Acoustics BULLETIN

VOL 30 No 1 Jan/Feb 2005

Reproduced Sound 20 - meeting report

IoA Young Person's Award announced

The presentation of underwater random noise

The airline view of noise mitigation

Statistical assessment of amplified music

Institute of Acoustics

Acoustics BULLETIN

Vol:30 No:1 Jan/Feb 2005

CONTACTS

Editor:
I F Bennett BSc CEng MIOA

Associate Editor
J W Tyler FIOA

Contributions, letters and information on new products to:
Ian Bennett, Editor, 99 Wellington Road North, Stockport SK4 2LP
Tel 0161 476 0919 Fax 0161 476 0929
e-mail ian@acia-acoustics.co.uk

Books for review to:
S R Peliza MIOA, Institute of Acoustics, 77A St Peter's Street, St Albans, Herts AL1 3BN

Advertising:
Advertising enquiries to
Dennis Baylis MIOA, Peypouquet, 32320 Montesquiou, France
Tel/Fax 00 33 (0)5 62 70 99 25
e-mail dbioa@hotmail.com

Published and produced by:
The Institute of Acoustics, 77A St Peter's Street, St Albans, Herts AL1 3BN
Tel 01727 848195 Fax 01727 850553
e-mail ioa@ioa.org.uk
Web site http://www.ioa.org.uk

Designed and printed by:
Russell Purvis, Designs for You, Oak Court, Sandridge Business Park, Porters Wood, St Albans, Herts AL3 6PH

Production Editor:
Ann Satchell CamDipPR

Origination:
Norman Simpson

Annual subscription (6 issues) £110.00
Single copy £20.00

Contents

Institute of Acoustics

The Institute of Acoustics was formed in 1974 through the amalgamation of the Acoustics Group of the Institute of Physics and the British Acoustical Society and is the premier organisation in the United Kingdom concerned with acoustics. The present membership is in excess of two thousand and since 1977 it has been a fully professional Institute. The Institute has representation in many major research, educational, planning and industrial establishments covering all aspects of acoustics including aerodynamic noise, environmental, industrial and architectural acoustics, audiology, building acoustics, hearing, electroacoustics, infrasonics, ultrasonics, noise, physical acoustics, speech, transportation noise, underwater acoustics and vibration. The Institute is a Registered Charity no 267026.

There's a *New Kid in Town*

Created for You

Brüel & Kjær presents its innovative 4th generation hand-held instrument for sound and vibration. Experienced users from all over the world assisted us in setting the requirements for the new Type 2250.

- Color Touch Screen is the easiest user interface ever
- Non-slip surfaces with contours designed to fit comfortably in any hand
- Incredible 120 dB measurement range so you can't mess up your measurement by selecting an improper measurement range
- User log-in so the meter is configured the way you want it to be, and templates to make it easy to find user defined setups
- Optional Applications for Frequency Analysis and Logging are seamlessly integrated with the standard integrating SLM application
- High Contrast display and "traffic light" indicator make it easy to determine the measurement status at a distance even in daylight
- SD and CF memory and USB connectivity make Type 2250 the state-of-the-art sound analyzer

Created, built and made for you personally, you'll find Type 2250 will make a wonderful difference to your work and measurements tasks.

United Kingdom: Brüel & Kjær · Bedford House
Rutherford Close · Stevenage · Hertfordshire · SG1 2ND
Telephone: 01438 739 000 · Fax: 01438 739 099
ukinfo@bksv.com · www.bksv.co.uk

Type *2250*

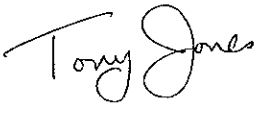
Brüel & Kjær

Dear Members

Now that Christmas festivities are but a distant memory we can look ahead to 2005, which is likely to be another busy year for the Institute. Your Council has been considering ways to enhance the Institute's image and to improve communications both with the outside world and within the Institute. A major achievement in this regard has been the development of our new web site, unveiled in December 2004. A further advance is the appointment, from January 2005, of Judy Edrich to the new post of Publications and Information Manager. I'm sure that you will all welcome Judy to the head office team, and that before too long the benefits of her work for the Institute will become evident.

Council has also agreed a new award, to acknowledge the importance of those who bring awareness of acoustics to the non-scientific community. You should find an announcement about the Award for Promoting Acoustics to the Public elsewhere in this issue.

I have referred before to the vital work of our various committees. With the head office staff, it is the volunteers on our committees who sustain the Institute's activities and services. New blood is welcome on all of our committees, but at present I would mention the need for additional members of the Publications Committee and Engineering Division Committee. The Publications Committee is responsible for the distinctive face of the Institute through Acoustics Bulletin, the web site and our other publications. The Engineering Division endeavours to ensure that acoustical engineering is given due recognition, and recently achieved a licence from the EC^{UK} *(Engineering Council) for the Institute itself to administer the engineer registration process independently. Please contact me, or Roy Bratby at the head office, for further information if you would like to assist with the important work of these (or our other) committees. With a view to widening representation at the highest level, Council has decided that shortening the term of office of Council Members would increase opportunities to serve on Council itself. As this requires an amendment to our Articles of Association, the approval of the membership will be sought at a General Meeting. Representation on external committees is an important way of exercising the Institute's influence. Although already having a presence on several British Standards Institution committees, and those of some other bodies, the Institute is seeking to improve the coordination of our representatives' work and to provide appropriate feedback and reporting mechanisms. So, with plenty to be getting on with, it remains to wish you all a prosperous 2005.*



Tony Jones
President

New Award for young acousticians

The Institute of Acoustics is delighted to announce the launch of the biennial 'Young Person's Award for Innovation in Acoustical Engineering'

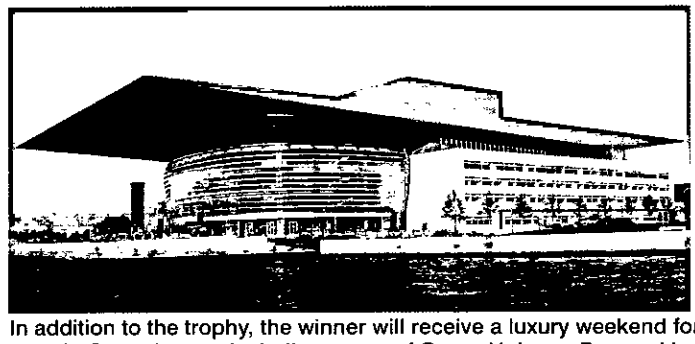
The award was unveiled to member delegates at the Institute's Annual Conference in October by Brian Quarendon, CEO of the award's corporate sponsors, IAC Ltd. Entries are now invited for the award, which will be made for the first time in November 2005. It is designed to recognise excellence and achievement in acoustical engineering among those who are aged under 30, or early in their careers in industry. It departs from the usual format in that it is also intended to increase awareness of the value of acoustic engineering and technology to the community at large.

Commenting on the new award, IOA President Tony Jones, said: "We are delighted to announce the launch of this biennial award. For many years the contribution to industry of the inventiveness and skills of acoustical engineers has been undervalued. We are keen to see their contributions recognised and celebrated and to promote the area of industrial acoustics across a wide spectrum of engineering applications. In an increasingly noisy world the prospects for those embarking on a career in acoustics are looking better than ever. The high standards being achieved by acoustics graduates in recent years promise a high calibre of entries and I envy members of the judging panel their job of recognising and rewarding excellence."

Judging panel

Entries are welcomed from now until the closing date of 15 July 2005 when the distinguished panel of judges drawn from academia and industry will select a winner and two runners up. The judging panel will be: Dr Andrew Moorhouse BSc PhD MIOA CEng, Reader, University of Salford; Colin English BSc CEng FIOA MIMechE, Partner, English Cogger Partnership and President-Elect, Institute of Acoustics; Roger Menaldino BSc CEng MIOA, Principal Research Engineer, Acoustics, BAE Systems Electronics Ltd Underwater Systems Division; and Geoff Crowhurst MIOA MIOD Director, IAC UK Acoustic Division.

Projects likely to catch the judges' attention will be innovative and inventive, feasible and practicable, money-saving, green, end-user friendly, time-saving, and improvements to existing processes.



In addition to the trophy, the winner will receive a luxury weekend for two in Copenhagen, including a tour of Opera Holmen, Denmark's new national opera house

Prizes

The winner of the *Young Person's Award* will receive a prestigious trophy being designed by a leading British silversmith, a luxury weekend break for two in Copenhagen with £500 to spend, and a tour of Denmark's new world-acclaimed national opera house, Opera Holmen, courtesy of Arup Acoustics. The first runner-up will receive a cheque for £200 and a commendation goblet, and the second runner-up a commendation goblet.

Brian Quarendon, Chief Executive Officer and President of IAC expressed his pleasure that the achievements of acousticians in industry will be recognised and applauded in this award. His company was delighted to be supporting the Institute, and flying the flag for this sector of engineering.

