise was applied to propeller-driven aircraft as well as to jet aircraft. Depending on the actuation and sensing approach, it is possible to distinguish between active noise control (purely acoustical), active structural acoustical control (actuation: structural; sensing: acoustical), and active vibration control (purely structural). Within these different concepts, the state of the art in active control of aircraft cabin noise is reviewed in the first part of this article paper.

The second part is dedicated to a specific problem that arises, if the active control system is used for the attenuation of broadband acoustical disturbances and in-flight entertainment. This problem was analysed in a two-year project within the Hamburg aeronautics research framework (LuFo). Using acquired data from an in-flight measurement in a typical light jet, an ANC concept was developed using custom-made loudspeakers combined with a multi-channel modified filtered-x algorithm with audio compensation and audio playback capability.

Aircraft active noise control: state of the art

The state of the art in interior noise control is recapitulated here. It starts with a summary on noise sources and noise transmission paths. Active control concepts and algorithms are then reviewed, and comments made on flight-proven systems.

Noise sources and noise transmission paths

Aircraft interior noise is caused by external sources, such as engine noise and aerodynamic noise, and by internal sources, such as noise from the auxiliary equipment (eg the ventilation system)[1]. The current discussion is restricted to external sources only. Especially for propeller-driven aircraft it is possible to distinguish between engine noise caused by the propeller rotation, and power plant noise. The first generally exceeds the noise from the power plant with respect to its absolute level and especially as regards is disturbance effects on man.

Noise due to propeller rotation causes a noise field that is highly tonal in frequency content and highly directional in its spatial distribution. The associated sound pressure field is deterministic and completely correlated at all points. The noise level is influenced by factors such as the engine power, tip speed, number of blades, and distance between propeller tip and fuselage.

Power plant noise was originally restricted to the exhaust noise of reciprocating engines. Nowadays gas turbines (turbo-jet, turbo-prop, and turbo-fan) are of practical importance[2]. For jet noise generated by these power plants, the acoustical field on the airframe is random, and can be an efficient exciter of structural vibrations at low frequencies[2]. Forward radiated noise from a jet engine fan inlet consists of broadband and dominant tonal components at various frequencies (buzz-saw noise). It can sometimes influence the cabin noise. In addition engine unbalance forces and other sources of engine excited vibrations can also cause tonal components of cabin noise.

Aerodynamic noise is generated by the airflow over the aircraft surfaces. For smaller aircraft airflow noise is important at higher frequencies[2]. For larger, jet-powered, well-streamlined aircraft, high speed flow generates significant levels of turbulent boundary layer noise that is usually the most important source of cabin noise for these types of aircraft. Results of in-flight measurements of the fluctuating pressure acting on the fuselage surface beneath the boundary layer taken from a large jet aircraft, operating at speeds from 138 to 242 ms^{-1} at an altitude of 7620m, clarified that the pressure was broadband and contributed significantly to the cabin noise between 100Hz up to frequencies above 2kHz[2]. It was found that increasing airspeed (from Mach 0.45 to Mach 0.78) resulted in an increasing pressure spectral density of about 7dB.

concept	controlled quantity	sensor type	actuator type
ANC	sound pressure in cabin	acoustical	acoustical
ASAC	sound pressure in cabin	acoustical	structural
AVC	vibration of structure or structural elements	structural	structural

Table 0

Overview of active control approaches.

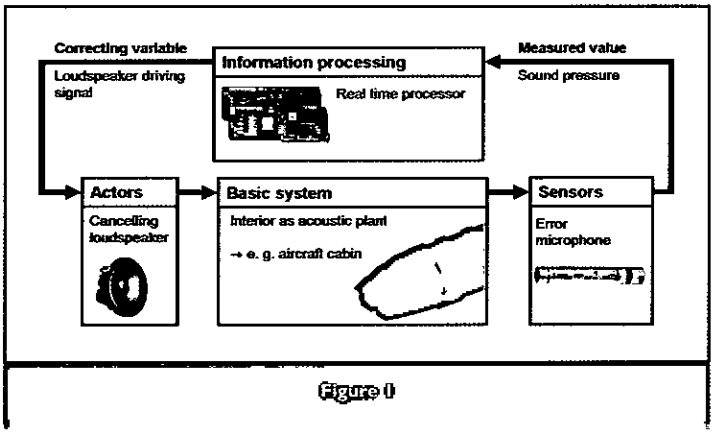

Figure 0

Active control of interior noise using acoustical sensors as well as acoustical sources

The noise field in aircraft cabins consists of airborne and structure borne components. Airborne noise is defined as the part of the cabin noise that is transmitted through the fuselage sidewall from sources that exert directly on the exterior of the fuselage.[2] Structure-borne noise can be defined as noise that is caused by mechanical forces or by aerodynamic pressures acting on distant regions of the airframe, because the resulting vibrational energy of these excitations is transmitted through the structure and radiated into the fuselage as sound.

Typical transmission paths associated with these noise components are the cabin sidewall path (not well defined and distributed, but transmits airborne noise), pressure bulkhead path (well defined and localised, and transmits airborne noise), the engine mount path (well defined and localised, and transmits structure-borne noise into the fuselage), and the fuselage path (not well defined and distributed, but transmits structure-borne sound through the fuselage).

Overview of active control concepts

Active control of aircraft interior noise can be interpreted as a mechatronic approach (discrete actuators attached to the basic cabin) and/or an adaptronic approach (structure integrated actuators acting directly within the flux of force) applied to improve the acoustical performance of aircraft cabins. Depending on the type of energy that has to be controlled as well as on the applied actuator and sensor type, it is possible to distinguish between active noise control (ANC), active structural acoustical control (ASAC), and active vibration control (AVC) as shown in Table 1.

continued on page 22

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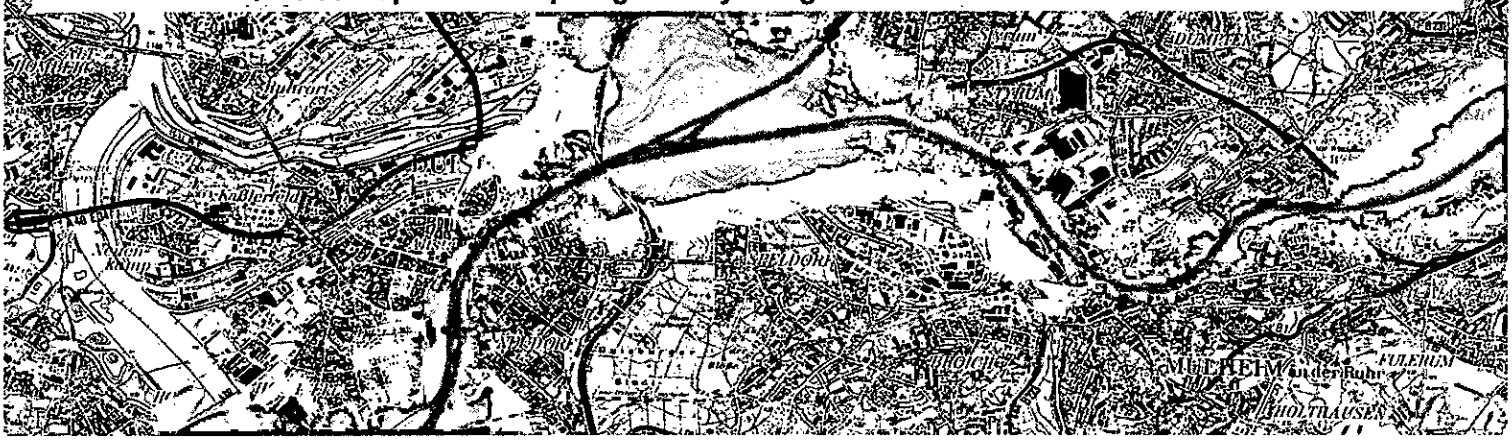

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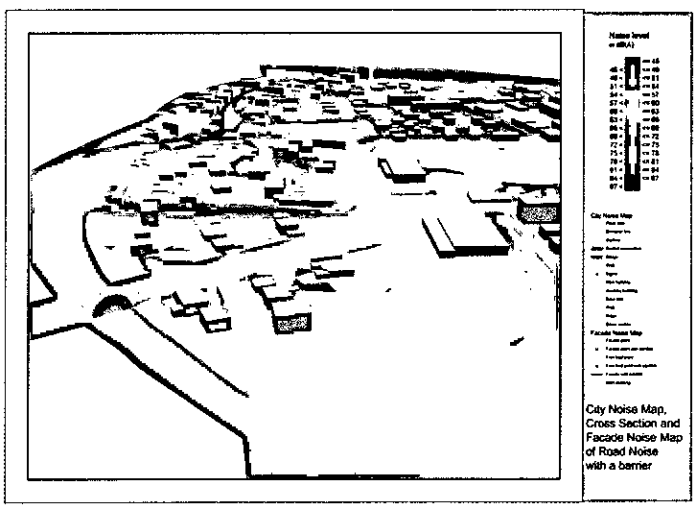
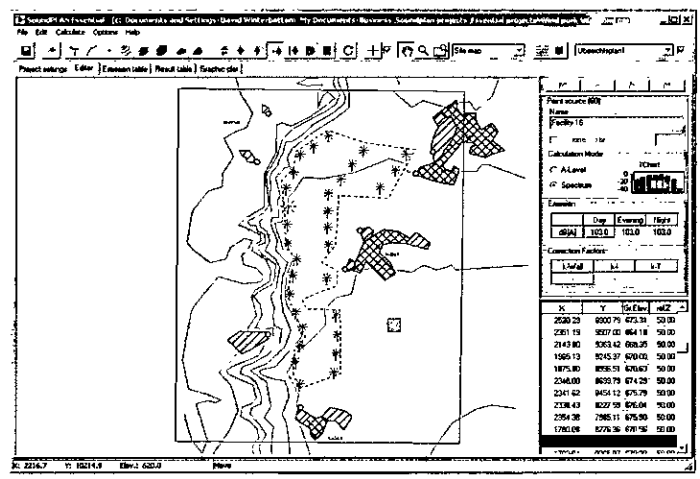


City Noise Map, Cross Section and Facade Noise Map of Road Noise with a barrier



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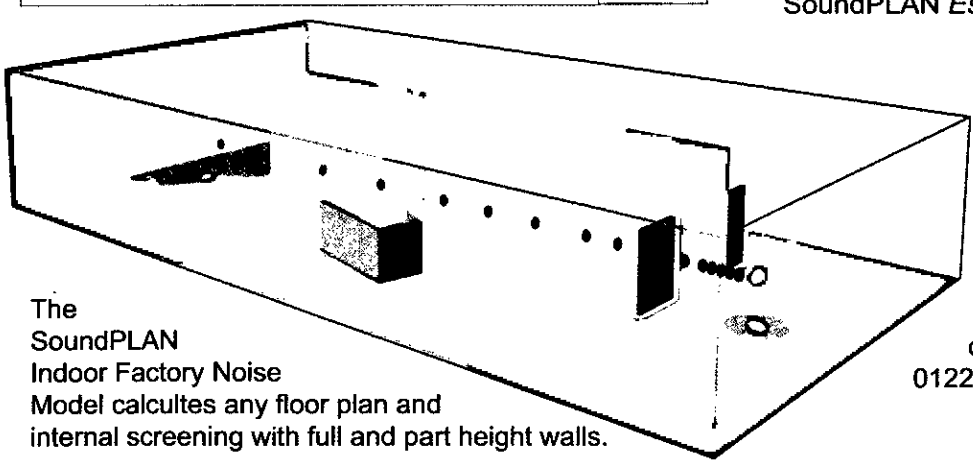

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Active noise control in aircraft cabins - *continued from page 20*

Common to all concepts is the necessity of measuring physical values (eg the cabin sound pressure), and the generation of cancelling signals that can be used to reduce disturbing quantities by a set of actuators, as shown in Figure 1 for the ANC approach. As shown in Figure 1, information processing is also needed to evaluate the measured values as well as to calculate the command signal. This information processing can be either adaptive or non-adaptive. Non-adaptive information processing uses the physical measure provided by sensors to drive the actuators by manipulating the sensor signal with a constant gain. An adaptive signal processing is capable of redefining this gain according to a change of the disturbance or to variation in the plant.

The differences between the active control concepts listed in Table 1 are caused by the kind of sensing as well as actuation. It is obvious that only the purely acoustica; concept of ANC is capable of avoiding additional structural loads that are generated by structural actuators. Furthermore, the maintenance friendliness of ANC systems is high compared with ASAC or AVC systems, because damaged loudspeakers and microphones can be easily replaced by new components. The disadvantage of ANC is that the noise has already entered the cabin when it is affected by this control method.

In order to reduce the transmission of disturbing noise, ASAC and AVC must be applied to the transfer paths. Typical examples are active mounts designed to reduce structural vibrations that are caused by engine unbalance forces[3] or distributed control based on active tuned vibration absorber[4].

Short note on the structure of control algorithms

The task of an active noise and vibration controller is to provide an actuator signal (secondary noise) which is able to cancel the desired signal (primary noise). The control profit is than measured by evaluating the remaining error signal (residual noise). In general, there are two basic control structures.

The first is the feed-forward control schema, as shown in Figure 2 (left). Here, the reference signal x which is correlated to the desired signal d is fed to the controller to compute the actuator signal y. This controller is only able to cancel that part of the desired signal d which is correlated to the reference signal x. Moreover, if the feed-forward controller is realised in an adaptive manner, the error signal e is used to adjust the feed forward controller.

The second control schema is the feedback structure, as shown in Figure 2 (right). Here, no reference signal x is required to provide the actuator signal y, because only the error signal e is fed into to the controller to compute the actuator signal y. If no reference signal is available by direct measurements, the feedback structure is the right choice, because the missing reference can be approximated using an internal model of the cancelling path. However, the feedback strategy is only able to cancel the deterministic part of the desired signal d. This controller can also be realised as an adaptive controller.

If the feed-forward or the feedback controllers are non-adaptive, the controller can be realised on analogue hardware. In other cases the controller must be realised on a digital hardware. Of greater concern here are the modelling uncertainties which may lead to robustness and stability issues. Furthermore, feedback systems have limited cancellation over a limited bandwidth and are highly dependent on a close placement of sensor and actuator in order to minimise the delay in the feedback path. It should also be noticed that the hybrid control strategy (a combination of the feed forward and the feedback control schema) combines the advantages of both control structures.

As described in standard literature[5] the filtered-reference least mean square algorithm (FxLMS) is most widely used for adaptive tonal and broadband active noise and vibration control applications. The name of the algorithm is derived from the fact that the reference signal is filtered with a model of the secondary path. The adaptation of the linear FIR filter is performed by the least mean square (LMS) algorithm. The main advantage of the algorithm is its simplicity and robustness. However, one drawback of this algorithm is the relatively slow convergence and tracking performance which depends on the secondary path and the signal statistic. To improve the algorithm performance, different variations such as the leaky FxLMS and the normalised FxLMS are used in practice.