Encouraging industry feedback

When wider industry was consulted on the introduction of the new award, feedback was encouraging. In the view of Malcolm Every, managing director of Sound Research Laboratories Ltd, the demand for the services of acoustical engineers was continuing to increase as noise became more of an issue throughout industry and society as a whole. He was always 'banging on' to engineering students how exciting a career in acoustics could be, and his organisation could not get enough good people. He felt sure that this award would encourage young people to see how they can contribute to a better environment for all, by raising the profile of acoustics, and would prompt them to consider joining the profession.

Ian Bromilow, director of BDP Acoustics in London was also encouraged, and welcomed the award. All too often in acoustics, innovation gave way to convention. At BDP Acoustics, innovation in building projects was positively supported, so he was delighted to acknowledge this award as a step forward in the field of acoustics. He hoped that it would encourage forward-looking engineers to think 'outside the box' and develop innovative acoustical engineering solutions.

Entry forms

Entry forms can be downloaded from www.iacl.co.uk and will shortly also be available from the Institute's new website at www.ioa.org.uk Alternatively, interested parties can request a leaflet and entry form by phoning the Institute on 01727 848195, sending a fax to 01727 850553, or e-mailing ioa@ioa.org.uk

Judging Panel

Pictured top left: Geoff Crowhurst MIOA MIOD, Director, IAC UK Acoustic Division
Top right: Colin English BSc CEng FIOA MIMechE, Partner, English Cogger Partnership and IOA President-elect
Bottom left: Dr Andrew Moorhouse BSc PhD MIOA CEng, Reader, University of Salford
Bottom right: Roger Menaldino BSC CEng MIOA, Principal Research Engineer, Acoustics, BAE Systems Electronics Ltd Underwater Systems Division

New Institute Award for
Promoting Acoustics to the Public

The Institute wishes to encourage work that promotes the importance of acoustics to people outside the acoustics world. Most of us can benefit from a greater awareness of acoustics amongst schoolchildren or students, the general public, public bodies, legislators and industry. Promoting acoustics can help encourage more people to study and follow careers in acoustics. It can also help prevent acoustics being treated as a Cinderella subject by industry and legislators.

To promote work in the public understanding of acoustics, the Institute of Acoustics is instigating an award either to recognise a piece of outstanding work over the previous year, or in respect of sustained long-term activity. The term 'public' is intended to be interpreted widely as people without acoustical expertise. The work should have benefited the public in the British Isles.

Examples of work would include:

- Writing articles for the non-acoustical press
- Authoring web pages
- Demonstrations and lectures
- Work with schools to promote acoustics
- Media work on TV or radio
- Exhibitions

The criteria for the award are that the person should have either:

- ❑ *A track record of carrying out public promotion of acoustics work over some years; or*
- ❑ *Undertaken a particularly noteworthy piece of work in the last year, which will be cited in the award.*

Nominations may be made by third parties or by the individual concerned. The individual nominated need not be a member of the Institute. Self-nominations should be supported by referees.

Nominations should provide a statement about the work undertaken in promoting acoustics. The statement should concisely indicate the track record of the nominee, the piece of work being highlighted, the audience reached by that work, and why the work was particularly noteworthy. Supporting evidence such as articles written should be provided.

Closing date

The anticipated annual programme would be:

- Closing date for nominations 31 May
- Award presented at Institute's Autumn Conference

Informal enquiries about the award can be made to the chair of the judging panel, **Prof. Trevor Cox,** (t.j.cox@salford.ac.uk)

Nominations should be sent to the Institute of Acoustics, 77A St Peter's Street, St Albans, Hertfordshire, AL1 3BN, UK, or emailed to (ioa@ioa.org.uk).

Professional achievement

Congratulations to Adrian Popplewell MIOA, on attaining Chartered Engineer status. Adrian graduated from the Institute of Sound and Vibration Research, University of Southampton, with an honours degree in Engineering Acoustics and Vibration in 1995.

Having joined Arup Acoustics as an Assistant Consultant in March 1997, he is now a Senior Consultant with a wide range of project experience on both multi-disciplinary and specialist projects covering many areas of acoustics, and noise and vibration control. His current projects include performing arts centres, a 1000-seat sub-divisible lecture theatre, several hospitals and educational facilities, and the design and development of modular construction systems. He also has particular experience of large sports stadia design. Adrian is a member of the management committee of the Building Acoustics Group.

The Institute Diploma Examination 2004

Prof. K Attenborough, FIOA summarises the results

The number of candidates gaining Merits (M), Passes (P) or Fails (F) in each Module are shown for each Centre in the Table of Results. This includes the results of appeals. Note that the failures include those who were absent from the written examinations. The Diploma was not offered this year at the College of North East London. 140 candidates took the General Principles of Acoustics (GPA) paper (121 entered in 2003, 154 entered in 2002, 129 entered in 2001, 150 entered in 2000 and 183 entered in 1999). Ten candidates were absent for the written GPA examination. There were 91 candidates for Law & Administration (L&A), 85 for Noise Control Engineering (NCE), 58 for Architectural and Building Acoustics (ABA), 29 for Transportation Noise (TN), five for Vibration Control (VC), five for Sound Reproduction (SR) and three for Measurement (M). Candidates who have not submitted their project reports are shown as failed in the Table. The project numbers do not include deferred November 2004 submissions.
This year, the proportion of candidates gaining Merits on the GPA were particularly high at Salford and Distance Learning (St Albans). These candidates also did very well in the ABA Module. The numbers of Fails on the GPA were particularly high at Leeds and Bristol.

Popular questions

Questions 3, 6, 7 and 8 of the written GPA paper on room acoustics, hearing, barrier attenuation and equivalent continuous level respectively were popular. Q5 on Doppler effect was least popular. This question and the overall balance of the GPA paper attracted some criticism. However, the mean marks for the GPA this year are comparable with previous years. The mean marks at Colchester for Q3, Derby for Q7 and Salford for Q6 were particularly high. DL and NESCOT candidates did relatively well on Q2 (a vibration mount problem).
As in the previous two years, a merit threshold of 70% was applied to the written paper and the conflated GPA mark. The examination scripts of candidates satisfying the conflated mark threshold but gaining between 67% and 69% on the written paper were examined at moderation, re-marked where appropriate, and judged individually as 'pass' or 'merit'. However, even if these criteria were satisfied, a merit was not awarded if the assignment mark was carried over.
The GPA CW Assignment 1 marks for the Distance Learning candidates were increased by 5% at moderation to compensate for an apparent relative severity in their marking. The raw mean marks for the Architecture and Building Acoustics module were noticeably higher than in previous years and much higher than the corresponding marks for the other specialist modules. Consequently, at moderation it was decided to reduce the exam marks by 5% and the CW marks by 8% for ABA. Even after these adjustments 38% of ABA candidates (50% at Salford) obtained merits.

Moderation process

As a result of the GPA CW moderation process introduced last year, three examples of assignments corresponding to 'fail', 'moderate' and 'merit' marks were provided by each Centre for the moderation meeting. The clear discrepancy between mean CW and mean written paper marks for NCE and the resultant prospect of failing many students, who had achieved quite respectable examination marks, because of their CW marks, prompted an investigation of the assignment marking. It was agreed with the examiner that the marking of questions 2 and 3 on the assignment had been too severe. Q2 marks were increased by 10% and Q3 marks increased by 5%.
The written examination marks for the Sound Reproduction Module were relatively low this year. Examination of the scripts for the written paper suggested that they had been marked quite severely. Consequently at moderation the examination marks were increased by 10%.
As last year, the mean CW marks for three of the Specialist Modules were less than the corresponding mean written examination marks. For a Merit grade candidates were required, either to have a conflated mark of at least 75 plus a mark of at least 70 in exam, or a mark of at least 70 in exam and a mark in the upper quartile in the relevant assignment. No merit was awarded if it depended on a deferred score.

IOA Diploma winner

The IOA Diploma prize for best overall performance (4 merits including project and the highest average mark on the written papers) has been awarded to Mr Rees (NESCOT). Dr Cookson (Salford, ANC project prize) also achieved 4 merits. Special commendations, for achieving 3 Merits, have been made to Mrs Hitchins (DL), Mr Archer (DL), Dr Kirwin (DL), Mr Pennell (DL), Mr Mason (Derby), Mr Lindsay (Ulster) and Ms Alzoubadi (DL New Zealand).

Grades awarded to Diploma candidates in 2004

CENTRE	GRADE	GPA	ABA	L&A	NCE	TN	VC	Meas	SR	Project
NESCOT	M	3	3	0	3	0				15
	P	15	3	12	5	7				5
	F	2	3	6	1	0				2
Leeds	M	1	3	0	1					2
	P	11	3	8	9					5
	F	6	0	3	5					6
Derby	M	5	2	0	3	0				7
	P	17	5	17	6	12				13
	F	3	2	3	1	6				2
Colchester	M	3		0	3		0		0	1
	P	5		9	4		0		1	6
	F	1		3	4		2		0	2
Bristol	M	2	3	0	0	0				0
	P	14	0	3	11	1				10
	F	6	0	2	1	0				3
Salford	M	4	5	1	2	1			1	3
	P	8	5	3	5	2			1	6
	F	2	0	1	0	0			0	2
Ulster	M	1	3	1	1	0				0
	P	6	4	1	2	0				4
	F	1	0	0	4	1				1
distance learning (St Albans)	M	4	5	0	0	0	0	1	0	6
	P	8	3	1	4	1	3	2	1	3
	F	2	1	2	2	2	0	1	3	2
distance learning (Scotland)	M	1	0	1	0		0		0	2
	P	7	3	3	3		1		1	3
	F	0	0	0	2		0		0	0
distance learning (Bristol)*	M	2	1	0	0	2				2
	P	5	4	1	6	0				7
	F	3	2	1	2	0				2

* DL Bristol includes one DL New Zealand student

Diploma projects and centres July 2004

Derby

1 A study of statutory controls applied to noise from a commercial premises (a tanning salon)
2 Acoustic performance of DSG soundbloc
3 Environmental controls for concerts held at Donington Race track
4 Sound absorption testing in a reverberant chamber
5 Speedway racing in Long Eaton Stadium
6 Acoustic treatments for a multi-purpose church hall
7 Assessment of the accuracy of predicted rail noise
8 Noise Impact a road carriageway alteration (at Breadsall village)
9 Noise exposure of amateur brass band musicians
10 Effectiveness of a sound field system in a classroom
11 Effect of microphone position on noise nuisance assessment
12 Effectiveness of hay as an acoustic barrier
13 Effectiveness of parging aircrete blockwork walls
14 Impact of road traffic noise on a new residential development
15 Occupational noise exposure of waste collection operatives
16 Comparison of high powered car audio systems
17 Assessment of in-car noise quality and relationship to road surface
18 Industrial noise and planning/statutory controls
19 Frequency and common chord scale on an acoustic guitar
20 Sound reducing properties of folding partitions
21 The internal acoustics of the 16 bells of St Martins in the Bullring, Birmingham
22 Absorption coefficients of gas turbine panels

NESCOT

23 Static insertion loss of circular attenuators
24 Effectiveness of lobbied entrances to Pubs and Clubs
25 Noise from a gas holder supply system
26 Effect on road traffic noise of a traffic calming scheme
27 Use of secondary glazing to reduce noise breakout from clubs
28 Effect of increasing barrier height on noise level
29 Use of PPG24 for assessment of proposed Helicopter pad adjacent to a residential development
30 BS4142 assessment of noise from an extractor unit
31 Speech interference level in a meeting room
32 Noise from a large plastics factory
33 Reducing the reverberation in a community hall
34 Validity of the statistical parameters used in the Noise Act 1996
35 Comparison of measured and predicted road traffic noise
36 Acoustic improvements to a recording studio
37 Control of noise from a pub
38 Sound insulation testing of separating floors
39 Noise levels from an extraction system in an underground coach park
40 Use of Good Practice Guide to assess noise from Pubs and Clubs
41 Development of a Spectral Adaptation Term for disco music
42 Measurement of airborne and impact sound insulation of various floor compositions
43 Sound insulation performance of a nightclub door

Colchester

44 Noise control for a fan test cell
45 Comparison of noise levels inside trains for two different underground lines
46 Sound power measurements of a car jet wash machine
47 Attenuation of light-weight enclosures
48 Noise impact of off road motorcycle training
49 Acoustics issues relating to a new small industrial unit
50 Noise impact of an air extract system

Salford

51 Acoustic qualities of a new church hall
52 Noise from a go kart track
53 Noise from a domestic boiler
54 Vibration modes of an acoustic guitar
55 Noise from children's toys
56 Noise impact of a proposed windfarm development
57 Acoustic conditions in classrooms
58 Hand arm vibration exposure
59 Noise impact of a quarry development
60 Noise at Work assessment of refuse collectors

Leeds

61 Whole body vibration exposure during operation of ride-on road sweepers
62 Hand arm vibration exposure from use of D I Y equipment
63 Appraisal of the VP160A point source loudspeaker system
64 Hand arm vibration exposure of employees in a vehicle repair depot
65 Airborne sound insulation between office meeting rooms
66 Effectiveness of a road traffic noise barrier
67 Sound insulation of music rooms in a school and comparison with the requirements of BB93
68 Measurement and evaluation of whole body vibration transmitted through the seats of various on road motor vehicles

Bristol (UWE)

69 Noise from vehicles using traffic calming measures
70 Effectiveness of low noise nozzles
71 Vibration levels of handheld drills
72 Acoustic performance of fire alarm systems
73 Subjective assessment of tones
74 Qualitative and quantitative assessment of in-vehicle noise from different road surfaces
75 Effectiveness of ISO/TS 13474 for impulse sound propagation
76 Effect of damping on noise from simulated rain
77 Night-time noise levels from licensable premises
78 Effectiveness of attenuating techniques on noise from bottle banks

Distance Learning (Bristol)

79 Optimisation of chewing gum coating process using microphone signals
80 Sound attenuator design - theory and practice
81 Potential noise hazards from military kennels
82 Road surfaces and interior noise levels in vehicles
83 Predicting and measuring the effect of leakage in Helmholtz resonators
84 Noise Impact of bottle banks
85 Comparison of three active noise control headsets
86 Comparison of broadband and pure tone reversing alarms
87 Commissioning an IEC Listening Room

Ulster

88 Hearing protection devices in a working environment
89 Workers noise exposure in a food processing factory
90 Industrial noise mapping model
91 Noise impact of mixed-use commercial and residential development
92 Acoustic coupling between source and panel enclosure
93 Effect on absorption coefficient of air gap between panel and absorber

Distance Learning (St Albans)

94 Compatibility of ventilation requirements (BB87), with acoustic requirements (BB93) in schools
95 Hand arm vibration measurements of a budget hand held angler grinder
96 Acoustic assessment of the Oxford Playhouse theatre
97 Measurements of diesel engine noise and evaluation of noise reduction measures
98 Noise and vibration testing of diesel engine generating sets
99 The effectiveness of hearing protection for motorcyclists
100 Attenuation of noise in a music studio workstation
101 A study of sound insulation test methods and repeatability
102 The effectiveness of bicycle warning devices

Distance learning (Edinburgh)

103 Pausing out extraneous noise
104 Noise levels in a municipal recycling factory
105 Use of longitudinal stress wave velocity to investigate properties of wood (Sitka Spruce)
106 Comparison of measurement and prediction for three different traffic noise indices
107 Investigation of a planning application for a night club

Editor's Notes

Ian F Bennett BSc CEng MIOA
Editor

The feature articles in this issue cover a range of subjects, from underwater acoustics through air transport noise to leisure-related problems. I am grateful to the various contributors, as ever, for enabling me to present material of potential interest to the widest possible audience.

I am indebted to John Tyler for his report and photographs from *Reproduced Sound - Improving the Listening Experience.* I understand from John that he has now been to every RS meeting in the last 20 years, so I can only deduce that by now he must be the best (or most improved) listener in the Institute. He is well ahead of me in the 'learn to drive a digital camera' stakes, too.

Well, I can only blame myself. Now that the world has had time to catch up with the Cassini/Huygens expedition (reported in *Acoustics Bulletin* vol.29 no.4 (July/August 2004), and the Huygens probe has landed on Titan, everyone wants to see the pictures and hear the sounds at once. As a direct result I was one of 700,000 BT broadband customers on Friday 14 January who were unable to access th'international interweb. I got as far as checking that my monthly subscriptions were up to date (guilty conscience) then gave up and left the office early. It was not until halfway down the second pint that I realised the likely cause of the 'interruption of service'. Pause for self-congratulation.

However, on reflection perhaps we are not (yet) so widely known, so I look forward to working with Judy Edrich, our new publicity guru, in raising the awareness of the Institute in general. On behalf of *Acoustics Bulletin* we welcome her to the team (even if she does support the wrong cricket county...).

Copy for the March/April issue should reach me by 11 February 2005 at the latest, please. Offers of technical contributions or less weighty articles for publication are, as always, welcome.