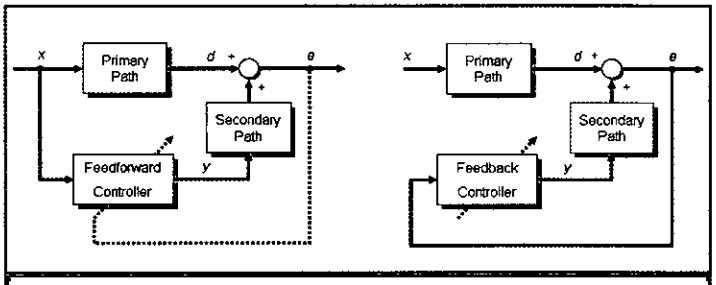

Figure 2

Control structures: feedback (left), and feed-forward (right)

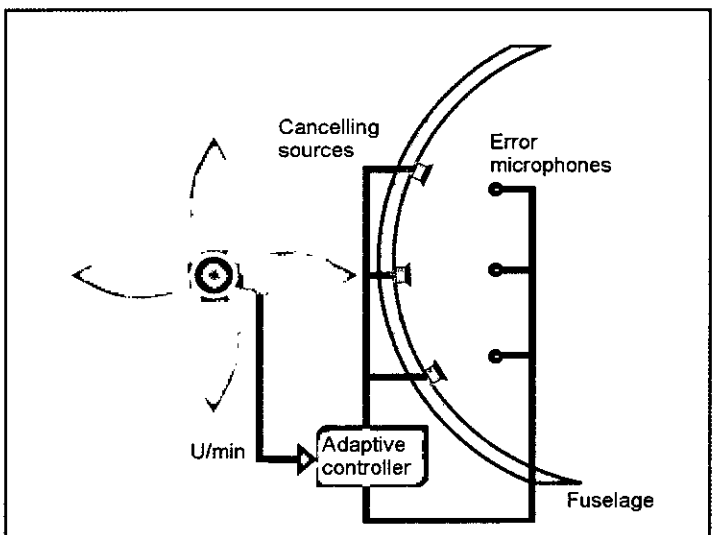

Figure 3

Adaptive feed-forward control in propeller-driven aircraft

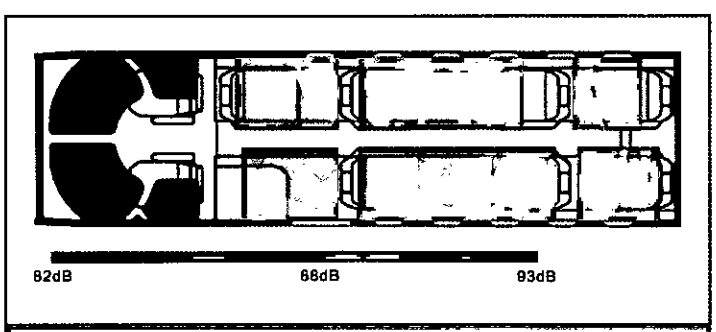

Figure 4

Mapping of cabin sound field during cruise overlaid on the cabin layout

Examples of flight-proven systems

Johansson[6] states that two companies, Ultra Electronics (England) and Saab Aircraft (Sweden), developed the first commercially-available ANC system for reduction of propeller induced noise in aircraft cabins. The first commercial aircraft in the world in which this technique was used was the SAAB 340 and its successor, the SAAB 2000. The first SAAB

340 was delivered in the spring of 1994, and the first SAAB 2000 was delivered later the same year. The ANC system in the SAAB 340 uses 48 control microphones and 24 loudspeakers. The system in the SAAB 2000 consists of 72 control microphones and 48 loudspeakers. The functional principle of such a system is illustrated by Figure 3.

According to the manufacturer[7], the Ultra-system has up to now been adopted on the Bombardier Q100, Q200, Q300 and Q400, Bombardier Challenger 601 and 604, Airbus A400M, Lockheed Martin C-130, Beech King Air 350, and Saab 2000 and 340.

According to Elliott Aviation[8], an Ultra-system in a King Air 200 with 12 loudspeakers achieves a mean noise reduction of 6 - 9 dB(A). Hansen[9] reports an Ultra-system with 96 input channels (error and reference sensors) and up to 48 output channels for actuators. The error sensors were mostly microphones, located just above the aircraft windows in the cabin lining as well as in the centre of the ceiling lining and in the head racks. Performances of 10dB, 7dB and 3dB are given for noise reduction of the fundamental frequency and the first two harmonics (spatially averaged reduction determined at passenger head-level).

Billoud[3] reports on the AVC system developed by the Lord Corporation that was applied to reduce helicopter floor vibrations. This system uses up to 16 accelerometers as sensors and is capable of driving up to four force actuators. Billoud[3] also reports on an ASAC application of Lord's technology in which the accelerometers were replaced by microphones. Two jets, a Douglas DC-9 and a Cessna Citation X, were equipped with active dampers at the engine mounts. In both cases, the turbines were mounted on the rear fuselage and the error sensors were distributed in the cabin lining in order to achieve global reduction. No absolute reduction performance values are given for the Citation X. According to Billoud[3], a reduction of up to 8dB(C) at 120Hz and 170Hz was reached for the rear 45 seats of the DC9.

Other examples of flight-proven systems are noise-cancelling headphones with analogue feedback control. Because active headphones are able to act close to the error sensor these systems provide a significant noise reduction. An active attenuation of 25dB in the frequency range 25 to 500 Hz was reported[10] for a closed headphone. Open headphones reach an attenuation of approximately 10dB in a frequency range between 400Hz and 1kHz[10].

Combination of active noise control and in-flight entertainment

Bearing in mind that every aircraft needs an audio system that can be used for public address but also for in-flight entertainment it is worthwhile analysing the feasibility of combining low frequency active noise reduction and audio playback. To drive the sub-woofer of the in-flight entertainment system as anti-noise sources by superimposing a cancelling signal on the audio track is the main idea behind such an approach. Calculation of the cancelling signals requires a modification of the error signal measured at the control microphones in order to remove the audio part from the signal using internal models of the acoustical transfer paths.

Based on the state of the art reviewed above it is possible to investigate a combined audio active noise control (AANC) system within the Hamburg aeronautics research framework (LuFo). This two-year project was carried out in cooperation with INNOVINT Aircraft Interior. The active noise part was limited to the low frequency range, so electro-dynamical loudspeakers (instead of alternative technologies such as trim panel speakers[11]) were considered as actuators. Furthermore, a local ANC approach based on headrest integrated microphones was chosen. Multi-channel feed-forward control was applied to evaluate the limits of active control in a relevant environment. A mock-up, manufactured by the project partner, was built to represent both the main dimensions of a VLJ cabin (cabin length approximately 5m, fuselage diameter approximately 1.6m) as well as a typical interior. The mock-up was constructed from timber covered with typical lining materials[12].

continued on page 24

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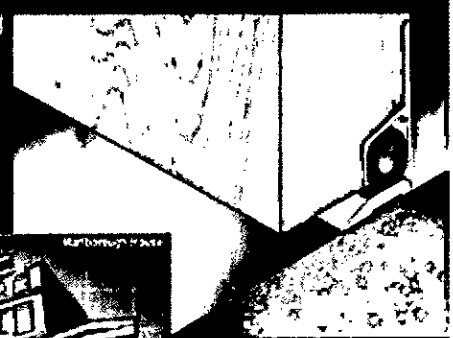

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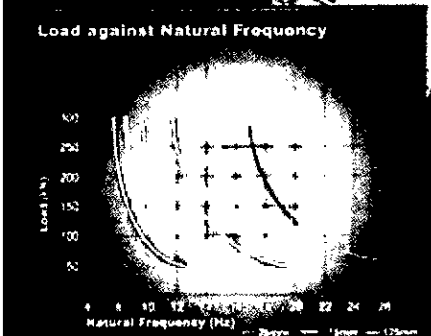

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Active noise control in aircraft cabins - *continued from page 23*

In order to determine the noise characteristics inside a very light jet (VLJ), measurements were made in a Cessna Citation Bravo[12]. It was found that the highest sound pressure level occurs at the rear, close to the engine inlet, as shown in Figure 4. The spectral shape of the ANC-relevant part of the disturbance (during cruise, nearly stationary) is coloured, broadband noise with few narrowband components, concentrated below 300Hz. The low-frequency components are mainly responsible for the differences in sound pressure level between the front and rear cabin areas[12].

Control strategy for a combination of audio and active noise control

In order to assess performance limits in such an environment, the modified filtered-x least mean squares algorithm (mFxLMS)[13] was implemented and adapted for multi-channel usage. The controller layout is shown in Figure 5 with the secondary path $S(z)$, its model $\hat{S}(z)$ and the adaptive control filter $W(z)$. The error signal in the update path is $e(n)$.

The mFxLMS is not only advantageous for the integration of the audio playback capability but also allows for simple adaptation to more sophisticated algorithms than LMS such as the recursive least square (RLS) or Kalman filter based algorithms, since the update section itself is independent of the secondary path and its model. Furthermore, the step size and therefore the convergence speed of the mFxLMS algorithm are not dependent on the secondary path delay for well-modelled path estimates.

In order to merge the in-flight audio system and the active noise control system, the low-frequency components of the audio signal could simply be added to the controller output. However, two main issues then arise. The audio may interfere with the ANC system inhibiting a correct adaptation of the filter and furthermore, the ANC system may also cancel parts of the audio signal as well as the disturbing noise.

Nonetheless, high quality audio in the passenger area can be achieved if the error signal is freed of audio signal components before being used in the filter adaptation process. This can be done in a straightforward manner as shown in the block diagram of the modified Fx-LMS with audio in Figure 5. The preamplified audio signal is added to the cancellation signal resulting in $y_a(n)$ and, owing to the modified structure, is subtracted from the error signal along with the cancellation signal.

With a perfect plant model $S(z)=\hat{S}(z)$ and assuming that the audio signal is not correlated with reference signal, $d'(n)=d(n)$, as is the case without audio. A controller-integrated audio system may also be used for online secondary path modelling[5], thereby compensating for changes in the cabin area.

Experimental evaluation of control performance

A set of eight error microphones and six cancelling loudspeakers, as shown in Figure 6 (left), was used for the active control task. This set was determined by sequential optimisation.[12] Two error microphones are located at each headrest.

A photograph showing the mock-up interior, electro-acoustic equipment, and the measurement device used for sound field mapping is shown in Figure 6 (right). The cancelling sources are custom made: each loudspeaker consists of a 150mm driver mounted in an enclosure with a volume of only 4 litres, and represents an attempt to achieve a high output at low frequencies with a compact box.

The control algorithm was implemented on a dSPACE hardware platform (type 1006, 2.6GHz, 16bit I/O) for a multi-channel system size of one reference, eight microphones and six secondary sources with a sampling frequency of 4kHz. The algorithm was implemented in the power normalised, leaky form with offline plant modelling for the secondary paths.

The primary noise field was created with a separate loudspeaker, also

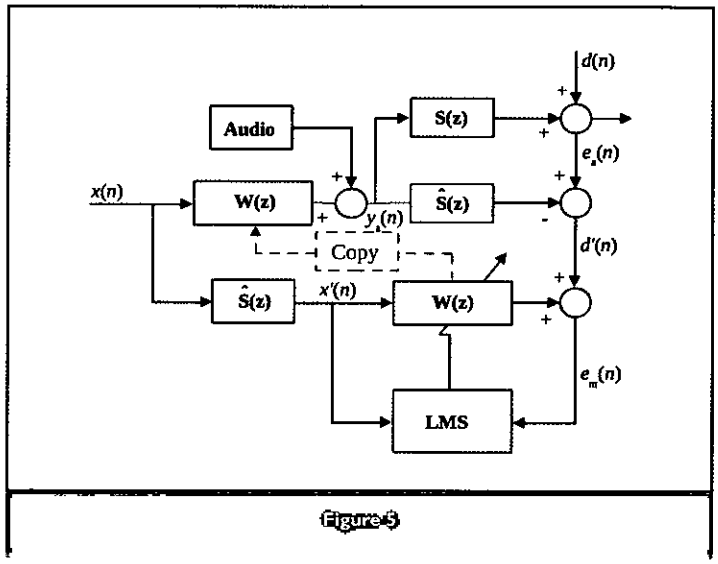

Figure 5

Block-diagram of the modified Fx-LMS algorithm for ANC with audio

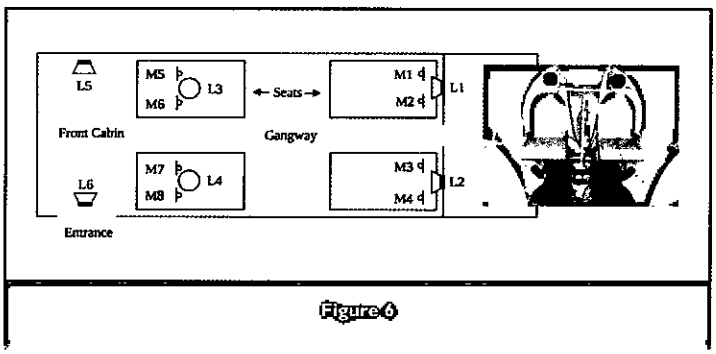

Figure 6

Actuator (L) and sensor (M) locations (left) and mock-up interior (right)

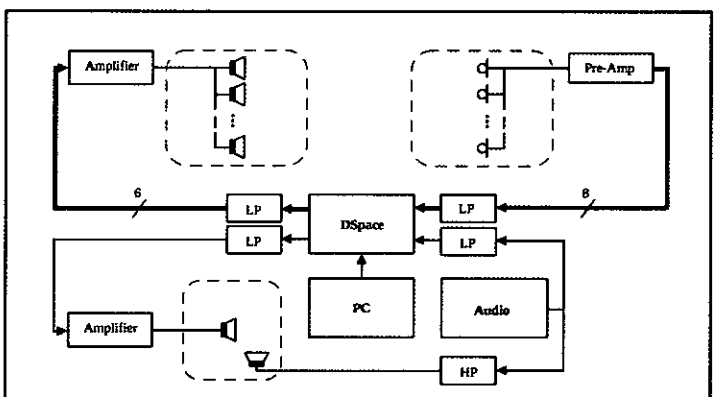

Figure 7

Overview of the experimental system layout

located in the cabin. For these experiments, the noise signal is passed directly through to the controller (internal referencing). The audio signal input to the controller is pre-filtered with a generic low-pass filter (cut-off frequency 1kHz). A high-pass filtered version of the audio signal is sent to a separate audio system. The system layout is summarised in Figure 7.

The experimental results shown here were created with a broadband

continued on page 26

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Active noise control in aircraft cabins - *continued from page 24*

primary noise field (50Hz < f < 800Hz) 45dB above the cabin background noise of ~40dB. Best results were obtained using a filter length of 300 coefficients for the adaptive filters and 200 coefficients for the secondary paths.

The area of effect of the active noise system around the error sensors was mapped with a rectangular array of 16 microphones. As an example, the zone of quiet around the microphone pair M7 and M8 is shown in Figure 8. Owing to linear interpolation between the measurement points the highest values of attenuation are not exactly at the error sensors in the vertical plot. As can be seen, the attenuation is higher for the microphone closer to the gangway. The zone with a minimum of 10dB attenuation (total sound pressure level reduction) is extended to approximately 0.15 - 0.2m around the error microphones. The mapping is done without placing an artificial head and torso in the seat.

The controller was also tested with combined ANC and audio playback. As described above, the low-pass filtered audio signal is input to the ANC controller whereas the high-pass filtered part is passed on to a separate audio system. The effect of turning on the controller can be seen in the left-hand image of Figure 9. After about two seconds the ANC system is turned on and noise reduction is observable in the desired frequency range. Furthermore, the audio signal remains clearly visible as can be seen when comparing with the unfiltered reference spectrogram of Figure 9.

When comparing the audio signal elements in the spectrogram of the cabin microphone and the reference, the effect of the 1kHz low- and high-pass filters as well as the cabin's acoustical properties must be kept in mind. During audio playback no disturbance of the ANC system is detectable. The noise reduction can be interpreted as a direct improvement of the signal to noise ratio (SNR) thereby enabling the use of lower playback sound pressure levels in the low frequency range for the audio system.

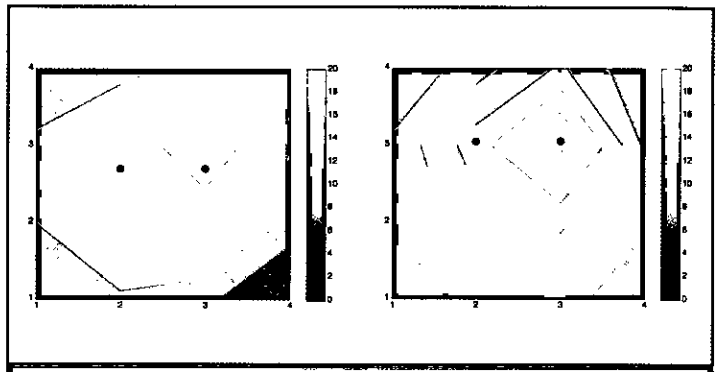

Figure 8

Attenuation mapped at microphones M7 and M8, vertically (l) and horizontally (r). Measurement points shown as white dots, spacing 0.1m. Black dots represent the actual positions of the error sensors

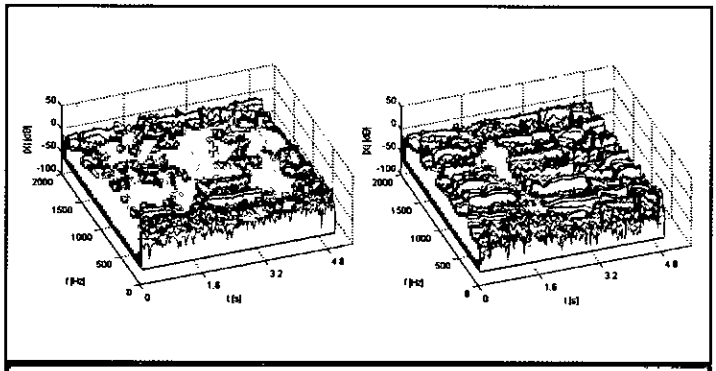

Figure 9

Spectrogram of a cabin microphone signal while switching on the ANC system at ~2s (l) and of the original unfiltered audio signal (r)

Conclusions

The commercial use of active control systems in propeller-driven aircraft and also in jet aircraft has shown that these systems can effectively support passive noise treatments, especially if tonal noise components - well correlated to the fundamental propeller frequency or engine unbalance forces - have to be reduced. Flight-proven systems were capable of realising a noise reduction of up to 10dB overall. Furthermore, it is possible to combine active noise reduction with in-flight audio entertainment. It was shown that a combined system was capable of generating a broadband zone of quiet (f < 500Hz) within 0.1 - 0.2 m of the error microphones in a very light jet mock-up. Owing to the general problem of finding proper reference signals for the acoustical disturbances in jet aircraft, future work will focus on methods of incorporating a multi-channel feedback system to similar environments.