Ian Bennett
Editor

EXAMINATION RESULTS

Certificate of Competence in Environmental Noise Measurement, October 2004

Colchester Institute
Batten M R
Bristow J L
Crabtree C
Finch A L
Harley C L
Hartill S P
Hayes D M
Heffernan L M
Johnson M C
Laws T
Neville S

NESCOT
Cowley H K
Gaynor W J
John I A
Le S
Lee C M
Ley J S
Nelson O
Ryan D M
Toy M R

University of Derby
Day E
Dixon A E
Emery K
Freeman A P
Kemp G A
Roberts R P
Spain P M
Tranter R J
Woodhouse E J

University of the West of England, Bristol
Boladz A P
Buchanan G G
Davidson R
Hawkins D A
Larcombe W C
Osborn J
Pearce M W
Soler I

University of Strathclyde
Dempsey C
Devlin C
Foster O S
Hales C C
Laidlaw R
McInally V C
Stark B

Leeds Metropolitan University
Allen V L
Bramwell L A
Carrick JV
Devlin R O
Jones M E
Parrett M A
Robertson M J
Robinson M C
Smith A

University of Birmingham
Brown C J C
Dalton E
Davies G R
McNally I H
Price S J
Robinson A K
Smith G J
Styles D K
Tiernan B J
Watt A

Certificate of Competence in Workplace Noise Assessment, November 2004

Colchester Institute
Brice T

NESCOT
Boughton J H
Crysell S R
Price D

University of the West of England, Bristol
Amphlett K
Davies N
Sara P J
Scott M
Sims J
Willcox A

EEF Sheffield Association
Arnott D
Davies D C W
Evans G
Noyce S

University of Derby
Beighton J M
Burnett J A
Mason C
Reddington B A
Tilley P
Todd I J
Wheat R J

Institute of Occupational Medicine
Coen C
Coyle J
Gaittens K J
McLay J
McMillan M
Swan P
Watts A

Leeds Metropolitan University
Andrews M O
Brown K H
Harrop J
Phillips C R

EEF East Midlands
Canham P M
Latimer G M
McNally P T
Roberts H
Slawson J A

Certificate Course in the Management of Occupational Exposure to Hand Arm Vibration, November 2004

Institute of Naval Medicine
Clarke L E
Greenwood R P
Hounslea A S
Owens A C

EEF East Midlands
Martin I
Plowman A D
White I P
Williams R

EEF Sheffield Association
Bartholomew R
Church D J
Johnson L
Payling A
Phillips C R

IOA to turn up its volume

New Publicity and Information Manager is appointed

Members can expect the Institute to start sounding its own trumpet, following the appointment of **Judy Edrich** to the newly-created role of Publicity and Information Manager.

The position has come into being so that the IOA can be better promoted to the outside world. Judy will be responsible for raising its profile, in order to encourage new members and increasing the current 2500 count. She will also be responsible for ensuring that the Institute's many conferences and meetings are well publicised, with a view to attracting a wider attendance, and she will also be promoting the Institute's important educational programme.

Judy's previous position was as Communications Officer for an environmental charity. She has travelled extensively and has many years experience of working with the United Nations and the World Health Organisation in Geneva, and in sales and marketing in the UK. Her 'claim to fame' will be of special interest to cricket fans - those who are old enough to remember - because she is the daughter of the late Bill Edrich, who played for Middlesex and England between 1938 and 1955.

Commenting on the appointment, IOA President Tony Jones, said that the Institute had been in existence for thirty years, and was very successful thanks to the support and hard work of its many volunteers. However, there remained plenty to be done in a continuously-evolving environment. A new web site offers improved communication features and Judy's appointment meant there was someone dedicated entirely to boosting our profile.

Of her role, Judy says she is looking forward to the challenge of developing this new position, and raising public awareness of the Institute's valuable contribution in the field of acoustics.

IOA Seminar

Lets Get Physical

Control of Vibration at Work and Control of Noise at Work Regulations

Seminar 13 July Workshop 14 July Health and Safety Laboratory, Buxton

In order to implement the Physical Agents Directive, the UK is bringing into force new regulations for the health and safety of workers exposed to noise, hand-arm vibration and whole body vibration. In July 2005 the Control of Vibration at Work Regulations, and in February 2006 the Control of Noise at Work Regulations, will come into force. It is important for employers and those concerned with safety to understand their responsibilities under these regulations.

The IOA is holding a one-day meeting on the subject of these new regulations on 13 July 2005 at the Health and Safety Laboratory in Buxton, Derbyshire. Speakers from the Health and Safety Executive and the insurance industry will give their view of the implications of the regulations for employers and industry. They will be followed by papers on the practical aspects of exposure measurement and assessment, instrumentation, health surveillance, and case studies of exposure reduction.

There will also be an opportunity to tour the Health and Safety Laboratory's noise and vibration test facilities. The Health and Safety Laboratory (an agency of the Health and Safety Executive) is now housed in a new purpose built facility and is the UK's largest health and safety research and test laboratory.

Exhibition space will also be available.

On 14 July there will be the option of a follow-on one-day practical workshop on vibration measurement and exposure assessment provided by the Noise and Vibration Section of the Health and Safety Laboratory.

For information regarding the seminar or the workshop please contact Liz Brueck (meeting organiser), Noise and Vibration Section, Health and Safety Laboratory Tel: 01298 218387; email elizabeth.brueck@hsl.gov.uk or Linda Canty, Institute of Acoustics Tel: 01727 848195; email linda.canty@ioa.org.uk

From DAT to DISK

A reminder that this IOA seminar on *Recording Sound for Playback and Analysis* takes place on 15 February 2005. Full details were published in Acoustics Bulletin (Nov/Dec 2004, page 4).

Further details are available from Linda Canty at the IOA (tel: 01727 848195 email: linda.canty@ioa.org.uk) or the meeting organiser, Simon Bull, Castle Group (tel: 01723 584250 email: sales@castlegroup.co.uk)

NEW MEMBERS

At Council on 9 December 2004 the following were elected to the membership grades shown

Member

Carey A L
Smith P Q
Triner N G
Wood R O
Parnell N
Rogers K
Rogerson F E
Skingle S C

Associate Member

Akil H
Balsom M
Davenport S M
Duarte S
Grattan B L
Griffiths R L
Kokkinos G
Leach R
Malone N J
Mangan J E
Papanagiotou K

Affiliate

Parratt R

Technician

Hilborne C
Quinn J M

Student

Brierley M D
Grover E J
Hargreaves J A
Williams A

Improving the listening experience

Chairman Mark Bailey opens 2004's Reproduced Sound 20

Chairman's overview

Mark Bailey recalls the highlights, from microphone replacement on the grand piano to benefits of the tin can string telephone!

It was an honour, once again, to chair the IOA's longest-running conference, held at the Oxford Hotel on 8 and 9 October 2004. As we opened on the Friday morning, I had a real sense of anticipation for the proceedings to come. We were not to be disappointed.

We started with an excellent paper presented by the Tyndall Medal winner, Trevor Cox, who managed to educate, demonstrate and articulate (very well) his subject of acoustic diffusers. A cracking start to a very interesting day that featured presentations from no fewer than five different countries, which was quite impressive considering there were nine papers! Once again I was impressed at the diversity of our small audio community, and the international interest that Reproduced Sound generates.

The day finished with an evening workshop on microphone placement. Aside from the interesting aspects that this proposed and demonstrated, there were two major treats in store. Assisting and driving the evening was Matt Howe, a Grammy award winning recording engineer, with 12 number one singles to his name. Matt, in a quiet and unassuming way, allowed us to examine some of his tried and tested microphone techniques, and then gave time for the delegates to try some of their own methods - or just let them experiment.

The input for this was ably and entertainingly provided by Sam Wise on the Northumbrian pipes, Simon Stephenson on the banjo and last, but by no means least, Shelley Katz on the grand piano. Shelley is a widely acclaimed classical pianist and has performed in every major hall in Europe at least once. His performances have been heard by world leaders and figureheads (he once played for the Queen) and we were lucky enough to have him play for us. After providing some delightful 'snippets' for us to experiment with some microphone placement on the piano, Shelley allowed us to just sit back and listen. The audience, normally very lively and outspoken, was stunned into silence as Shelley treated us all to a mini recital.

The following day, having a hard act to follow, showed no signs that it was about to come second in anything other than order of proceeding. Some excellent papers on surround sound and loudspeakers were ably chaired by Steve Jones and Helen Goddard – our first female paper session chairman.

The day, and the conference proceedings, finished with a bang – or perhaps it was a burst of pink noise? Peter Mapp, last year's winner of the Peter Barnett Memorial Award, gave a truly outstanding presentation that covered some newer aspects of intelligibility. His pun-laden paper was as amusing as it was entertaining, and spent some time on the benefits of the tin can string telephone! Even the intelligibility 'subjects' were not the usual type ... though it is good to know that when I use my Homer Simpson bottle opener, the words "Hmmm ... Beer" can be clearly understood.

The day, however, was not yet done, for the dinner and evening demonstrations were to follow.

The dinner was marked by two notable events. Firstly, and most importantly, the Peter Barnett Award for this year was announced. James Angus is a remarkable acoustician, but more than that, he is a long-standing supporter and attendee of *Reproduced Sound*. He is always a pleasure to talk to, especially in the bar in the evening – and I still think I bear the emotional scars from when he tried to explain to me the rules of the Radio 4 programme Mornington Crescent. If you're interested, try a search on the Internet for that one [or just listen to BBC7 – Ed.]. Secondly, after much persuasion, I managed to compose some more poetry for the event.