Acknowledgments

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Thomas Kletschkowski and **Delf Sachau** are with the Helmut-Schmidt-University/University of the Federal Armed Forces Hamburg, Mechatronics, email addresses **Thomas.Kletschkowski@hsuhh.de**, and **Sachau@hsuhh.de** . This article is closely based on a paper they presented at Euronoise 2009, Edinburgh.

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Proposal for a shortened measurement procedure

Clive Bentley. **for the assessment of night time noise ($L_{Aeq,\ 8h}$)**

Introduction and background

The Department of Transport's *Calculation of Road Traffic Noise* 1988[1] contains a widely used method that allows an estimate to be made of an 18 hour L_{A10} (06:00h to 24:00h) from measurements of the noise levels over three consecutive between 10:00h and 17:00h adjacent to a road. Factors can then be applied (as set out in PPG24[2]) to derive an estimate of the 16 hour daytime $L_{Aeq,T}$ value, allowing an estimate to be made of the daytime NEC in some circumstances without the need to stand next to the road for 16h.

With the publication last year of the new World Health Organisation Night Noise Guidelines (NNG) for Europe, 2009[3] a new noise parameter was proposed for use in the assessment of the health impact of noise (the WHO definition of health including effects on well-being such as sleep disturbance). This is the $L_{night,\ outside}$, generally known simply as L_{night}. It is defined in that document as:

'*...the night-time noise indicator (Lnight) of Directive 2002/49/EC of 25 June 2002: the A-weighted long-term average sound level as defined in ISO 1996-2: 1987, determined over all the night periods of a year; in which: the night is eight hours (usually 23:00h – 07:00h local time), a year is a relevant year as regards the emission of sound and an average year as regards the meteorological circumstances, the incident sound is considered, the assessment point is the same as for Lden. See Official Journal of the European Communities, 18.7.2002, for more details.*'

The anticipated use for this new parameter is that where existing L_{night} values are high, EU member states may wish to consider action to reduce them. According to the NNG, adverse health effects have been observed at a level of L_{night} of 40dB (the 'lowest observed adverse effect'). This is an incident sound level (equivalent to a free-field level) which would equate to a level of around 43dB at the façade of a property.

Although these guidelines have yet to be incorporated into planning policy, or adopted by DEFRA, both the World Health Organisation *Guidelines for Community Noise* 2000[4] and BS.8233: 1999[5] contain guidance on suitable eight-hour L_{Aeq} values. Previous versions of these two documents are referred to in PPG24 and are often used in noise assessments.

Most acoustical consultants will be familiar with the problems involved in carrying out an eight-hour measurement of ambient noise levels overnight. If a suitable secure location can be found, then a meter can be left at a site and periodic checks and observations made as necessary. However, if there are a number of different locations which need to be monitored and equipment is limited, or if there is no suitable secure site, the person carrying out the monitoring must remain with the meter for the whole period.

Such an eight-hour shift, often sandwiched between hours of travelling, can very tiring. A shortened method is therefore desirable in such circumstances, not least for health and safety reasons.

Given this backdrop, it seemed to be a good idea to investigate whether *(a)* there is a relationship between the noise level recorded over a single night and when averaged over all nights in a year, and *(b)* a robust assessment of the eight-hour night-time $L_{Aeq,T}$ could be made,

continued on page 28

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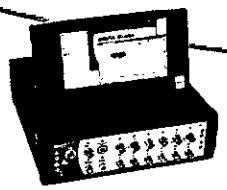

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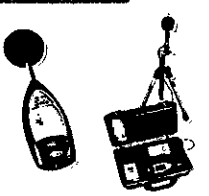

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Proposal for a shortened measurement procedure - *continued from page 29*

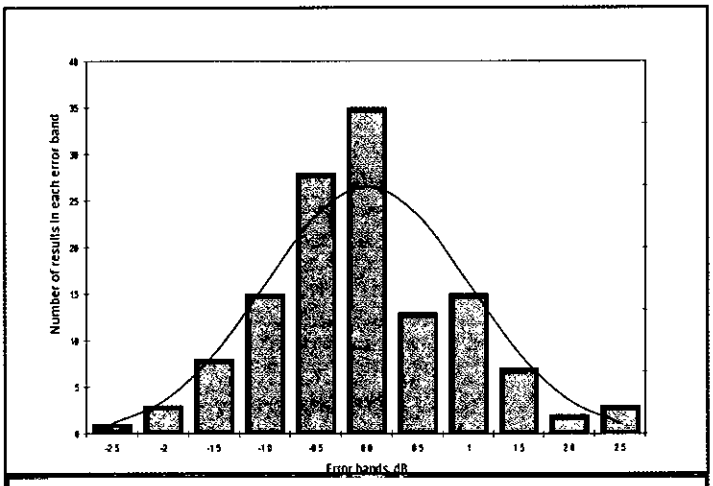

Figure 3

Spread of errors between estimated and measured values of $L_{Aeq,night}$ using the method described, along with the normal distribution curve for this range

variations in assessed levels using this method. However, the data were examined further to determine whether there was any systematic error for particular situations. For example, the method might have consistently underestimated the levels in a rural area, whilst consistently overestimating the levels in a city centre, with the errors cancelling each other out.

Any errors greater than 1.2dB were examined so determine whether there was any such bias for particular types of environment. Table 2 is an analysis of these errors.

The list of values in Table 2 suggests that there is no particular pattern to any overestimates or underestimates in any particular type of environment.

Note

The typical values of short-term L_{Aeq} at 23:00h, 03:30h and 06:30h must be determined with care. It is recommended that these are each measured over a 30-minute period, logging every five-minute value during the period, and it is important to ensure that the monitoring is by attended measurement. The typical value of L_{Aeq} can then be selected from the measured values (excluding any periods in which significant untypical events occurred), or by logarithmic averaging if all measurements are found to be typical.

Conclusions

1. A reliable estimate of the $L_{Aeq,8h}$ can be made using this method for most environments within the UK.
2. Attended measurements are important, to ensure that the conditions experienced can be described as 'typical'.
3. The method will be less reliable in situations where noise occurs at unpredictable times, although even in relatively unusual circumstances, it appears to provide a reasonably accurate estimate.
4. There appears to be more variation between different nights at the same location than there is between values estimated using this method and those actually measured for any given night.

Author's note

The author would be interested in readers' feedback, especially if they are able to provide any information the method's effectiveness at other locations. Any other comments or criticisms would also be welcome. Clive Bentley can be contacted at **clive@sharpsredmore.co.uk** or by phone on **01473 730073**.

Overestimates > 1.2dB	
Location	[illegible]
Adjacent to large food store car park	2.7
City – busy night spot	2.4
Adjacent to large food store car park	2.3
Quiet rural location	1.8
City – busy night spot	1.8
Quiet rural location	1.6
Industrial estate	1.5
City courtyard	1.4
Rural – adjacent motorway	1.4
Industrial estate	1.4
Small town	1.4
Small town	1.3
Adjacent to heliport	1.2
Underestimates < -1.2dB	
Location	[illegible]
Urban location adjacent to busy road	-2.6
City suburb underneath Heathrow flight path	-2.1
City – busy night spot	-2.0
City suburb	-1.9
City courtyard	-1.7
City courtyard	-1.6
Quiet rural location	-1.5
City suburb	-1.5
City – busy night spot	-1.3
Industrial estate	-1.3
City courtyard	-1.2

Table 2

Examination of environments in which errors greater than 1.2dB occurred

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Sound emission and propagation caused by vuvuzelas

DataKustik GmbH.

This article is reproduced by courtesy of Campbell Associates: thanks are offered to Jo May for bringing it to our attention! The original author appears to wish to maintain his (or her) anonymity within DataKustik GmbH.

Introduction

The noise emissions from vuvuzelas have been investigated. These emission values are necessary to determine the noise produced by the extensive use of these instruments as was the case during the football World Cup in South Africa.

This short article contains information about

- Historical aspects
- Determination of sound emission values
- Determination of sound pressure levels when vuvuzelas are used outside
- Determination of sound pressure levels when they are used in closed rooms

Historical aspects

It is not exactly known in what century this instrument was first developed and used. However, one of the oldest documents found in the archives in industrial cellars in Greifenberg, home of DataKustik proves that they were used in ancient times.

Determination of sound emission values

The most important sound emission value of technical sources is the sound power level L_W. This value has been determined according to ISO 3741 in a reverberation chamber in accordance with the specifications of this standard.

To get correct values, a bavarigene who survived from ancient times was contracted to do this blowjob realistically.

The photographs show this strange person while blowing and acting as noise source in the reverberation chamber at measuring point 365.

Measuring values and the calculation of A-weighted sound power levels in octave bands (determined from third octave bands) are summarised in Table 1.

Column 2 shows the reverberation time of the empty reverberation chamber. With its volume of 234.5 m³ and its surface finishes (floor, walls and ceiling) it is in accordance with the specification of the relevant International Standards.

In column 3, using the reverberation times from column 2 and the room geometry the equivalent absorption area was calculated. To account for the voluminous blower of the vuvuzela an additional correction of 1.5m² was used in the following evaluation.

Column 4 shows the measured sound pressure levels in octave bands calculated from third octave bands, all these values being averaged from all measuring points in the reverberation room. Column 5 shows the corrections for A-weighting, and column 6 the A-weighted levels of the sound field in the reverberation room.

Figure 0

A vuvuzela under test

	1	2	3	4	5	6	7
	Frequency Hz	T60 s	A m²	lin dB	A-weighting dB	L_A dB	L_{WA} dB
1	63	12.0	5.2	49.6	-26.2	23.4	24.6
2	125	12.0	5.2	64.8	-16.1	48.7	49.8
3	250	9.3	6.1	112.7	-8.2	104.5	106.4
4	500	10.2	5.7	114.1	-3.2	110.9	112.5
5	1000	9.1	6.2	113.0	0.0	113.0	114.9
6	2000	6.1	8.3	104.1	1.2	105.3	108.5
7	4000	3.7	12.4	91.3	1.0	92.3	97.3
8	8000	3.0	14.7	72.7	-1.1	71.6	77.3
9	16000	1.5	27.5	59.4	-6.6	52.8	61.2
10	**Total**					**116.0**	**117.8**

Table 1

Determination of sound power levels

Column 7 gives the A-weighted sound power levels calculated from the A-weighted sound pressure levels in column 6 and the equivalent absorption areas of column 3, including the 'blower-specific' correction described above. The result is an L_{WA} of **117.8dB**.

continued on page 32

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Sound emission and propagation caused by vuvuzelas - *continued from page 31*

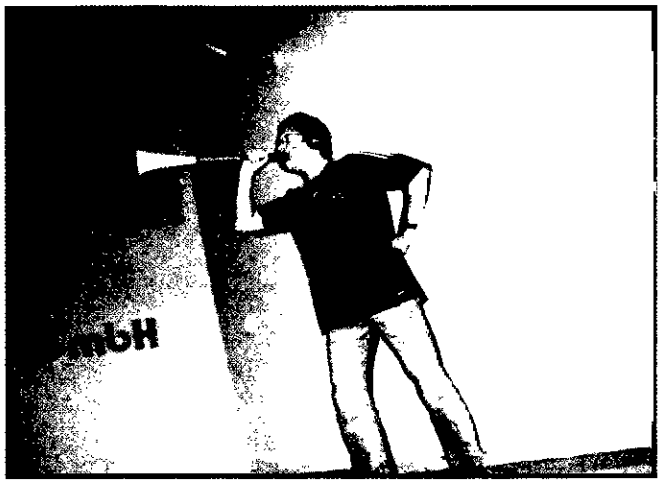

Figure 2

Good spatial averaging in the reverberation chamber

The A-weighted sound power levels in octave bands and linear and A-weighted total sound power levels are shown in Figure 3.

The directivity was then determined from three additional measurements at 0°, 90° and 180° relative to the direction of blowing (the longitudinal axis of the device).

To obtain the directivity index DI the A-weighted sound pressure levels were related to the energy mean value.

angle	dB(A)	DI (dB)
0°	98.2	-0.7
90°	100.2	1.3
180°	95.1	-3.8

Table 2

The A-weighted sound pressure level at a distance of 500mm from the vuvuzela mouth, $L_{0.5m}$, is **117.7dB(A)**.

Determination of sound pressure levels if Vuvuzelas are used out of doors

Using the sound power levels and directivity indices described above the noise immission caused by one or any number of these torture facilities can be determined using the CadnaA software.

With free sound propagation the A-weighted sound pressure level can be determined approximately from the relationship

$L = 118 - 8 - 20*\log(r)$

Determination of sound pressure levels if Vuvuzelas are used inside closed rooms

The sound pressure level in rooms can also be determined. Often the diffuse field theory can be used to approximate the real situation – in such cases the sound pressure level is determined from

$L = 118 - 10*\log(A) + 6$

where A is the equivalent absorption area in m^2.

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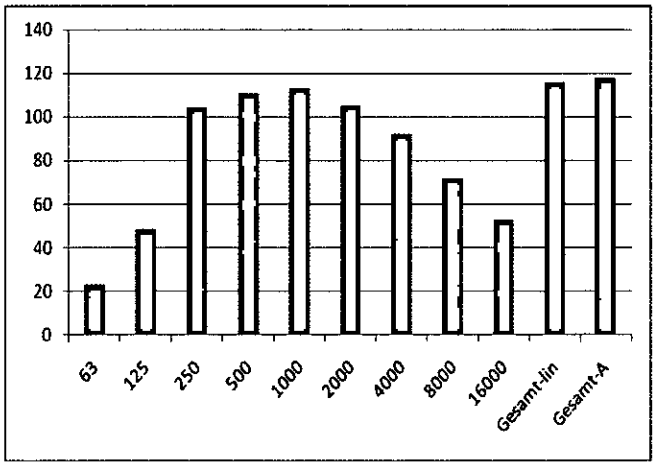

Figure 3

Sound power levels from vuvuzela

Figure 4

External directivity tests

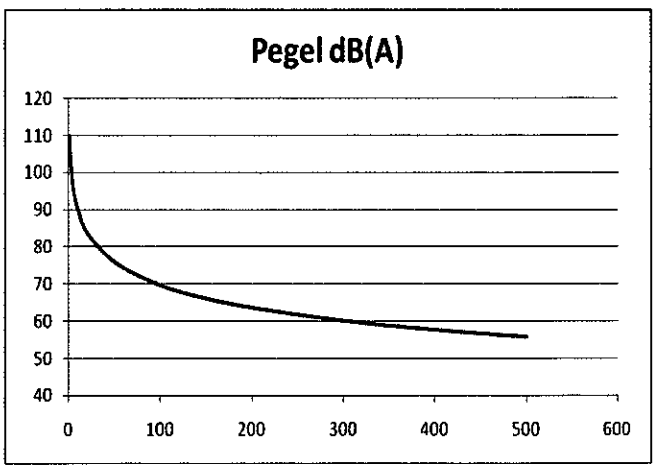

Figure 5

Decay of sound level with distance

Noise in the absence of air transport sources

Chris Parker. What happens when an Icelandic volcano erupts

Background

On 14 April 2010, following the eruption of Eyjafjallajökull in Iceland, volcanic ash was projected several kilometres up in the atmosphere which led to air travel disruption in north-west Europe for six days from 15 April 2010 including the closure of airspace over many parts of Europe.

The town of Kegworth in Leicestershire is located directly under the flight path to and from East Midlands Airport (EMA). Given that the prevailing wind is generally from the west, flights heading towards EMA tend to come from the east descending over East Leake, Sutton Bonington and finally Kegworth before approaching the runway. Conversely, when the wind blows from the east, flights departing EMA tend to head east over Kegworth.

A couple living in a residential area to the south of Kegworth kindly agreed to the installation of environmental noise monitoring equipment in their back garden to measure ambient noise levels before and after the flight ban was lifted. Figures 1 and 2 are photos taken on Friday 23 April 2010 once the flight ban was lifted - they show how close the aeroplanes normally pass by their property:

continued on page 34

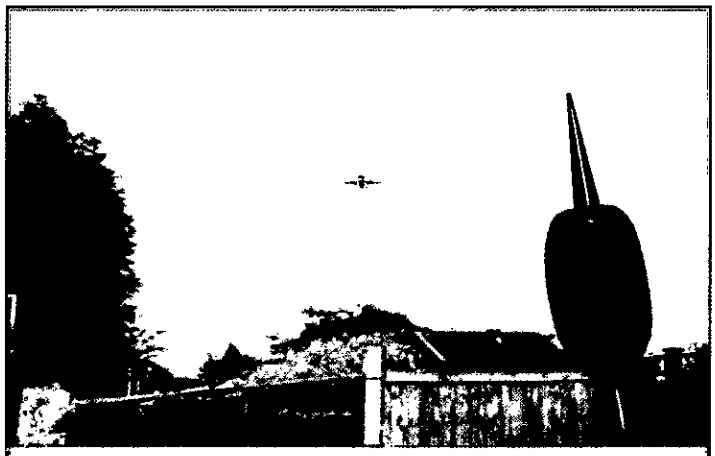

Figure 1

Aircraft approaching the noise monitoring location

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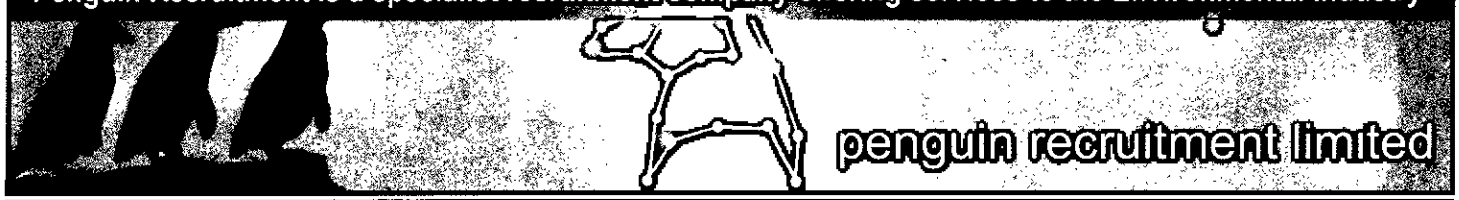

Associate Director/Principal Acoustic Consultant
Newcastle-Upon-Tyne - £30-40K + Benefits **KAL1503**
Due to a consistent increase in workload our client, a leading multidisciplinary consultancy with expertise in energy, sustainability, infrastructure, mining and waste working closely with clients in both public and private sectors have a requirement for an Associate Director/Principal Acoustic Consultant. You will be responsible for the management of the organization's air and noise department; mentoring a multidiscipline team of environmental specialists in their Newcastle-Upon-Tyne branch. To be considered for the role you must possess considerable acoustic consultancy experience in the environmental sector at a similar level, demonstrable business development, staff and project management skills and expert witness experience at public inquiry level.

Acoustics Consultant - Manchester - £18-25K + Benefits **KAL1511**
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Noise in the absence of air transport sources - *continued from page 33*

Noise survey

Weather-proof noise monitoring equipment was connected to a tripod-mounted microphone at a height approximately 1.5m above ground level. The kit was positioned on an area roughly centrally in the rear garden and as far as possible from any vertical reflective surfaces. The equipment was set to log a number of parameters including L_{Aeq}, $L_{Amax(f)}$, L_{A10} and L_{A90} using 15-minute intervals between 20:49h on the evening of Tuesday 20 April 2010 and 17:58h on the evening of Friday 23 April 2010. The equipment consisted of the following:

- Norsonic 140 sound analyser
- Norsonic 1225 microphone with Nor1284/204 dehumidifier
- Norsonic 1212 outdoor microphone protection kit
- Norsonic 1251 portable calibrator
- Norsonic heavy duty tripod

During the commissioning of the noise survey equipment the flight ban was still in effect. It was noted that this location was affected by distant continuous road traffic noise from both the M1 (approximately 850m distant) and the A453 dual carriageway (approximately 990m distant) which run roughly in parallel to the west, in a north-south direction. Other than aircraft and road traffic noise, this location appeared to be a relatively quiet residential area with a large expanse of rural land to the south and no industrial or other significant noise sources nearby.

Results

Analysis of the data (presented in Figure 3) shows that, during the initial monitoring period between 20:49h and 23:00h on Tuesday 20 April 2010, ambient noise levels were consistently around 50dB $L_{Aeq(15\ min)}$ with $L_{Amax(f)}$ levels ranging between 55 and 60 dB. It can also be seen that the measured L_{A10} noise levels are roughly 1 to 2 dB higher than the L_{Aeq} which is a strong indication that, during the flight ban, the dominant noise source affecting this location was distant road traffic noise from the motorway.

Figure 3 shows that the first notable event of the survey occurred between 23:19h and 23:34h on 20 April. It can be seen that, for this 15 minute period, the ambient noise level rose to 67dB $L_{Aeq(15\ min)}$ with a maximum noise level of 91dB $L_{Amax(f)}$. In order to obtain a more detailed account of this noise event the sound pressure level time history of this 15 minute measurement was analysed. The time history of the sample is plotted in Figure 4.

It can be seen that the noise level increased and decreased in a fairly symmetrical manner, *ie* the sound pressure level took roughly the same amount of time to increase to peak level as it did to decay back to the residual level over a period of approximately 30 to 40 seconds. This is what one would perhaps expect from an aircraft over-flight.

In order to confirm or disprove that this event was an overhead aircraft the online EMA Webtrak service (http://ema1.webtrak-lochard.com) was consulted. This service details and illustrates a history of aircraft movements on an interactive site where particulars such as the date and time can be entered so that the user may view any aircraft movements that occurred during that time. A screenshot from the site, running at the same time as the event detailed above, is presented in Figure 5.

The pink aircraft icon in the centre of the image shows that flight DHK973 passed the south Kegworth area at 23:33:13 on 20 April 2010, heading west towards the runway in the red area. This correlates with the large peak in the noise history detailed above, confirming the first peak in the data as an aircraft over-flight.

An online search has revealed that flight DHK973 was a freight flight heading for the DHL cargo hub at EMA. It would appear that this was the first arrival to EMA after the flight ban. The data acquired for the rest of Tuesday night is plotted in Figure 6.

It can be seen that, following the first event at 23:33h, this property experienced an additional five events where noise levels rose abruptly. They occurred between the time periods 01:04h - 01:20h, 02:05h - 02:20h, 02:20h - 02:35h, 04:05h - 04:20h and 04:20h - 04:35h. Again, the online Webtrak service for EMA was consulted in order to confirm whether or not these events were likely to have been overhead aircraft flights. Webtrak yielded the following results regarding arrivals to EMA passing the south Kegworth area during the early hours of Wednesday 21 April 2010. (see Table 1)

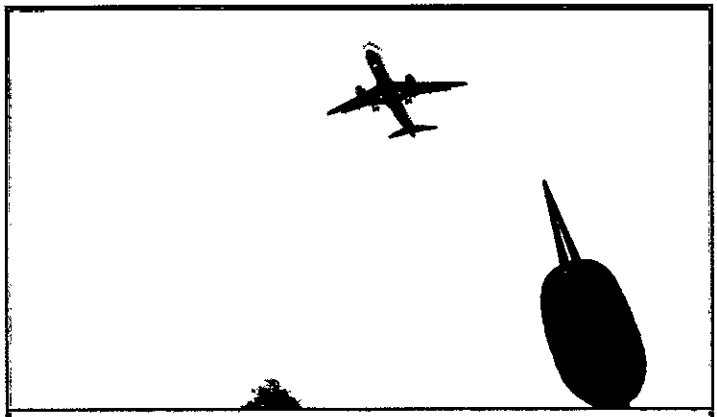

Figure 2

Aircraft over-flying the noise monitor

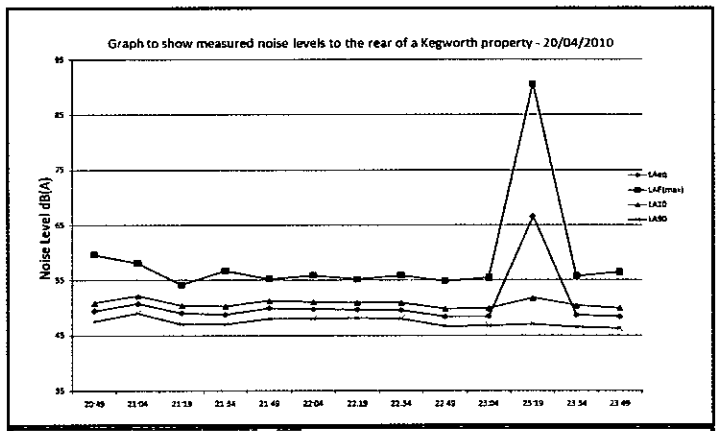

Figure 3

Section of time history on a Tuesday evening during the flight ban

Logged time (hh:mm)	Flight no.
01:06	NPT502P
02:07	BCS825
02:32	BCS1224
04:06	NPT522P
04:24	BCS882

Table 1

It can be seen that the logged flight data correlates with the large peaks in the noise data measured during the rest of Tuesday night. It is possible to analyse every peak in the data throughout the four-day monitoring period in this manner and all data are available to make this possible but, given the data trend, the location and the apparent steady state noise levels at this property during the flight ban, it is considered reasonable to deduce that similar peaks in the data (ambient levels above 65dB $L_{Aeq(15min)}$ and maximum noise levels above 85dB $L_{Amax(f)}$) are all likely to be due to aircraft.

Online searches of the flight numbers listed previously reveals that these flights were freight (flight numbers with the prefix BCS) and commercial (flight numbers with the prefix NPT). It is not known why these commercial flights took place or whether they had passengers on them. Once can speculate that before the official ban was lifted, several mobilisation flights were made (without passengers) to enable operators to be in a position to clear effectively the backlog of passengers stranded at certain airports.

On the morning of Wednesday 21 April 2010 it was announced that commercial flights would officially resume. Noise levels measured at the

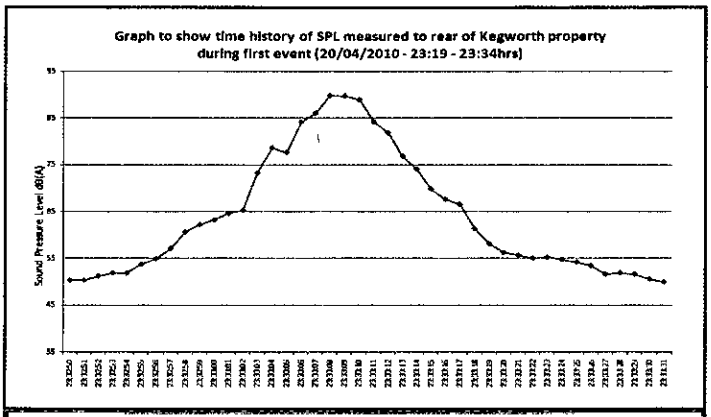

Figure 4

Detailed time history of a noise event

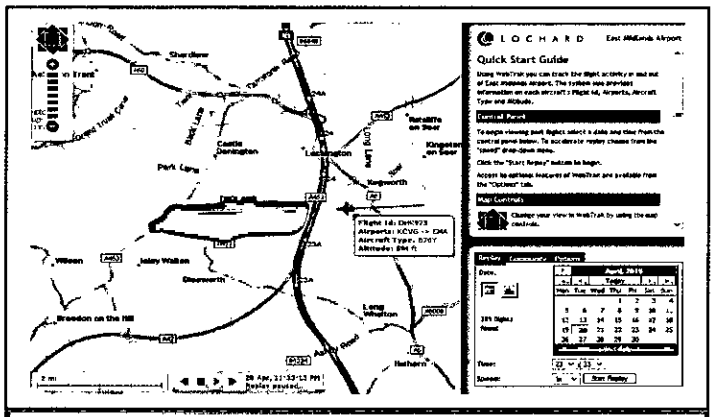

Figure 5

Screen shot from the EMA Webtrak service

Kegworth property for the remainder of the survey are presented in Figures 7 to 11.

There are several points to note when considering the data acquired after the flight ban was lifted (between Wednesday 21 April and Friday 23 April).

- Ambient noise levels greater than 60dB $L_{Aeq(15min)}$ were regularly measured (day and night) once the flight ban was lifted;
- Maximum noise levels ranging from 85 to 90 dB $L_{Amax(f)}$ were regularly measured (day and night) once the flight ban was lifted;
- The highest noise level recorded during the survey was 108dB $L_{Amax(f)}$ during the evening of Thursday 22 April 2010.

With regard to the last point, the 108dB $L_{Amax(f)}$ measured between 20:25h and 20:40h on 22 April 2010, the event time history of this 15 minute period was analysed to obtain a more detailed account of its nature. The event plots are shown in Figure 12.

As before, it can be seen that the noise level increases and decreases in a manner that would be expected from an aircraft over-flight, taking roughly the same amount of time to increase to peak level as it does to decay back to the residual level. Once more, in order to confirm this event as an aircraft pass-by the online East Midlands Airport Webtrak service was consulted. A screenshot from the site running at the same time as the event detailed above is presented in Figure 13.

The pink icon in the centre of the image shows that an aircraft (ADB2824) passed the south Kegworth area at 20:37:41 on 22 April 2010 heading east

continued on page 36

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Noise in the absence of air transport sources - *continued from page 35*

from the airport away from the red area of the screen. This confirms that the maximum measured noise level during the survey was in fact due to an aircraft, in this case, one that had recently taken off. An online search of the above flight number revealed that this flight was a particularly large freight aeroplane (Antonov 124 heavy lift freight aircraft) heading east.

Conclusions

- During the flight ban ambient noise levels measured at this Kegworth property were typically around 50dB $L_{Aeq(15\ min)}$ with maximum noise levels ranging between 55 and 60 dB $L_{Amax(f)}$.
- Once the flight ban was lifted ambient noise levels measured outside the property rose to around 60 - 65 dB $L_{Aeq(15\ min)}$ with maximum noise levels ranging between 85 and 90 dB $L_{Amax(f)}$ and occasionally higher. This has been shown to be the case for both daytime and night-time periods.
- The above indicates that ambient noise levels at this location were elevated by around 10 - 15 dB $L_{Aeq(15\ min)}$ and maximum noise levels were elevated by around 25 - 30 dB $L_{Amax(f)}$ as a direct result of aircraft noise
- The highest measured maximum noise level during the survey was 108dB $L_{Amax(f)}$. This has been shown to be the result of an aircraft over-flight.

Acknowledgements

Thanks are given to Dan Atkinson and Dan Birkinshaw for their assistance.