The evening presentations, again to the usual high standard, featured two methods of enhancing stereo reproduction. The first was Layered Sounds' patented use of flat panel loudspeakers with conventional units to give an interesting effect of spaciousness and depth. The second was a derivation of multiple channels from two channel stereo by Funktion One. This part of the evening showed what really could be done with only a stereo source, and the software was able to do some quite remarkable things with the sound image.

Finally, of course, we retired to the bar. *Reproduced Sound* certainly would not be the same without the late night discussions. This year, due to imperfect health, I could not participate as fully as I would have liked. Next year (beware!) I expect to see you all and maybe I'll even buy you a drink!

This year was excellent, but next year's conference will be even better. RS21 is something that should be a fixture in any audio professional's diary, and I look forward to seeing you there.

The organising team

For Reproduced Sound 20, the organising committee was strengthened with the recruitment of Helen Goddard (AMS Acoustics) to the team. Under chairman Mark Bailey, the committee also included Mark Avis, Robin Cross, Ken Dibble, Stephen Jones, Paul Malpas, Peter Mapp, Martin Roberts, Bob Walker, Sam Wise and Julian Wright. They are to be congratulated on producing another successful, enjoyable and informative event.

The conference papers reviewed

Session reports and photographs by John Tyler FIOA associate editor

ACOUSTICS

Mark Bailey welcomed delegates to the conference and introduced the first session which was chaired by *Sam Wise* (Arup Acoustics), whose first task was to initiate the award of the **Tyndall Medal** to *Trevor Cox* of Salford University. Sam introduced the IOA President, *Tony Jones*, who then read out the Citation and presented Trevor with his award.

Then followed Trevor's paper, **Acoustic diffusers: The good, the bad and the ugly**, which was light-hearted but serious in intent. One humorous comment involved the now well-known Salford experiment on echoes from a duck's quack, a subject which still educes laughter from audiences.

The modern acoustic diffuser has an ability to attract comment: some say they sound good, others that they sound bad; some designs look beautiful while others are ugly. Proper amounts of the right diffusion are credited with contributing to spectacular acoustics, too much of the 'wrong' diffusion gets blamed for ruining one hall, while the lack of scattering in another is held responsible for a poor acoustic. How can there be so many contradictions? Is it just a matter of personal taste, or is there some underlying physics and psychoacoustics that needs to be better understood?

It is almost 30 years since Schroeder published his seminal paper on diffuse reflections from maximum length sequences, and despite much research effort since then, issues about when and why diffusers should be used, and what kind of surfaces should be used, remain to be answered fully. In this paper Trevor explored some of the myths surrounding diffuser application, presented the current state of the art in the design and posed the future questions that need answering.

Paul Scarborough (Akustiks, USA) followed with his paper, co-authored with *C R Todd* and *A H Nittoli* (also with Akustiks), entitled **Exploding myths about Multi-purpose hall design**. Exigencies in the performing arts market in North America frequently result in the construction of large multi-purpose auditoria. These are intended to serve a broad array of performance types from symphonic concerts and opera to touring musical theatre productions and contemporary amplified music entertainment. This wide range of performance types demands an acoustic environment that can be substantially modified to meet the unique requirements of each art form. In the past, attempts to create this kind of adjustability were less than successful, leading many to conclude that a space designed to serve many uses would serve none of those well.

Recent changes in design approaches, coupled with client willingness to give acousticians a freer hand in developing the design for such spaces, has resulted in some notable successes. Paul discussed the results achieved in two recent projects, the Oklahoma City Civic Center Music Hall and the Schuster Performing Arts Center in Dayton, Ohio. He placed particular emphasis on the issues of form and shape as well as the devices required to accomplish the requisite adjustability.

The first paper after coffee, given by *Steve Ellison* (Level Control Systems, USA) was co-authored with *M Poletti*, (Industrial Research Ltd, New Zealand) and was titled **Control of room acoustic parameters by the Variable Room Acoustics System (VRAS).**

Steve described VRAS, which is an electronic system for enhancing the natural acoustics of a room. Both early and late energy are adjusted through distinct algorithms. Early reflections are enhanced by generating a large number of reflections via a set of cardioid microphones in the vicinity of sound sources, typically on stage, to a set of lateral and overhead loudspeakers that are directed back to the performers and/or audience members. Steve further elaborated on the capabilities of this very flexible and comprehensive room acoustic manipulation system.

Paul Scarborough (Akustiks) followed with his second paper of the session, **Acoustic enhancement at the Hilbert Circle Theatre**, co-authored with *C N Blair* (Akoustiks).

continued on page 12

Presenters take points from the floor during one of the conference sessions

Improving the listening experience

continued from page 13

As Bob explained, for some time it had been recognised that the current standard loudspeakers used throughout BBC Radio and Television for many years, ie. the LS3/5A, LS5/9 and LS5/8 introduced from 1975 to 1984, were obsolescent. As part of the redevelopment of London premises, it was decided that a new set of loudspeakers should be selected as the normal choice for areas requiring high quality audio monitoring facilities. In view of the considerable improvements in commercial loudspeaker design and the lack of the necessary resources within the BBC, the decision was made to look for replacements in the commercial sector.

Bob described the background to the requirements for a range of new loudspeakers for BBC Radio & Music, the organisation of an extensive set of subjective tests and the results obtained. It was intended that the selection should be made, not only on the absolute quality of the loudspeakers, but also on their family resemblances, so that a more uniform sound quality could be achieved over a range of applications. Bob refused to be drawn on the identity of the final choice of manufacturer in spite of demands from some delegates!

The next speaker was *Keith Holland* (University of Southampton) who explored **Modulation depth as a measure of loudspeaker low-frequency performance,** in a paper co-authored with *Philip Newell* (Consultant, Spain) and *Peter Mapp* (Peter Mapp & Associates). Modulated noise is a useful test signal for benchmarking audio systems. The speech transmission index (STI), for example, is based on these signals and has become established as the industry standard for intelligibility measurement in public address systems.

In 2003, the authors presented a paper on the low-frequency performance of monitor loudspeakers. Within this paper it was demonstrated that the degree to which the depth of modulation of narrow-band low-frequency signals was preserved when the signals were reproduced over loudspeakers was influenced by the loudspeaker alignment, and that those loudspeakers which were expected to perform best appeared to suffer the least loss of modulation depth. The link between these findings and the STI were noted in that presentation but not explored. In the present paper the authors investigated the possibility of adopting a STI-type approach to the measurement of the low-frequency performance of high-quality loudspeaker systems.

Alex Campbell (ISVR, University of Southampton) was the final speaker before the coffee break. His subject was **Active versus passive crossovers for mid-priced hi-fi loudspeakers**, in a paper co-authored with *Keith Holland* (ISVR). Alex explained that loudspeakers with active crossover networks have been available for some time. The traditional thinking is that they can out-perform similar loudspeakers with passive crossovers, but at a price penalty. Nowadays, high-quality, mass produced electronics are available at ever lower prices, so the concept of a competitive, mid-priced, active hi-fi loudspeaker has become feasible. Currently, active crossovers are only found in higher-priced hi-fi loudspeakers and studio monitors.

Alex discussed the possibility of designing and building a loudspeaker with active electronics for the same cost as a closely equivalent passive loudspeaker. The two loudspeakers were designed and constructed from scratch using readily-available, off-the-shelf components, and the price of the active electronics included the crossover filters, power amplifiers and regulated power supply. Comparisons were drawn between the objective performance and subjective sound quality of the two loudspeakers through anechoic measurements and a series of in-room listening tests. In most respects the listening panel preferred the active loudspeaker, and since the crossover components in each design were of similar cost the conclusion was that there could be a market for an active loudspeaker in the mid-price band.

A refreshed audience returned to hear *Andrew Goldberg* (Genelec Oy) present his paper on **Compensating the acoustical loading of small loudspeakers mounted near desktops**, co-authored by *Aki Makiverta* and *Ari Varia* (Genelec Oy). He explained that in professional audio applications, small loudspeakers are often mounted on or near (within the loudspeaker's near field region) large solid surfaces, such as mixing consoles, desktops and work surfaces. For approximately two-thirds of loudspeakers mounted in such a fashion, the magnitude response was compromised in a predictable and systematic way. An upward deviation of peak value 5.0dB ± 1.5dB centred on 141Hz ± 31Hz was observable in approximately 80% of the cases studied.

Andrew then proposed an additional Room Response Control in active loudspeakers to compensate for the aberration. A statistical analysis of 89 near-field loudspeakers helped define the correction filter, and quantified the effectiveness of the fixed filter design.

A critical audience judging the demonstration by Funktion One

Use of the proposed filter in an automated response optimisation algorithm for in-situ response equalisation was demonstrated.