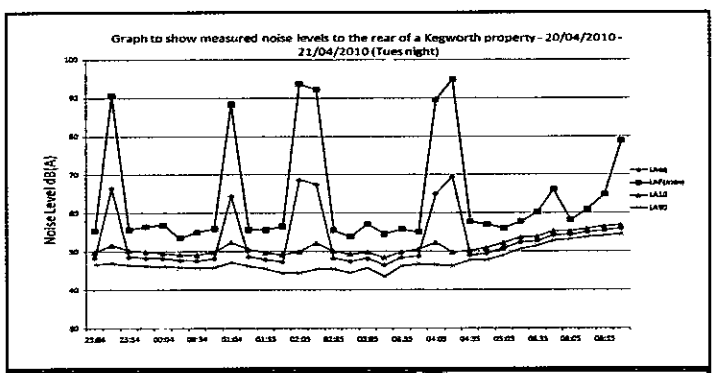


Figure 6

Time history showing further over-flights

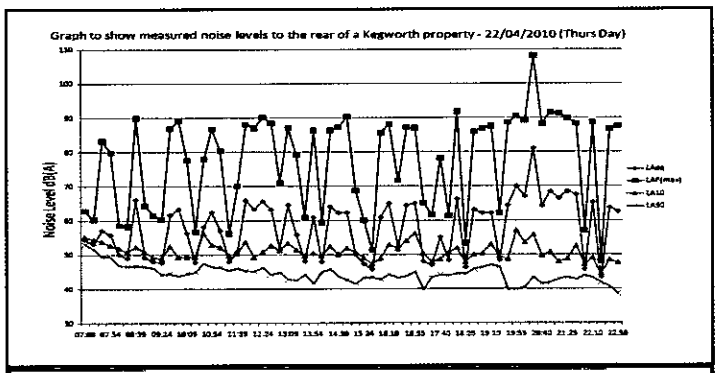


Figure 9

Thursday daytime noise level history

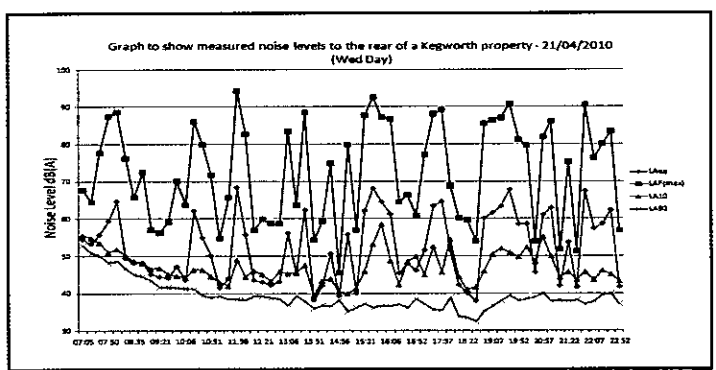


Figure 7

Wednesday daytime noise level history

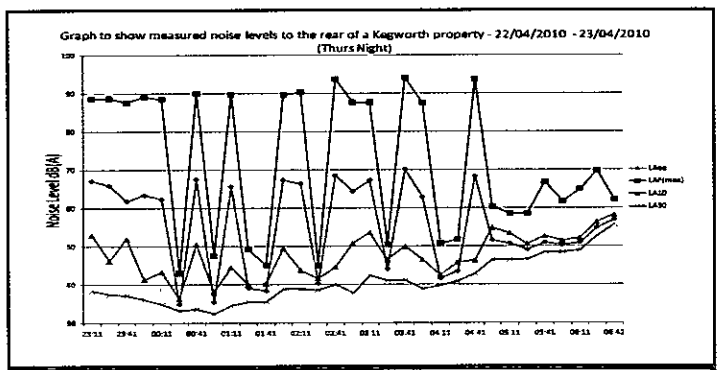


Figure 10

Thursday/Friday night-time noise level history

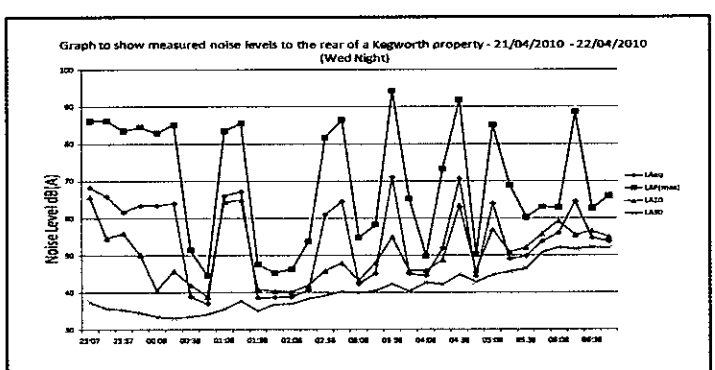


Figure 8

Wednesday/Thursday night-time noise level history

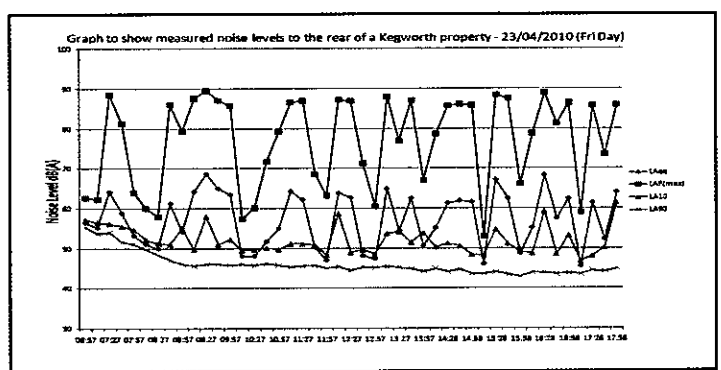


Figure 11

Friday daytime noise level history

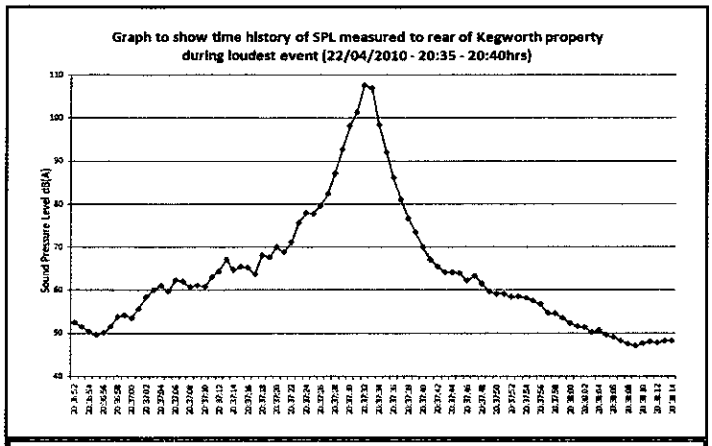


Figure 12

Detailed time history of a noise event

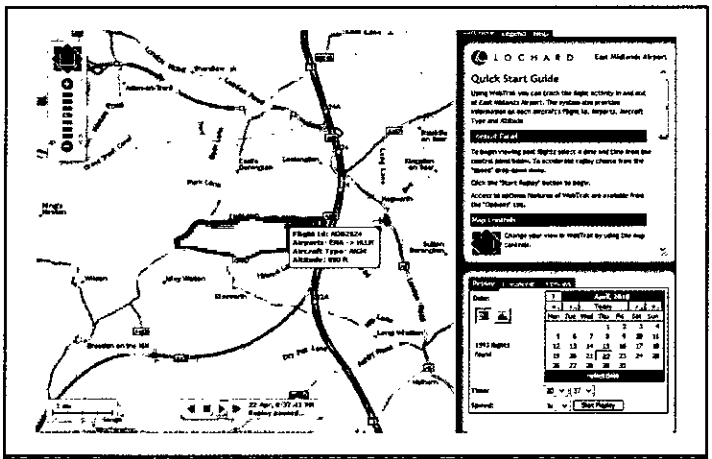
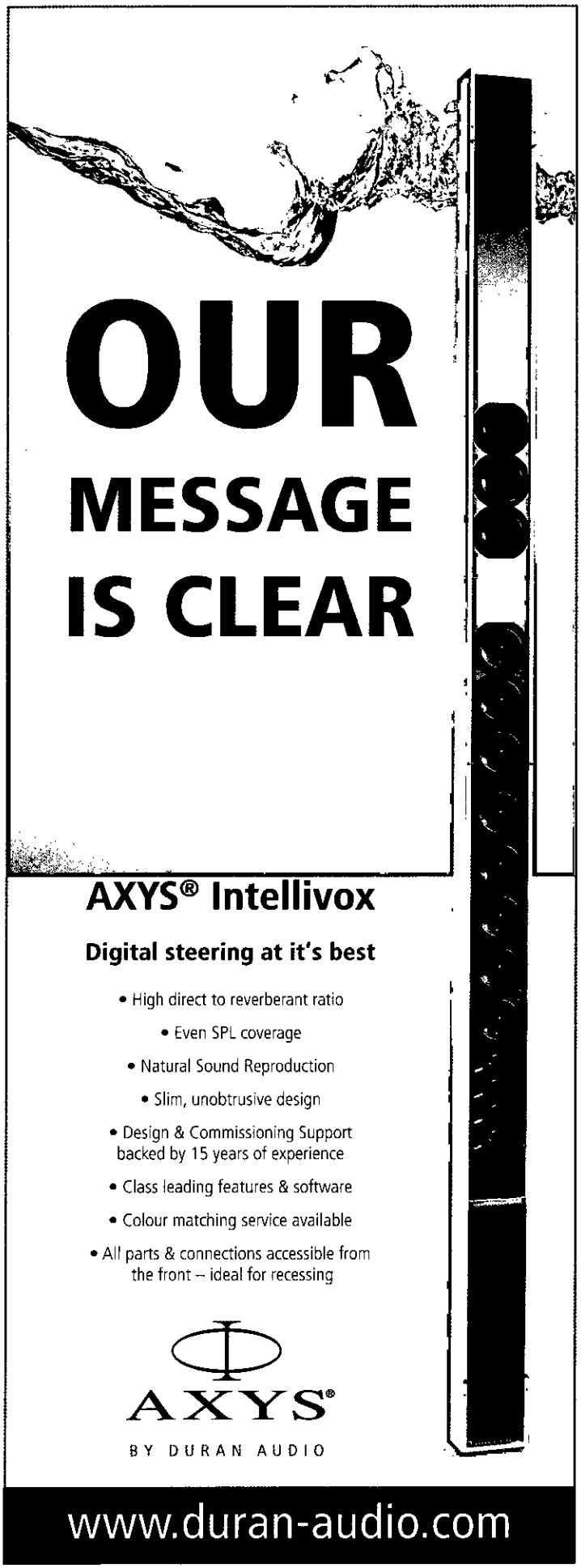


Figure 13

Screen shot from the EMA Webtrak service

Figure 14

The author poses next to the newly-installed noise monitor



Supplementing Dublin's noise maps with long term monitoring

Paul McDonald, Brian McManus and Dermot Geraghty.

Introduction

The passing of the Environmental Noise Directive (END) has motivated EU member states to begin treating environmental noise as a serious pollutant. Rather than be relegated to an unfortunate but unavoidable by-product of progress, environmental noise pollution is now being recognised as a major problem throughout the continent. The noise produced from major transport systems and industrial sites has been shown to affect adversely the health and happiness of the general population[1]. The goal of the END is to minimise the harmful effects which environmental noise pollution has on EU citizens. The first logical step in this process was identifying where high noise levels are likely to have the most negative impact. Once the relevant authorities obtain a general indication of where environmental noise is likely to be at its worst they can then begin to focus their efforts to protect the public from any undesirable effects. Of course for each member state to do this on a national scale we must have the ability to simulate probable noise scenarios and develop predictions regarding noise levels. We therefore use noise mapping. Predictive mapping allows us to generate simulations of likely noise pollution scenarios based on standard local conditions, averaged over a year. These maps provide an indication of both the actual and relative noise exposure levels throughout a given area. Using these maps, responsible authorities can gain an understanding of which areas may have a noise pollution issue which must be investigated.

These maps however have limitations. They are a tool designed for a specific purpose - to identify potential problem areas and areas for protection. Noise maps offer an insight into the likely noise contribution from a particular source but are not intended to be representative of the real world noise levels experienced in these areas. These predictive maps provide an aid to developing a strategic approach to assessing noise pollution, but they are not a substitute for real world data. In order to assess accurately the acoustical situation at any given location it is necessary to perform on-site measurements of noise levels. The collection of real world data allows for the detailed assessment of any noise mitigation strategies and accurate analysis of the effectiveness of such measures. This requires large amounts of data, of an order which can only be obtained through extended monitoring. Long-term monitoring has previously been seen as unfeasible owing to the expense and level of work involved in maintaining remote sites[2]. Sonitus Systems has developed a low-cost solution for permanent and automated noise level monitoring at remote sites. This article details the deployment of an extended remote monitoring network by Dublin City Council, which is used to supplement the Council's noise mapping procedure and support the implementation of the associated Noise Action Plan.

Noise monitoring network

Noise monitoring units

The Sonitus Systems noise monitoring unit is designed for long-term remote monitoring of environmental noise. The units are specifically designed to provide the type of functionality which is needed for bodies addressing the requirements of the END. The noise monitors can be deployed *in situ* and operate autonomously for extended periods of time. Equipped with a class 1 microphone the units are constantly monitoring noise levels and logging statistical data as required. Figure 1 shows a Sonitus Systems noise monitor.

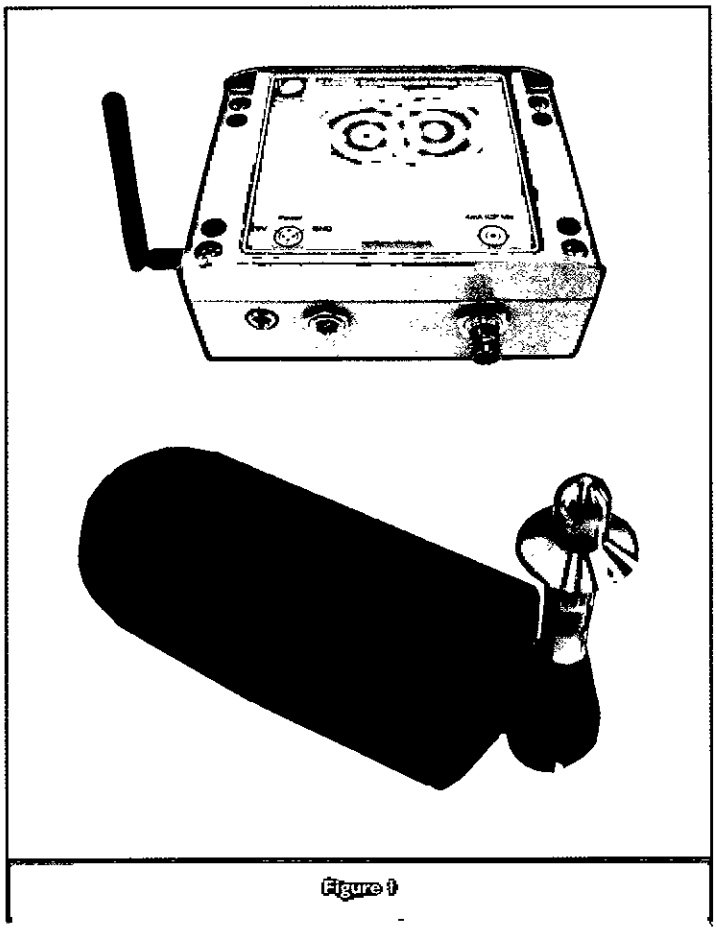


Figure 1

A Sonitus Systems noise monitor as used in the work described here

The units are configured to log noise level data every five minutes. The statistical indicators recorded are L_{eq}, L_{10} and L_{95}, both A-weighted and C-weighted. Data of this granularity provides considerable scope for detailed analysis of trends in local noise scenarios and also allows computation of accurate long-term averages. By recording data in this manner on a permanent basis we can use actual noise level readings for validating noise map predictions. L_{DEN} and L_{night} values can be calculated from readings averaged over the long term and compared directly with mapping estimates. This provides a more accurate indication of the actual noise levels at any given location.

The noise monitors are wi-fi enabled and can be accessed easily using any standard wi-fi device. Noise data files which are stored locally on the unit's internal memory can be transferred over the wireless link for further analysis. The units can also be

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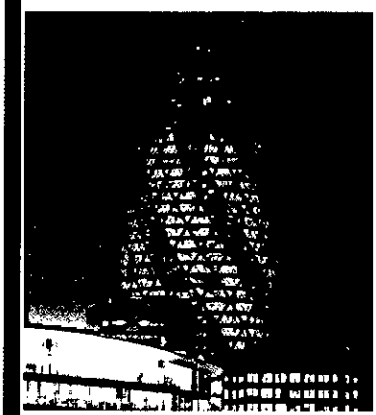

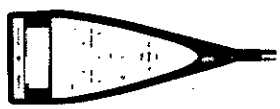

Sound Masking Systems are very flexible, features can include the incorporation of PA, Sound Level profiling, integrated music systems etc. With three Sound Masking product ranges, there is a system to suit every need

Single Office or Multi-Storey Office blocks makes no difference, Sound masking can improve speech privacy in a discrete and cost effective way. Working throughout Europe, AET has gained the reputation as a company that can do.

Decorative Acoustic Panels

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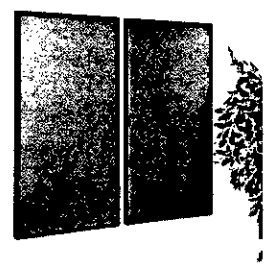
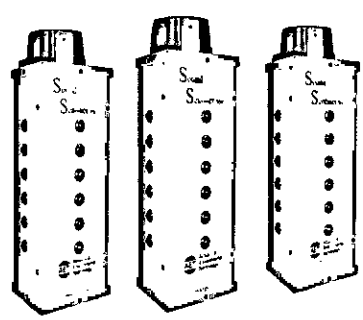


Sound Sentinel

Protection in Public Places and for Employees

Sound Sentinels can be found guarding against excessive noise in Village halls, night clubs, community centres etc. This might be to protect their licence, be a good neighbour or to protect other parts of the building from noise. The main unit has a built-in microphone to measure noise levels and the Sentinel flashes a warning as noise levels approach the maximum permitted. If the red lights flash and the operator does not reduce the levels, the protected power source will cut-off then reset
In Industry the Sound Sentinel-SS series provide a direct visual indication of noise levels within the work place, the Xeon flash indicating when hearing protection is required.



AET

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Supplementing Dublin's noise maps... - *continued from page 38*

equipped with a GSM modem meaning data can be transferred over the internet with no need for visits to remote locations. The noise monitors can email data to a central storage server or directly to the end user. This facilitates simple management of an extended network from a centralised location. By deploying the units at strategic locations the end user can build an extensive database of noise level readings for validation and calibration of noise maps and investigation of individual noise events.

Noise monitoring network deployment

Dublin City Council has deployed noise monitors at ten key locations around the city. These monitors are logging data on a permanent basis, which are used for the ongoing assessment and analysis of the city's environmental noise levels. The locations chosen are at strategic points which satisfy a number of criteria. The primary reason for site selection was the indication given by the Council's noise maps that these locations warranted detailed noise assessment. In most cases this meant that traffic noise levels may be undesirably high, but locations were also chosen which were seen as 'Quiet Areas' within the agglomeration, where noise levels were indicated as being favourably low. Many of the sites also offered some manner of public amenity, such as public libraries, and, in one case, a nature reserve. The majority of these locations were chosen because of their proximity to major sources of traffic noise pollution where few other noise sources would influence the readings. In effect, the only sources of environmental noise being measured were those addressed in the relevant noise map. Figure 2 indicates the position of some of the monitoring sites, overlaid on a noise map of the area. The data gathered at these locations will be compared with the predicted levels shown in the noise maps. These readings will then allow for the accuracy of the predictions to be assessed.

Results

Samples of the results obtained from the ongoing monitoring campaign are given below. At the time of writing the noise monitoring network had been gathering data for approximately seven months. The graphs presented below show how the monitoring units are used to provide greater insight into environmental noise level trends and actual *in situ* noise levels. Figure 3 displays a sample of noise level readings (L_{eq}) at a public library. The readings are divided into day, evening and night periods as specified in the END. This location is in the general vicinity of two major roadways which constitute the only appreciable local source of environmental noise pollution. The plots clearly show a diurnal pattern corresponding to the expected changes in traffic flow during normal daytime and night-time periods.

Figure 4 plots similar data for a proposed Quiet Area in Dublin. This location is exposed to relatively little traffic noise, owing to its isolated location. The area is also home to a nature reserve. The plot shows considerable variation in the noise trends, with no discernable pattern obvious from this data set. Contrary to expectation the noise levels recorded are, at times, higher than those experienced close to the busy roadways. In addition there are no predictable quiet times, with night-time and evening levels sometimes exceeding daytime levels. This is most likely a result of the exposed nature of the monitoring location. The island is often subject to high winds and ocean noise may play a considerable part in the noise levels recorded here.

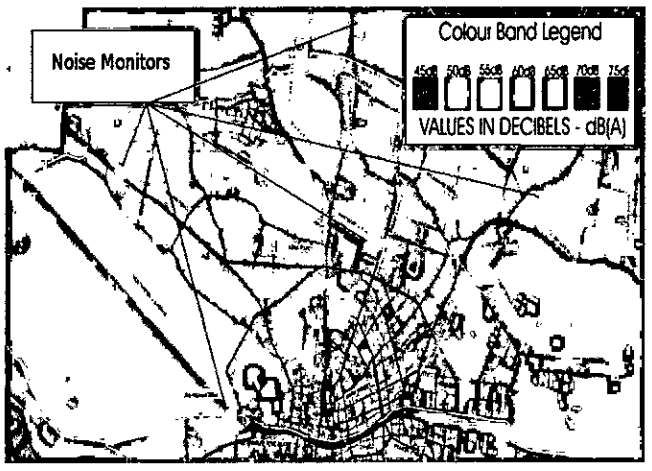

Figure 2

A section of the Dublin noise map showing the locations of the verification noise monitors

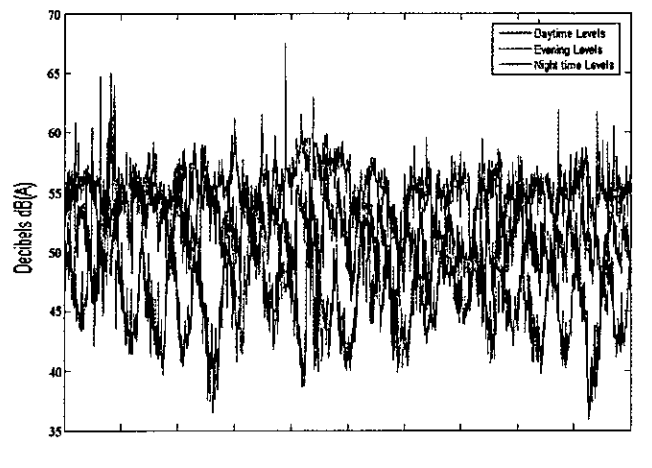

Figure 3

Three weeks' worth of sample noise levels outside a public library

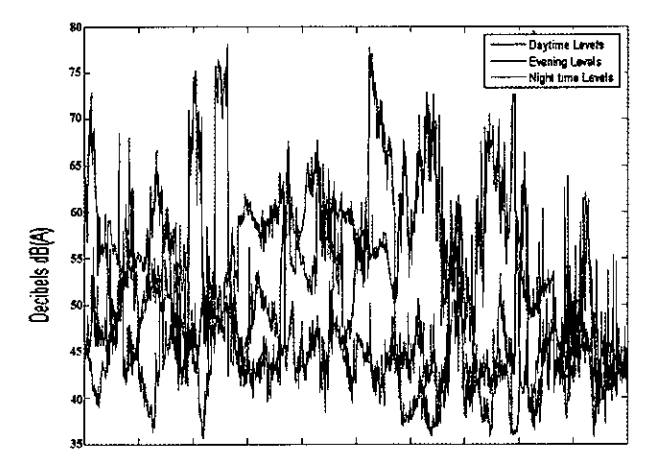

Figure 4

Two weeks' worth of sample noise levels in a proposed 'quiet area'

This data set serves to highlight the fact that the noise levels actually experienced at a given location may well differ significantly from those predicted by noise mapping. This is a key point when communicating noise map data to the public and other stakeholders. In order to ensure a level of confidence the maps must have a certain degree of accuracy, but also the limitations must be clearly outlined. Data sets such as that shown in Figure 4 can help highlight the fact that noise maps do not always show the full picture.

However, in locations where other sources of noise are negligible and the assumptions made during mapping hold true, then we can use our noise monitoring data to assess directly the accuracy of the noise mapping process. Measurements in these locations allow the monitoring network to supplement noise mapping by providing long-term noise level readings to validate the methods used for noise predictions.

Table 1 shows data for a key residential noise monitoring location in the central Dublin area. The noise level data was collected over a seven-month period and analysed to provide L_{day}, L_{night} and L_{DEN} readings. These were directly compared with noise mapping results to verify the accuracy of the mapping process.

	Daytime dB(A)	Night-time dB(A)	LDEN dB(A)
measured	56.3	49.6	58.6
modelled	54.5	51.0	58.6
difference	+1.8	-1.4	0

Table 1

Differences between measured and modelled noise indicators

As can be seen from the table even with less than one year of data the measured L_{DEN} is the same as the predicted level. This serves to validate the procedure used for producing the associated noise map.

By installing a permanent monitoring network we can avoid many of the issues encountered when attempting to compare short-term measurements with long-term values. Such methods require considerable variance in the sample timing, meaning they can be quite intensive in terms of manpower. For example the associated American ANSI standard requires that measurements be taken on between five and seven non-consecutive days[3]. By monitoring constantly in the long term we can make more direct comparisons.

In addition to L_{DEN} calculations we can also perform accurate assessments of the effectiveness of any noise mitigation schemes. By monitoring noise levels before and after a particular scheme is implemented we can directly quantify the effect of noise reduction measures. This will allow relevant authorities to assess both the human and economic benefits achieved through noise reduction strategies[4].

Conclusions

The effective implementation of the Environmental Noise Directive will depend on accurate identification of environmental noise problems and the subsequent application of appropriate noise abatement policies. The first step in this process was the noise mapping of extensive areas of all EU member states. Predictive noise maps are an invaluable tool for the first stage of assessment of areas subject to environmental noise pollution. By indicating potential problem areas noise maps allow authorities to concentrate their resources where they will be of greatest value.

The next step in this progression is accurately to assess the noise impact of any major sources on surrounding areas. For this we need real data. By installing a permanent, automated noise monitoring network responsible bodies can obtain accurate data allowing them to refine their noise mapping techniques and subsequently perform detailed local noise analysis.

Dublin City Council has deployed such a monitoring system. The data gathered will be used for the validation and calibration of noise maps and also to continually refine the Council's approach to the treatment of noise pollution. This paper provides an overview of the noise monitoring network installations and presents some preliminary data highlighting the range of analysis options open to the Council as a result of this method. By adopting this approach to the treatment of noise we hope to continually aid in the provision of more accurate and effective noise predictions, a better standard of information for the public and the generation of more effective and beneficial noise reduction strategies.

Acknowledgments

Sonitus Systems would like to thank Dublin City Council for their co-operation and help with this research.

Paul McDonald, is with Sonitus Systems Ltd, email paul.mcdonald@sonitussystems.com. **Brian McManus** is with Dublin City Council, email brian.mcmanus@dublincity.ie, and **Dermot Geraghty** is with Trinity College Dublin, email tgerghty@tcd.ie.

This article is closely based on a presentation given at Euronoise 2009, Edinburgh.

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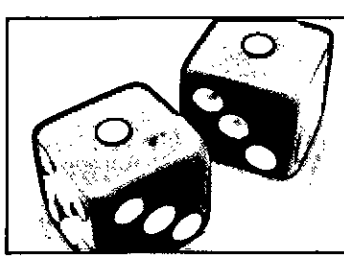

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How big is a bang?

Gunfire noise investigations

At the end of May 2010, Sharps Redmore staff and a number of volunteers from the BASC met at an open field in rural Suffolk to carry out research into noise propagation from different shooting arrangements. The tests, which lasted a marathon 11 hours, were to establish how different guns, ammunition and other conditions affect the propagation of sound over distances of up to 1.3km in all directions. The BASC hopes to use the results to inform its position when considering the potential impact of noise from shooting on wildlife.

Pictured are some of the volunteers receiving a briefing prior to the start of the day. A number of captions spring to mind.

For more information contact Clive Bentley at Sharps Redmore Partnership, **01473 730073**. The BASC website is **www.basc.org.uk**

Sharps Redmore Partnership and British Association for Shooting and Conservation (BASC) carry out shooting noise research in the wilds of Suffolk

The silent treatment for eco-friendly libraries

Architecturally-sensitive secondary glazing

A library is traditionally a collection of books embodying knowledge and ideas and many fine buildings have been constructed over centuries to reflect the importance of such collections. Today, information is stored in far more diverse ways but libraries continue to be an important place for access either to the printed word or to electronic information in all its forms. Libraries are changing to meet these modern needs but many also retain their heritage by adapting and developing buildings to create environments that are both sustainable and conducive to learning.

Windows are an important architectural element of many traditional libraries but being single glazed they provide minimal thermal insulation and poor acoustical insulation. As a result of technological and design advances in recent years, secondary glazing now provides an attractive and practical solution to these issues, particularly for listed buildings.

A secondary window is a reversible adaptation and with sensitive design it can provide a sympathetic addition to any building. This will offer far more significant noise insulation than standard double glazed units and the use of thermally efficient glass will reduce heat loss by more than half, and so meet insulation levels set out in Part L of the Building Regulations. Security of collections is also becoming more important and secondary glazing accredited to 'secured by design' or to loss prevention standards will provide a significant but discrete barrier.

In addition to facilities within the education sector, there are in excess of 4000 public libraries in the UK. The government-backed Museums, Libraries and Archives Council (MLA) works tirelessly to ensure that public libraries throughout England can continue to make a measurable and substantial contribution to local economies, helping to bridge social divides and enrich lives, with a remit to promote best practice, inspire innovative, integrated and sustainable services to all.

Selectaglaze, the UK's leading secondary glazing specialist, is playing an important role in preserving our architectural heritage and four libraries have recently benefited greatly from the introduction of secondary glazing to enhance energy efficiency and improve noise insulation.

Enfield Town Library was officially re-opened this spring by Sir Andrew Motion, former poet laureate and chairman of the MLA. This newly renovated flagship library has been the focus of a £5m refurbishment programme which has seen the introduction of a teenage area, a café and enhanced computer facilities in addition to the existing traditional adults' and children's services.

The development featured the addition of an impressive glass and steel frontage and the combined new and old sections of the library now use renewable energy sourced from 100m below the ground, with bore holes cut into the walls to cool the building in the summer.

Selectaglaze's challenge was to help bring the original 1912 building up to today's demanding standards of thermal and noise insulation while maintaining the listed character of its Edwardian façade. To achieve this, a total of 27 sash windows were fitted with a combination of vertical sliding counter-balanced units and lift-out units, thus enhancing the building's green credentials and at the same time keeping the noise of the town traffic at bay.

Clapton Library is a Grade II listed Edwardian neo-classical library which has been restored to its former glory, retaining and uncovering many of its original features, while updating its facilities with a striking new extension.

Sustainability was at the heart of the refurbishment, with energy-efficient green technologies being adopted throughout the project. These include rainwater harvesting, solar water heating, and energy efficient lighting and heating systems. The existing windows have been upgraded in an unobtrusive manner using hinged casements linked to lift-out panels to match the window sight lines.

Ramsgate Library rose phoenix-like from the ashes five years after fire gutted the 104 year old Grade II landmark building on the Kent coast.

The impressive two-storey north façade escaped the ravages of the flames, and this and the west façade were the only principal elevations of the original building to have survived. Single-glazed timber sash windows were specified to these facades, some of which were salvaged from the fire. However, to meet modern standards of thermal insulation and energy efficiency, a sympathetic secondary glazing system was required. This

involved a diverse range of styles including hinged casements with curved heads that exactly matched the external window design.

Seeley Library at Cambridge University was designed by James Stirling. Completed in 1968, the library won a RIBA gold medal in 1970 and has been listed by English Heritage.

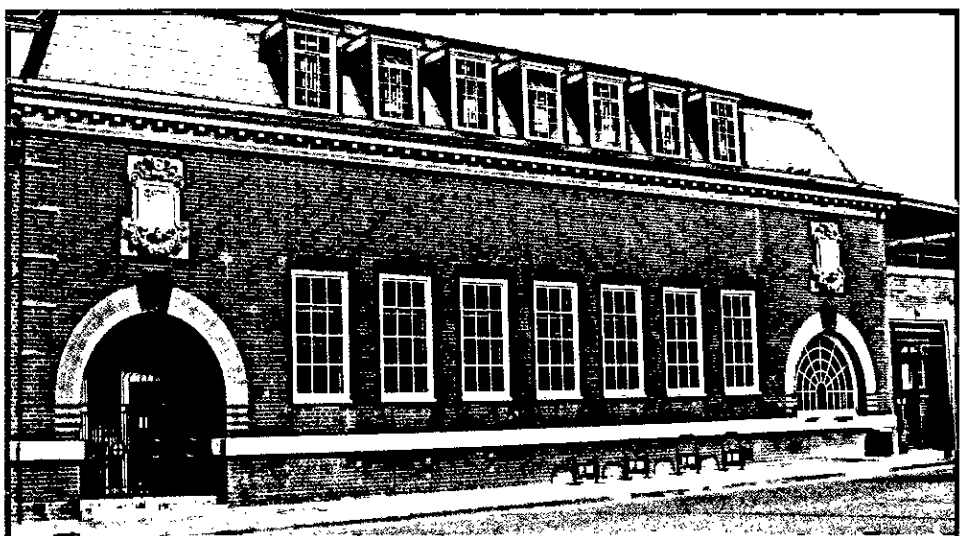
The building features an intricate angled glass structure creating a light and airy library with a partial glass roof overlooked by numerous meeting rooms, some of which are cantilevered with viewing galleries looking out across the library.

To afford students total peace and quiet the meeting rooms have been provided with secondary glazing but one room presented a significant challenge due to the many and varied shapes and angles used to create the viewing gallery. The existing glazing is a complex patent glazing roof construction with opposing pitches and multiple hips. The secondary glazing needed to run parallel and Selectaglaze used digital 3D mapping and modelling to perfect a solution that maintained the existing sight lines. The final result is both efficient and aesthetically pleasing.

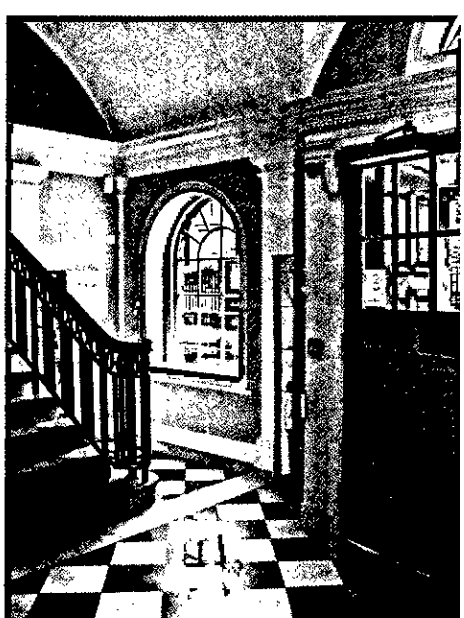
Established since 1966 and a royal warrant holder since 2004, Selectaglaze is at the forefront of product development and design. The extensive range of systems has undergone rigorous third party assessment and test covering acoustics, thermal efficiency, and resistance to intruder or blast. Product literature and data sheets covering performance and test results are available on request from **enquiries@selectaglaze.co.uk** or by phoning **01727 837271**.