Lampos Ferekidis (Acoustics & Software Development, Germany) followed with a talk on **Cardioid low frequency sources**, co-authored with *U Kempe* (ASD,Germany). Lampos started by explaining how cardioid low frequency sources show beneficial properties when coupled to the acoustic of rooms. A LF-source with a cardioid radiation characteristic can be constructed from a range of configurations and he presented three implementations, namely the so-called CombiPole, the VariPole, and the Acoustic Resistance Box (ARB).

The CombiPole combines the radiation pattern of a monopole and a dipole to create a cardioid radiation characteristic. The second implementation is built around two spaced monopoles one of which is phase-delayed and time-delayed appropriately. The third cardioid consists of a single chassis coupled to a delay line, the other end of which is terminated by an acoustic flow resistance. Because of the partial cancellation of the radiated acoustic energy, in all three designs the excursion requirements of the LF-chassis are strong. He discussed these requirements, the underlying limitations of the design and some simulation results.

Mark Bailey (JBL Professional) led up to lunch with a presentation in his usual entertaining style called **Improving the monitoring experience**. As usual, it is difficult to summarise Mark's talk as he habitually fires off amusing asides! Suffice it to say that the delegates went for lunch relaxed and ready for the afternoon sessions. His main emphasis was on the acoustic treatment of listening (monitoring) rooms, that is, walls, floor and ceilings, to reduce uneven response from monitoring loudspeakers.

SURROUND SOUND

Philip Newell (Consultant, Moaña, Spain) opened the batting with his paper, co-authored with *Keith Holland* (ISVR, University of Southampton), **Surround sound - the chaos continues**. He gave a somewhat pessimistic view of the present state of surround sound development, expressing the view that the implementation of surround sound in practicable form is not an easy task. The world has been sold an idea that 'surround' can be hi-fi stereo plus an extra dimension, but the reality rarely achieves this goal. Many of the problems had already been encountered during the quadraphonic era of the 1970s, but many of the limitations which had been attributed to the matrix or multiplex, analogue, end-user formats were entrenched much deeper in the concept.

Marketing madness has forced on to the general public a plethora of systems and formats that it neither needed nor wanted. Indeed, one result of the confusion is that the level of domestic fidelity had tended, in many cases, to drop, rather than to improve. Quality, it seems, is frequently being traded for quantity, but for record companies and equipment manufacturers, only the exploitation of a new source of revenue appears to be spurring them on. In the rush for market share and licensing deals, the pursuit of the most realistic and functional system has largely been ignored. Many recording studios are reluctant to invest in serious rooms for surround mixing, because they perceive the concept to be ill-defined and fraught with problems. Philip described in a very comprehensive way many of the practical problems, and asked whether there truly is any way out of the chaos.

There then followed a more optimistic paper by *Tony Andrews* (Funktion One Research), **Observations and experiments with surround sound,** co-authored with *John Newsham* with contributions from *Toby Hunt* (Funktion One Research). In contrast to Philip Newell, Tony advocated surround sound as an exciting extra dimension to the sonic experience with 'ambisonics' as the favoured approach. Admittedly he was concentrating on surround sound for large-audience dance and pop music events but his approach was of great interest. Tony went into the history of surround sound, starting with Walt Disney in the 1930's and *Fantasia*, in which Fanta Sound employed eight tracks mixed down to four.

He then covered quadraphonic sound in the early 1970's and described the collaboration in the late 1970's of Michael Gerzon, John Hayes, John Wright, David Brown and Professor Felgett of University of Reading which produced ambisonics.

Tony followed by describing the applications of ambisonics to various public musical events carried out by Funktion One and concluded that the extra dimension and ability to generate moving events afforded by surround sound can truly be said to improve the listening experience in these situations. He then described how Funktion One achieved moving events from standard stereo material, which provided the basis for one of the demonstrations after the conference dinner.

The final paper before the tea break required a lot more concentration, by taking a fairly mathematical approach. *Mitsuo Matsumoto* (Chiba Institute of Technology) presented his paper, **Polynomial approximation of binaural impulse responses for moving sound images for**

continued on page 16

Improving the listening experience

continued from page 15

virtual reality audio, prepared with *Hirofumi Yanagawa* (Chiba Institute of Technology).

Mitsuo described the approximation of binaural impulse responses to simulate smoothly moving sound images. Binaural impulse responses between the sound source and a listener's ears change owing to movement of the sound source. If the latter moves along an arc that is centred on the listener, distance between one ear and the sound source changes as the source moves. Changes in distance are reflected in differences in the arrival times of the responses. By arrival-time correction, changes in the responses relative to direction of the sound source become smaller. Samples of the responses' arrival time, corrected on a cross-section relative to direction of the sound source at one sampling time were approximated using a low degree function. All samples on cross-sections at any time were approximated by quadratic functions. A set of responses was approximated using the set of the functions.

Approximated responses were evaluated by error ratio. It resulted in -21dB for 4th -degree function. Binaural signals simulated using the approximation method of 4th -degree function was the closest to that generated using a rotating dummy head. Sound images were moved smoothly by time variant convolution with synthesised binaural impulse responses.

James A S Angus (University of Salford) started off the final part of the session with his paper **Idle tones in SA-CD DSD encoders: which noise shape is best?** James started by explaining that many analogue-to-digital (A/D) and digital-to-analogue (D/A) converters use an intermediate sigma-delta modulating stage to convert signal inputs and outputs into a simple digital form for high quality conversion. This one bit signal is a perfectly valid representation because it contains all of the audio band information. It is also used as the information carrier in the new 'Super Audio' CD format.

One of the problems with this type of conversion is the presence of 'idle tones' due to the filtered feedback of quantisation noise. To remove these 'idle tones', dither is added to the signal at some point prior to quantisation. Recently the efficacy of dither in such systems has been called into question. Moreover, there has been some dispute over which system, PCM or Delta-Sigma Modulation, is more appropriate for high quality audio. A difference between the two systems is that PCM systems are essentially memory-less whereas Delta- Sigma Modulation relies on memory for its operation. This makes it difficult to compare the two systems as regards the effectiveness of dither. The difficulty in defining overload in one-bit systems also presents additional problems.

Previous papers had presented a new approach to dither in Sigma-Delta Modulation (SDM) systems. In particular, they had clarified the position of the overload point in one-bit SDM systems and had presented several overload control methods with comparisons of their efficacy. They had also examined the problem of applying dither to one-bit systems and had described new approaches to applying high levels of dither. However, there were still limitations to the amount of dither that could be applied without compromising the dynamic range of the system.

Reefman et al have presented work on limit cycles that suggests the behaviour of Sigma-Delta modulators depends on whether the filter has poles at DC or not. James presented work that showed the response of Sigma-Delta Modulation (SDM) systems to dither for different response shapes. In particular, he discussed the nature of an 'idle tone' and went on to consider the effects of applying dither to one-bit systems for a variety of filter transfer functions. Finally, he presented simulation results that showed the effects of different filter transfer functions on idle tones both with and without dither.

It goes without saying that James, in keeping with his now traditional performance, lightened his presentation with the use of an inflated rubber glove to illustrate some points!

Shelley Katz (Layered Sound Technologies), already familiar to delegates for his fine performances on the grand piano the previous evening, now gave his paper **An investigation of layered sound in large spaces**, co-authored with *Peter Mapp* (Peter Mapp Associates). Shelley set the scene by explaining that in general, digital pianos did not sound like acoustic pianos. A digital piano can be broken down crudely into four major components, one of which - the weakest component and most difficult to improve in order to emulate the sound of an acoustic instrument - is the acoustic radiator and related audio equipment.

Layered Sound was discovered when a Yamaha digital piano with conventional loudspeakers was combined with a digital piano that used Distributed Mode (flat panel) loudspeakers as the acoustic radiators and produced an improved depth and quality of sound. This was demonstrated in the Musical Dome in Cologne, which is a difficult acoustic space, owing to its high domed ceiling and the extremely wide, shallow seating. Eight Distributed Mode loudspeakers were installed and they dramatically improved the perceived sound. Layered Sound has been tested and shown to be functional in a wide variety of applications. Shelley demonstrated the effect during the practical sessions after the conference dinner.

Steve Ellison (Level Control Systems, USA) ended the formal sessions with another aspect of surround sound, **Generalised mapping system for surround sound control in small and large live performance venues.** He described possible solutions to the problems of controlling the distribution of surround sound in various performance spaces and gave examples of the use of a mapping system in venues of various size and acoustic characteristics.

Peter Mapp, Roy Bratby and the tin can telephone

Then followed one of the conference's main highlights - delivery of the **Peter Barnett Memorial Lecture** by *Peter Mapp* (Peter Mapp Associates) who was given the award last year. In his Chairman's Review, Mark Bailey has already commented on Peter's paper and all that remains is to add a little 'meat' to his account.