The company has a comprehensive web site at **www.selectaglaze.co.uk**

Internal view of Clapton Library

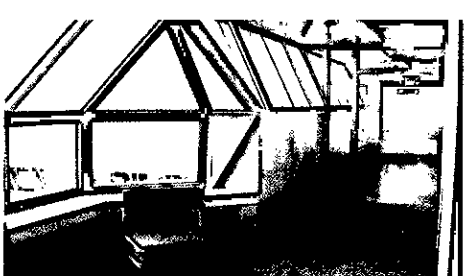


The neo-classical facade of Clapton Library



Staircase at Ramsgate Library

Internal staircase at Enfield Town Library



Meeting room in Seeley Library

Secondary glazing at Enfield

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Acoustic cubes help solve gymnasium noise

Recticel Ltd

Fulfilling a need for a practical yet cost-effective remedial acoustical treatment is not always easy.

Structural considerations with their associated additional costs, and the architect's aesthetic requirements, can make the task of finding a solution almost impossible.

This challenge was in a brand-new high school gymnasium at Whitmore High School in Harrow as the client, Kier Harrow Projects, called for a specification with a reverberation time of less than 1.5 seconds.

The acoustical design consultants for the scheme, Hawksmoor Engineering, recommended a solution using the versatile broadband body absorbers (otherwise known as 'the cubes') from Anti Noise Systems (ANS), part of Recticel.

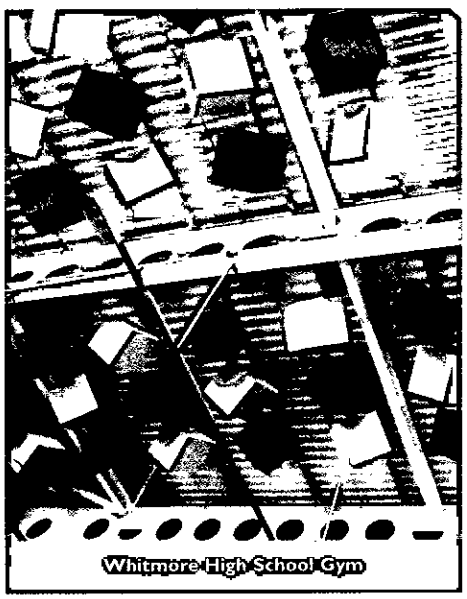
With an initial reverberation time of over four seconds it was calculated that the desired standard could be achieved with just over 200 of the 600mm cubes. Based on lightweight Class 0 melamine foam inserted into a specially manufactured fire resistant cover, the cubes offer excellent acoustical absorption properties with a load of less than 2.5kg each. Every cube was easily installed from a tower, and it took just a few hours to position them all in the hall.

Every absorber comes with adjacent loops already fitted for easy fixing with hooks or lines and they are available in a range of bright colours to suit most applications. The fabric covers can also be removed from the cubes and washed - washing the cover does not affect its acoustical or fire properties.

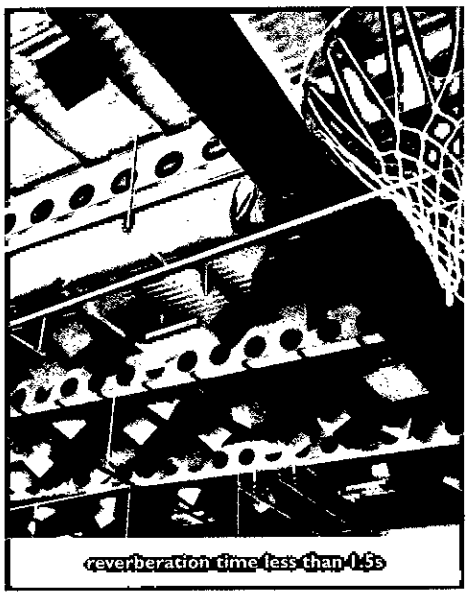
Kier Harrow Projects senior project manager Joe Murphy commented that the installation was straightforward and simple, and the blue colour selected worked rather well with the blue fabric ventilation ducting.

Recticel is a manufacturer and supplier of technical foams to a wide range of industries. The Recticel group is one of the world's largest manufacturers and converters of polyurethane foam, supplying the sports, acoustical, industrial, retail automotive and filtration markets. The company has established itself as an innovative market leader with a heavy focus on research and development with IDC (the €10m International Development Centre). Recticel works in partnership with customers to develop new products for their specific market areas, whilst also satisfying customers' needs through a wide and diverse range of existing products.

For further information please contact Chas Edgington on **01536 402345** or email **edgington.chas@recticel.com**



Whitmore High School Gym



reverberation time less than 1.5s

Acoustics for schools initiative

SRS Ltd

Sound Reduction Systems Ltd (SRS) is proud to launch its new 'Acoustics for schools' initiative. The main thrust of the scheme will see the launch of the new guide *BB93 and acoustics within the educational environment* whilst offering all UK schools, their specifiers and contractors free-of-charge evaluations, guidance and specifications to ensure that the school meets all the acoustical standards set out in BB93, as well as the needs of its staff and students.

Many schools in the UK suffer from poor room acoustics due to the acoustically reflective surfaces traditionally found within the learning environment. This leads to a great deal of reverberation and echo which creates poor speech intelligibility - an environment like this has a detrimental effect on both teaching and learning.

SRS has a new and unique range of acoustical absorbers that can be used to control noise within all school environments, from large gymnasiums and canteens to small classrooms and media suites. The Sonata range of products offers extremely high levels of performance but does not compromise design, with various shapes, colours and finishes available. Unlike many traditional mineral fibre based products, Sonata products are manufactured using innovative acoustical foams that are completely non-fibrous and perfectly safe to install during term time.

There are also significant problems with noise disturbance from adjoining classrooms, halls and corridors. Often, walls and ceilings are particularly lightweight and a simple application of an acoustically absorbent product can make a significant difference.

For example, walls and ceilings can be lined with Maxiboard - a high performance acoustical building board, designed to be used like standard plasterboard but with far greater acoustical performance. SRS also has a range of acoustical ceiling tiles, SoundBlocker, which can be used to increase the performance of lightweight suspended ceilings: cross-talk between classrooms with these types of ceilings installed is often a problem area.

In short SRS has the knowledge, expertise and practical solutions to deal with just about any sound insulation issue within the educational environment. To receive a free copy of *BB93 and acoustics within the educational environment*, to book a site visit, or just to talk through any acoustical issues that you have, contact the industry-leading technical team on **01204 380074**;
email: **info@soundreduction.co.uk**
or visit the web site
www.soundreduction.co.uk/schools

A real 4-in-1 winner!

Castle Group names winner of competition

Castle Group of Scarborough has announced the winner of their competition for a 4-in-1 environmental meter, held at the Safety and Health Expo in May at the NEC. He is Craig Edgar of G I Hadfield & Son Ltd, based in Manchester.

The prize was awarded to Mr Edgar in person at one of the free half-day environmental noise seminars run by Castle, in Carlisle on 24 June. Mr Edgar said that it was such a surprise to receive the call from Castle, and he was delighted to take delivery of the prize in person. He really did have a need for this piece of equipment, so it could not have found a better home.

Simon Bull, managing director of Castle, commented that there had been a fantastic response to the competition at the show, and it was great to be able to give the prize in person. The 4-in-1 meter is a big seller and people really find it a useful tool for health and safety monitoring.

The competition draw was held at Castle's offices on Friday 4 June, when Kara Stephenson, a pupil from Filey School who was on work placement with the company at the time, drew the winner's name out of the hard hat. Kara said that she particularly enjoyed being asked to draw the competition winner, as she had helped out with some of the exhibition preparation.

The 4-in-1 meter is a single device that can measure noise, light, temperature and humidity, thus avoiding the need for multiple pieces of equipment. The competition asked the question 'What is the accuracy of the RH reading on the 4-in-1 meter?'. The answer is 5%, which was option 'C' on the competition form.

For further information about the 4-in-1 meter, please visit: **www.castlegroup.co.uk** or phone **01723 584250**, email **sales@castlegroup.co.uk**

Kara Stephenson and Simon Bull draw the prize winner

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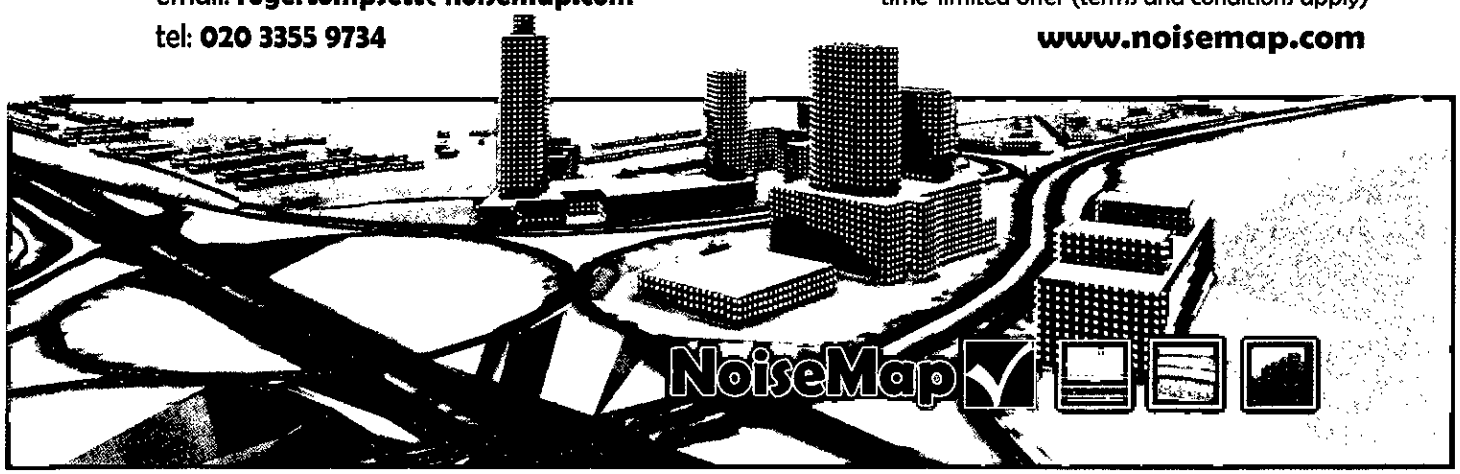


Bionic Ear Show booms in schools in Bury St Edmunds

World's largest ear causes sensation in Suffolk - again!

Hot on the heels of its successful appearance at the Suffolk Show, several schools in Bury St. Edmunds played host to the innovative 2010 Bionic Ear Roadshow, from national charity Deafness Research UK. Sponsored by BUPA, the show aims to use an hour's performance featuring the world's largest ear, to teach pupils about how important and delicate their hearing is and to remind them of the risks they face to their hearing from loud music, among other important educational messages about hearing.

The Bionic Ear Show was designed to raise awareness of the dangers to which many of us are unwittingly exposing our hearing, and for young people in particular to limit exposure to loud music by turning down the volume on MP3 players. Our hearing is as precious as our sight: a fact that people only tend to recognise when they are faced with losing it. There were demonstrations of what it sounds like to have high frequency hearing loss, plus 'Guess that tune' – allowing the students to appreciate how easy or hard it is for people with cochlear implants (so-called 'bionic ears') to recognise everyday music.

As well as the serious underlying message about hearing loss, the show featured among other things 'the world's largest ear'. During the show, the presenter constructed a model to highlight the different parts of the ear, which is over 7m long and 116 times the size of a normal human ear. Through this interactive and entertaining demonstration, pupils learn how the ear works, what can go wrong and what can be done to put things right.

Delivering the roadshow's message into schools is an opportunity to engage pupils in these issues via interactive activities. In Suffolk the aim is to ensure the next generation is not faced with the prospect of preventable deafness. Developed for audience participation, no specialist scientific knowledge was required to enjoy the spectacle.

While the revolution in MP3 and phone technology had given us the benefit of music on the move, an unwelcome side effect was that we were pumping up the volume into our ears and at a far earlier age than ever before, according to Vivienne Michael, chief executive of Deafness Research UK. It was feared that many of us were unwittingly 'downloading deafness' and playing music at such high volume that we risked permanent deafness and tinnitus sooner than would be expected simply as a result of old age.

The Bionic Ear Show includes free hearing tests along with other interesting and informative demonstrations about how the ear works. With the support of BUPA, the 2010 Bionic Ear Show is taking its message and its giant ear to a town, city or school near you so please contact Deafness Research UK if you would like the show to come to your school, community group or event for free. Bookings can be made by calling Laura Ganpot on **020 7679 8951** or email **bionicearshow@deafnessresearch.org.uk** The schedule is subject to change, but an up-to-date version and further information can be found on the website at: **www.bionicearshow.org**.

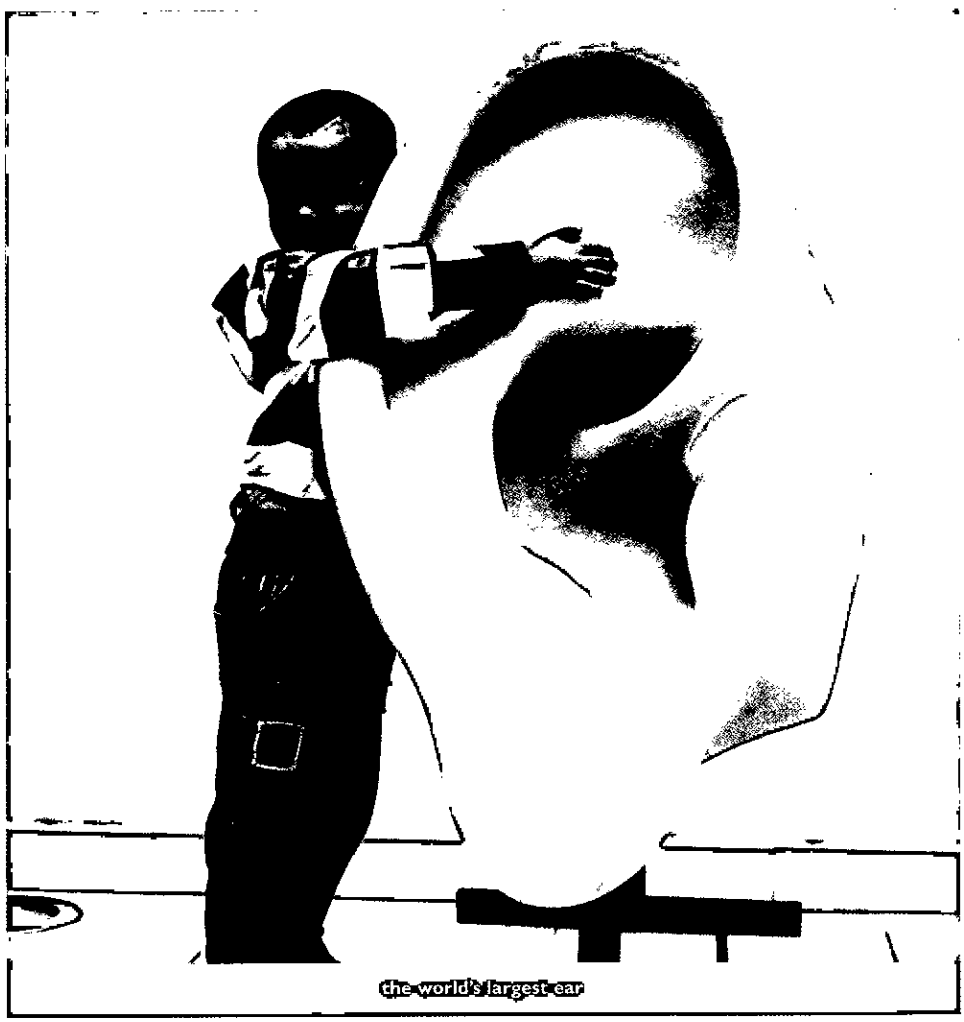
One of the key messages the Bionic Ear Show is taking to schools is not to stop children using MP3 players, but to listen to their favourite sounds safely. Turning the volume down slightly is such a simple thing to do and will enable today's generation to continue to enjoy their music for years to come.

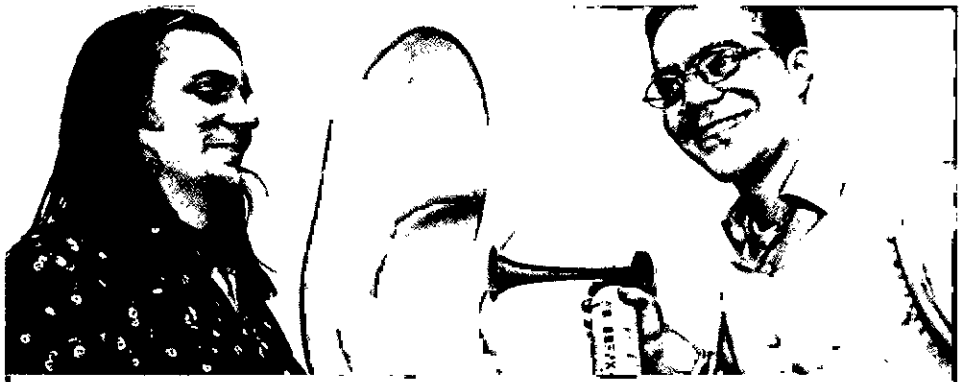
The Bionic Ear Show continues the campaign first launched in 2006 to highlight that hearing is as important as sight and to encourage people to protect their ears against potential damage. In launching the campaign, Deafness Research UK is stressing that young people today are at far greater risk of going prematurely deaf than their parents because they are listening to mobile phones and MP3 players at far too loud a volume and far too often.

A national survey found that over a third of all 16-34 year olds listened to their MP3 players for more than an hour a day and 14% listened for more than 28 hours a week. It also showed that 54% of people did not realise that listening to loud music on an MP3 player, in a nightclub or at a concert could damage their hearing.

More than a third of people who have experienced ringing in their ears after listening to loud music listen to their MP3 player every day. Ringing in the ears, or tinnitus, is a sign of damage to the hearing system.

Deafness Research UK is the country's only charity dedicated to finding new cures, treatments and technologies for deaf, hard of hearing and other hearing impaired people. The charity supports high quality medical research into the prevention, diagnosis and treatment of all forms of hearing impairment including tinnitus.





demonstrating how the ear works

no specialist scientific knowledge necessary

Calibration of reverberation time measuring equipment

News just in

AV Calibration Ltd has just attained UKAS Accreditation for the calibration of sound level meters able to measure reverberation time.

For further information contact Mike Breslin **mbreslin@anv.uk.com, 01908 642846.**

a working model constructed with audience participation

LETTERS

Misleading noise level information

a source of doubt and uncertainty

Dear Sir

It was with some interest that I read the letter on the misrepresentation of acoustical performance from Mark Page in the July/August 2010 edition of *Acoustics Bulletin*. I am now constantly battling with clients when I need to specify low noise, split-type air-conditioning systems (which are really heat pumps) for audio post-production rooms. I have my preferred units, based on both measured and subjective noise levels, but the clients are always going to the Internet or listening to salesmen (which can be even worse), and trying to the tell me that there are quieter units available which are also cheaper. The fact is that I need units of very low subjective noise when working at useful airflow levels. All too often, the supposedly quieter units are only quieter (in terms of *measured* noise) when operating at uselessly low flows. In many cases, models now have a super-quiet setting which is also at a super-low fan speed, which is perhaps suitable for a baby's bedroom but is nowhere near enough for a post-production room. Currently, there seems to be no link in the publicity material between noise levels and air-flows. This is very misleading for the clients and a source of much doubt and uncertainty. It is probably only a matter of time now before some manufacturer quotes a noise level with the machine almost stopped.

What is more, I remember Ampex introducing the AG440 analogue tape recorder in the 1970s as a replacement for the older AG350. In the specifications the newer machine was 3dB quieter than the older model, but when a shipment arrived at Pye Studios in London, they were all sent back as being faulty because the recording engineers said that they were all *noisier* than the older models. Ampex soon insisted that they were all within specification, and returned them to the studios with an electronics engineer to make the measurement in front of the staff. In fact, they *were* in specification, but the nature of their noise was more intrusive than from the AG350s, so they *sounded* noisier. There is a similar situation with many air-conditioning units. I know by experience which types will be most suitable for given applications, and yet, even when people are employing me as a consultant, it can still be difficult to convince them that what they read in the publicity is to be taken with a great pinch of salt.

Another bone of contention is the inconsistency in the units used in the publicity for loading capacity on springs and elastomers. Again, the clients love looking on the Internet, but the specifications can be highly confusing as they are variously given in kgm^{-2}, lbs/ft^2, lbs/in^2, kPa, kg/cm^2, N/mm^2, *etc.*

I must admit, however, that *grains per square furlong* I have yet to see. Why all this diversity?

Yours faithfully

Philip Newell FIOA

Obituary

Peter H Allaway

We were saddened to learn of the death on 17 July 2010 of Peter Allaway, a very familiar name in the world of acoustics.

Peter Allaway was born in May 1927 and was educated at Queen Elizabeth's Grammar School in Barnet. After army service in the infantry, and a short period working for a firm specialising in the thermal insulation of industrial buildings, he joined a tiny company, Absorbit Ltd, based in London. That firm dealt with applications of vibration isolation products, which it manufactured. He was first the manager and later a director under the guidance of Rolf Stein. Peter Allaway introduced noise control equipment to the product range and prepared some in-house selection procedures for silencers for air-conditioning and ventilation systems. Some licensing with companies in the USA and Germany followed.

After some years of successful trading an agreed takeover bid was received from the Cementation group of companies and Peter Allaway became managing director of Absorbit Ltd within that group. Whilst respecting his chairman, Sam Bythway, and the Cementation group and its top management, he felt that large-company life was not for him and he later left to set up Allaway Acoustics Ltd, a company which still exists although Peter Allaway withdrew from it after some years. That company continued to specialise in noise and vibration control applications and products, and it pioneered innovative, computer-based acoustical analysis for duct-borne noise.

During his period as managing director of Allaway Acoustics Ltd he sent himself to Chelsea College, University of London, and under the tutorship of Dr Geoff Leventhall successfully completed the postgraduate (MSc) course in applied acoustics. This was on a day release basis which, he said, caused considerable amusement among the youngsters in his company. This rebounded on him as some of the lads asked for time off to study and he could hardly refuse them - one of their number was Dr K W Hong (Westwood Hong), now a distinguished acoustician in his home of Hong Kong.

At the same time as setting up Allaway Acoustics Ltd, he and Prof (then Reader) Peter Grootenhuis of Imperial College set up Grootenhuis Allaway Associates (GAA) as consultants in acoustics, noise and vibration. As time went by he spent more of his time on consultancy projects and, as mentioned already, subsequently wholly withdrew from Allaway Acoustics Ltd. Peter Grootenhuis and Peter Allaway, sometimes known as the 'two Peters', worked together for some 23 years before the partnership was closed because, as Peter Allaway said, 'The DSS started paying us instead of the other way around!'.

Peter Allaway's work took him to many countries including New Zealand, Australia, Hong Kong, Taiwan, Pakistan, Italy, Spain, Germany, France, USA and Canada. He was a Chartered Engineer, a Fellow of the Institute of Acoustics (having been a member of the British Acoustical Society and the Acoustics Group of the Institute of Physics before that), and a one-time Fellow of the Chartered Institution of Building Services Engineers (for which he helped to write the 'sound control' chapter of the 1970 edition of the guide to current practice). He was a one-time Member of the Acoustical Society of America, for which his sponsors were Leo Beranek and Bob Newman. He was a Member of the Society of Environmental Engineers from its early days.

GAA were early members of the Association of Noise Consultants and Peter Allaway served that association as treasurer, vice-chairman, chairman and (twice) as honorary secretary - not, as he said, all at the same time. He was delighted when, after retirement, he was awarded honorary membership of the ANC. He was later honoured by appointment as the associations' president, for a five-year term, following Bill Allen and John Large in that honorary post.

He leaves a wife, Lyria, two children, six grandchildren and two great-grandsons. And not a few friends.

Bradford Newman Medal for Best Dissertation

Nick Durup

Nick Durup, a student at London South Bank University and consultant with the Sharps Redmore Partnership, has been awarded the Robert Bradford Newman medal for the best dissertation by the Acoustical Society of America, www.newmanfund.org. The prize is awarded for 'demonstrating excellence in acoustics and in the application of acoustical design principles during the course of their study'. The medal was presented to Nick on the occasion of his graduation on 29 July 2010. His Masters dissertation was entitled 'An investigation into the acoustic modelling, design and testing of a professional music rehearsal and recording facility'. LSBU and SRP plan to continue their co-operation, with Nick undertaking a PhD in the near future.

Nick Durup (r) with Steve Dance, LSBU, on graduation day

The evolution of Acoustilay

latest evolution now available

Acoustic insulation innovators Sound Reduction Systems Ltd (SRS) is not a company that is happy to sit still. The market leading range of acoustical products is under constant review to ensure that they offer the maximum benefit to specifier, installer and end user alike.

Acoustilay has remained unrivalled in the market place in terms of price, performance, sustainability and performance for over 14 years, however, SRS is extremely proud to announce the latest evolution of the UK's favourite acoustical flooring product.

The acoustical performance of Acoustilay is taken as read: however, it is the attention to detail with the new and improved product that keeps it unique in the market place, and the number 1 choice for anyone looking for acoustical flooring. The key innovations are:

- A unique and exclusive acoustical membrane – this material is only available from SRS in its Acoustilay product;
- The membrane is manufactured from recycled materials and is 100% recyclable at the end of its life;
- The recycled acoustical foam has been benchmark tested against many other foams and felts, to ensure that it is not only the most environmentally friendly, but also the best acoustically;
- Acoustilay now comes printed with a green film that carries both the fitting instructions and the logo. This ensures that installation issues are kept to a minimum, and that the specified product is instantly identifiable on site by both specifier and customer;
- The printed film has been specially designed and approved for use with most market leading flooring adhesives;
- The emboss pattern on Acoustilay has been specially designed to create the optimum 'key' between the material and the adhesive, if bonding is required, and also to ensure the perfect surface to take the flooring element;
- A wide range of accessories such as Acoustilay perimeter strips, for sound insulating beneath gripper rods, and the new Acoustilay joint tape ensures that every aspect of installation has been thought through and dealt with;
- The new version of Acoustilay is 100% sourced and manufactured in the UK.

Most importantly, all of this product development and innovation comes at no extra cost - the product remains the most economic and efficient method of sound insulating a floor there is.

Acoustilay has long been a firm favourite with specifiers and end users because of its good acoustical performance and its ease of installation, and it is often used to meet the requirements of Building Regulations Part E in flat conversions. However, it is also widely used simply to upgrade the sound insulation of floors in householders' own properties, for personal comfort.

Sound Reductions Systems has long maintained a commitment to provide free professional advice on any acoustical problems to specifiers and end users alike, along with unique, high performance acoustical insulation materials for buildings. All members of the SRS technical team have both practical and academic experience in acoustics.

For further information on the new, improved Acoustilay, or any other of our products please contact SRS on **01204 380074**, email: **info@soundreduction.co.uk** or visit the web site where all information is available to download: **www.soundreduction.co.uk**

The green printed film with fitting instructions is compatible with flooring adhesives

Noise training courses

Brüel & Kjær UK

Sound and vibration expert Bruel and Kjaer UK is running a series of training courses this autumn, designed not only for its customers, but also those seeking a good understanding about noise effects on everyday life.

B&K Royston HQ

New to the company's 2010 calendar are multiple sessions of LDS' *Vibration testing for engineers* course, which are to be held on site at B&K headquarters in Royston. Vibration specialist LDS - which became part of the Brüel & Kjær group in December 2008 - runs this two-day course as a practical introduction to the subject of vibration testing. It is designed to meet the needs of engineers new to the subject of vibration testing, and also acts as a useful refresher course for more experienced users. The course explains how to interpret vibration test specifications and apply them to a test system.

An optional third day on *Practical laser USB training* is also available. This hands-on workshop, which uses a LDS Laser USB controller with an LDS V830 shaker, allows students to run live tests for sine, random, shock and mixed mode testing using prepared laboratory sessions.

Brüel & Kjær UK continues to offer its most popular courses including *Sound insulation measurement*, which provides an introduction to measuring building and room acoustics, *Basic vibration measurements*, which offers guidance in selecting and using accelerometers for a wide range of industrial, research and design applications, and *Practical use of sound level meters*, which teaches new sound level meter users how to get the best from their equipment.

Brüel & Kjær is still running its free online training courses, with new topics added regularly. Upcoming sessions include Fundamentals of measuring sound and Basic 2250 sound level meter. Registrants from all over the world are welcome to take advantage of this opportunity to gain inside knowledge, plus helpful tips from the company's expert engineers.

For more information, please contact: **01763 255 780** or **ukinfo@bksv.com**

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Committee meetings 2010-11

DAY	DATE	TIME	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
Thursday	6 January	10.00	Meetings
Thursday	20 January	10.30	Diploma Tutors and Examiners
Thursday	20 January	1.30	Education
Thursday	27 January	10.30	Membership
Thursday	10 February	11.00	Publications
Thursday	17 February	11.00	Medals and Awards
Thursday	17 February	1.30	Executive
Thursday	3 March	10.30	Engineering Division
Tuesday	8 March	10.30	Diploma Examiners
Thursday	**10 March**	**11.00**	**Council**
Monday	4 April	11.00	Research Co-ordination
Tuesday	5 April	10.30	CCWPNA Examiners
Tuesday	5 April	1.30	CCWPNA Committee
Thursday	14 April	10.00	Meetings
Thursday	5 May	10.30	Membership
Thursday	19 May	11.00	Publications
Tuesday	24 May	10.30	CMOHAV Examiners
Tuesday	24 May	1.30	CMOHAV Committee
Thursday	2 June	10.30	Engineering Division
Wednesday	15 June	10.30	CCENM Examiners
Wednesday	15 June	1.30	CCENM Committee
Thursday	16 June	11.00	Executive
Thursday	23 June	10.30	Distance Learning Tutors WG
Thursday	23 June	1.30	Education
Thursday	**30 June**	**11.00**	**Council**
Tuesday	5 July	10.30	ASBA Examiners
Tuesday	5 July	1.30	ASBA Committee
Thursday	7 July	10.00	Meetings
Tuesday	2 August	10.30	Diploma Moderators
Thursday	1 September	10.30	Membership
Thursday	8 September	11.00	Executive
Thursday	15 September	11.00	Publications
Thursday	**22 September**	**11.00**	**Council**
Thursday	29 September	10.30	Diploma Tutors and Examiners
Thursday	29 September	1.30	Education
Thursday	6 October	11.00	Research Co-ordination
Thursday	13 October	10.30	Engineering Division
Thursday	3 November	10.30	Membership
Tuesday	8 November	10.30	ASBA Examiners
Tuesday	8 November	1.30	ASBA Committee
Thursday	10 November	10.00	Meetings
Thursday	17 November	11.00	Executive
Wednesday	23 November	10.30	CCENM Examiners
Wednesday	23 November	1.30	CCENM Committee
Thursday	24 November	11.00	Publications
Thursday	**1 December**	**11.00**	**Council**
Tuesday	6 December	10.30	CCWPNA Examiners
Tuesday	6 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.

Meetings Programme 2010

13-14 September
IOA / IEEE
International Conference on Synthetic Aperture Sonar and Synthetic Aperture Radar
Lerici, Italy

2-3 November
Building Acoustics Group and ANC
Autumn Conference 2010
Birmingham

18-19 November
Electroacoustics group
Reproduced Sound 2010
Cardiff

A full programme of events is planned for 2011.

Please refer to **www.ioa.org.uk** for up-to-date information.

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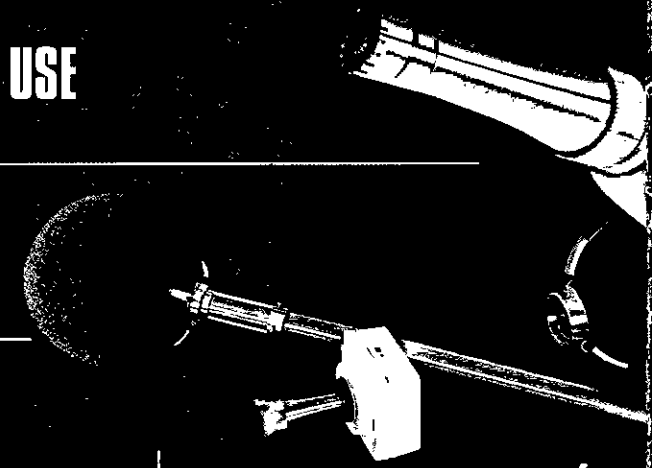

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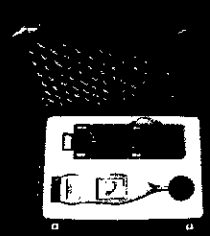

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