The lecture was curiously entitled, **Dumb Microphones and Deaf Loudspeakers - the measurement and reproduction of sound**. It could perhaps have been subtitled 'Acoustics is fun' as Peter decided to take a rather more light-hearted look at some aspects of reproduced sound. Looking back, it is difficult to understand completely how he seamlessly introduced such topics as 'acoustic definitions for the non technical', a 'talking baked bean tin and bottle opener', his version of 'canned music' and a singing hippopotamus. Although the latter demonstration completely crashed his computer, instead of himself grinding to a halt, he managed to use it to his advantage and continued by discussing the effect of stress on the voice. He even had a device to measure this and managed for the first time to see it 'go into the red', concluding that at this particular moment he probably was fairly stressed!

One of the talk's highlights, however, was the demonstration and discussion of 'String Telephones'. In this, Peter was ably assisted by the Institute's Chief Executive Roy Bratby, who brought the house down with his remark about the sound quality sounding 'tinny'. Peter then went on to show exactly why this was and presented a series of anechoic chamber measurements and impulse responses that he had made. The puns followed thick and fast. For example, re the impulse response 'ringing', being a telephone it probably would 'ring' and the follow-up remark was that it may just have been tin'itus! Irony was not lost on those present: the bandwidth of Peter's special 'high frequency string' telephone was almost as good as the current BT system. The sudden appearance of a duck in one of the anechoic chamber measurement photographs again had the audience in stitches and was a nice, if sideways, tribute to Salford University and Trevor Cox's earlier Tyndall Medal lecture.

Peter concluded his talk with a look to the future and a sneak preview of some of his recent research concerning directional STI measurements. Here, he introduced us to the concept of the 'Polar STI' and the 'Complex Correlated Polar STI'. Although he showed that the technique potentially produced the right polar shape, Peter stated that he felt there was a lot more work still required to make these new measures into viable techniques. But then there are 12 months to next year's *Reproduced Sound 21* - surely ample time, or has Peter got something else up his sleeve for that milestone event?

After the conference dinner and demonstrations described by Mark Bailey, thus ended another highly successful *Reproduced Sound* conference. Can the next one be even better? There is only one way to find out – book your place now!

SUPPORTING EXHIBITION

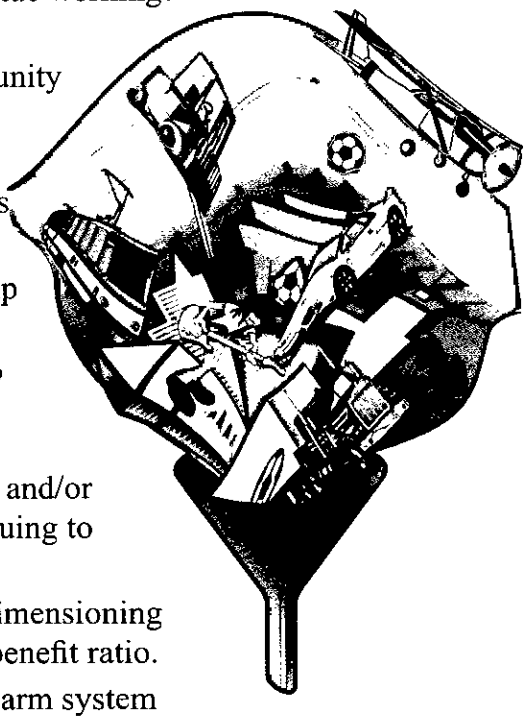
Our thanks to the following conference exhibitors who, as usual, provided a venue for discussions during the break periods in addition to informative demonstrations of their products and services.

Level Control Systems
Campbell Associates
Sennheiser
Outline
Beyerdynamics
ISVR, University of Southampton
Sound Directions
JBL Professional

SoundPLAN -one software for all environmental acoustic problems

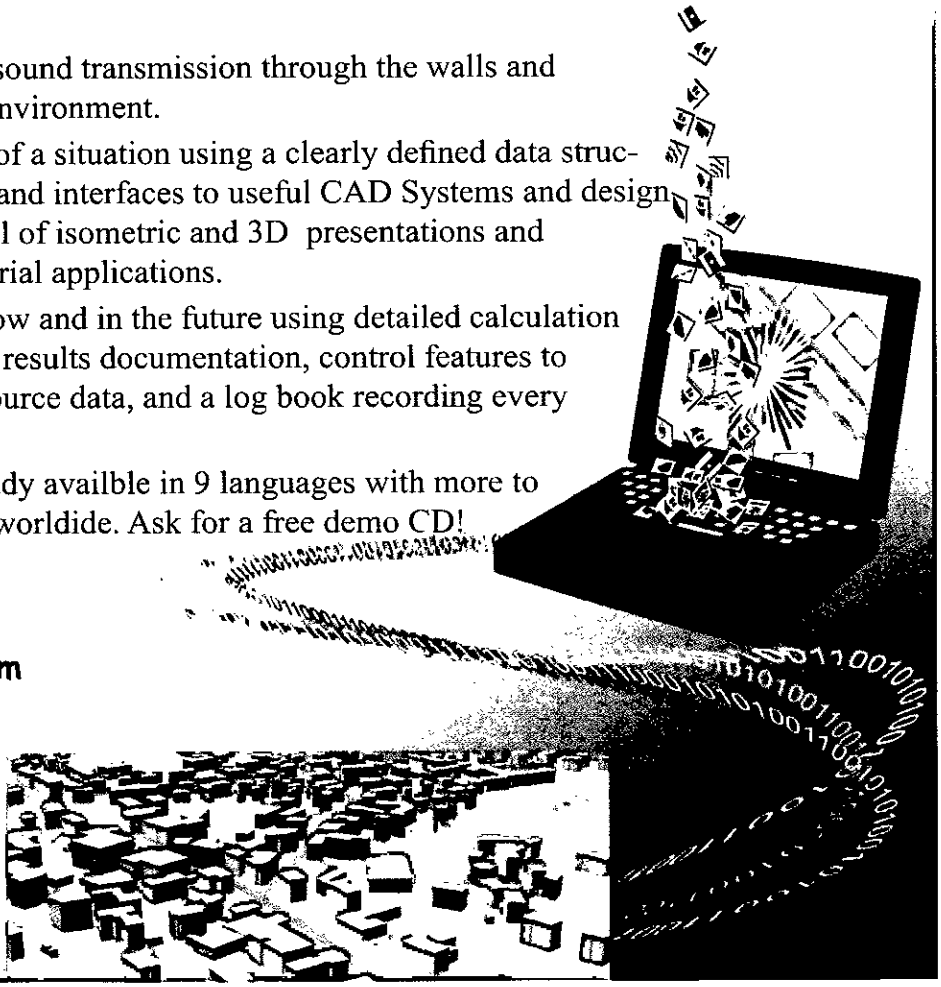
Do you have these kinds of questions:

- ❒ How can I efficiently map the transportation and industrial noise from an agglomeration? Can the software calculate in the background while I continue working? Can I use a PC network to distribute the calculations?
- ❒ What is the most cost effective method to minimize community noise?
- ❒ How loud is it inside a building? Which sounds dominate? Can the noise breakout be minimized with new doors, gates or window applications?
- ❒ Can I document my data sufficiently? Will the software help me comply with ISO 9000 quality control?
- ❒ Will I get the hotline support I might need in my language?



SoundPLAN has the answers!

- ✔ Analyze and map any size road, rail and air traffic network and/or industrial site. Calculate large models quickly while continuing to enter data. For even faster execution use a PC network.
- ✔ Develop noise reduction strategies using interactive wall dimensioning and an industrial expert system to find the optimal cost to benefit ratio.
- ✔ Target community noise impact, employee noise impact, alarm system design, etc.
- ✔ Model interior noise levels, sound transmission through the walls and sound propagation into the environment.
- ✔ Produce multiple variations of a situation using a clearly defined data structure optimized for planners, and interfaces to useful CAD Systems and design programs, with visual control of isometric and 3D presentations and extensive libraries for industrial applications.
- ✔ Trace and repeat past jobs now and in the future using detailed calculation execution protocol, in-depth results documentation, control features to verify input geometry and source data, and a log book recording every calculation.
- ✔ Software and service is already availble in 9 languages with more to follow. Distributors located worldide. Ask for a free demo CD!



Contact information:

David Winterbottom
Drwint@btopenworld.com
TD&I
7 Pownall Crescent
Colchester
Essex C02 7RG; U.K.
Tel: +44 1206 762617
www.soundplan.com

Peter Barnett Memorial Award

Professor James Andrew Scott Angus

Born in Scotland in 1956, James Angus was educated initially in Scotland but spent his first year as an undergraduate at the University of Lethbridge in Alberta, Canada where he had the opportunity to use a VCS3 synthesiser. In 1974 he enrolled on the undergraduate Electronics course at the University of Kent and graduated, in 1977, with a first class honours degree and prize for the highest overall final year marks. He continued his studies at Kent and in 1984 received his doctorate with a thesis entitled *The Design and Implementation of a General Purpose Signal Processor.*

The first three years of his professional career were spent as a research engineer at Standard Telecommunications Laboratories (STL) where he both carried out and supervised projects on speech technology and integrated optics. In 1983 James was appointed as a lecturer in the Department of Electronics at the University of York where he was heavily involved in setting up and delivering the Electronic Engineering with Music Technology Systems course. In 1993 he was appointed senior lecturer and reader in 1999. In 2002 he joined the staff in the School of Acoustic and Electronic Engineering at the University of Salford as the Professor of Audio Technology.

His research interests have been driven by his curious and creative nature and a desire to work on a broad academic front and to bring fresh views to established areas. James' research has largely been within the enabling technologies used in music technology and multimedia systems such as audio signal processing, acoustics, spatial audio and electromagnetic compatibility. Most recently he has been working on direct signal processing of Super Audio CD (SACD), novel diffuser designs and spatial audio. The nature of the research does not necessarily require huge amounts of funding. Nevertheless, James has secured well over one million pounds from both industry and research councils to the benefit of his students, his colleagues and the development of his chosen subject area.

James Angus receives his award from the President

Throughout his career James has contributed significantly to knowledge transfer. Apart from his direct contribution through conference presentations, which his audiences obviously thoroughly enjoy, and his extensive teaching experience, he is the author or joint author of three text books, one now into its second edition. He is also the author of well over one hundred technical papers and conference proceedings and is named on four patents.

James is a Fellow of the Institute of Acoustics and a member of the Audio Engineering Society and takes an active role in both organisations being a member of several conference and technical committees.

The Peter Barnett Memorial award is awarded in recognition of contributions to the fields of Electroacoustics, Speech Intelligibility or Education. This year's recipient fulfills the criteria for all three but would be a worthy winner in any one. The Institute of Acoustics is pleased to present James Andrew Scott Angus with the Peter Barnett Award for 2004.

Tyndall Medal

Professor Trevor John Cox

Trevor John Cox obtained a first class honours degree in physics from the University of Birmingham. In his final year he decided he wanted to study for a PhD in auditorium acoustics and was offered a place in the Department of Applied Acoustics at the University of Salford. His supervisor, Dr Raf Orlowski, suggested that he investigate the behaviour of diffusing surfaces in auditoria and so started an outpouring of research in this area which continues unabated.

Trevor Cox is now a leading world authority on diffusing surfaces and has published many seminal papers on the subject which have recently been distilled into a book (co-authored with Peter d'Antonio) entitled *Acoustic Diffusers and Absorbers, Design and Application.*

Trevor's most significant innovation has been to pioneer the use of numerical optimisation to design diffusers which not only have good acoustical properties but can be formed to suit the visual requirements of architects and designers. He has put his research into practice and is now employed as a consultant by the largest international manufacturer of diffusing products. The fruits of his efforts can be found in concert halls, music rooms and listening rooms around the world.

Professor Trevor Cox receiving his medal from the President, Tony Jones

Following his PhD work, Trevor was appointed to a lectureship in acoustics at South Bank University but returned to Salford a few years later where he progressed rapidly to a professorship. He is a dedicated teacher of both undergraduate and postgraduate students and has developed many innovative courses on acoustics. He leads a strong research group in room acoustics and has already successfully supervised a respectable list of PhD students.

Trevor is also an exceptional communicator on acoustic matters. Ask a man in the street what he has heard about acoustics recently and he might tell you he's read in the paper about a young professor investigating why a duck's quacks don't echo. On the subject of auditorium acoustics, Trevor was curator of an exhibition, together with Professor Bridget Shield, entitled *Concert Hall Acoustics: Art and Science* which toured the UK. Recently, he was invited to present the Isambard Kingdom Brunel lecture at the Festival of Science organised by the British Association for the Advancement of Science.

Trevor is deeply involved with the Institute of Acoustics, both as a member of Council and also as a member of the Publications Committee and Chair of the Electronic Publications Sub-Committee. He sits on several international standards working groups and is an associate editor for architectural acoustics for *Acta Acustica/Acustica.*

For his outstanding contributions to research, communication and teaching in acoustics, The Institute of Acoustics is proud to award the Tyndall Medal to Trevor John Cox.

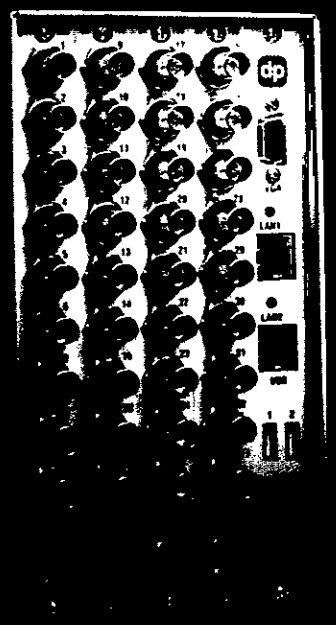
Wherever signal analysis takes you...

It's in the family

Experience scalable hardware and software designed to meet your challenges on the road or in the lab. An intuitive user interface makes sophisticated analysis easy. SignalCalc dynamic signal analysers are DSP powered to deliver precision and speed for all your noise and vibration applications:

- Structural dynamics analysis
- Rotating machinery diagnostics
- NVH and acoustic measurements
- Environmental vibration tests

Whatever your test, there is a SignalCalc analyser within your budget.



SignalCalc **ACE**

The world's smallest FFT analyser

- 2 input channels, 2 sources
- 100dB dynamic range
- 2kHz realtime bandwidth

SignalCalc **Mobilyzer**

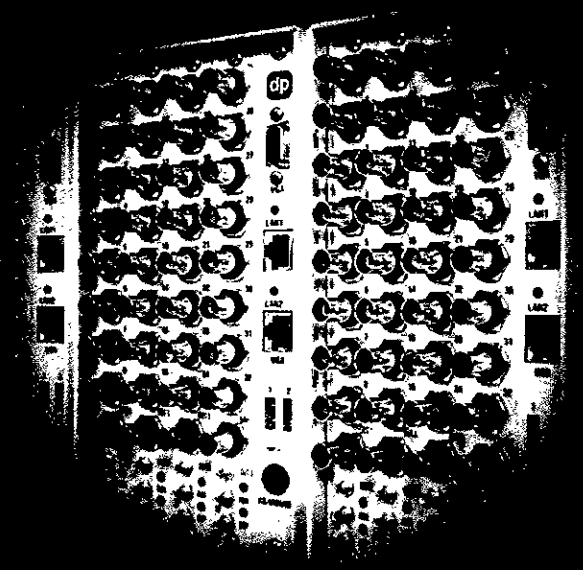
Powerful portable analysis

- 4–32 channels, up to 8 sources, 2–8 tachometer channels
- 120–150dB dynamic range
- 49kHz analysis bandwidth 97kHz optional

SignalCalc **Savant**

Power in numbers

- 40–1024 input channels
- Networked chassis with 1 Gigabit Ethernet to host
- 49kHz analysis bandwidth, all channels with simultaneous storage to disk



VIBES

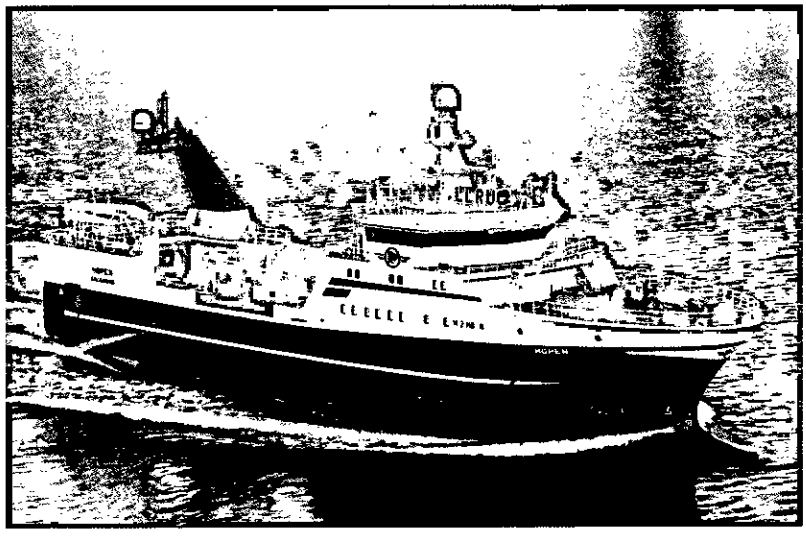
powered by

Discover more at www.dataphysics.co.uk

dp Data Physics

Contact us at Tel: +44 (0)1480 470345 Fax: +44 (0)1480 470456
E mail: sales@dataphysics.co.uk

The presentation of random noise



Why do underwater acousticians do it differently?

Dick Hazelwood suggests a possible useful compromise for environmental impact assessments

The recently increased interest in subsea random noise has been driven by environmental concerns. However, the necessary dialogue between acousticians who specialise in underwater noise, and the public, is limited by the lack of understanding on one side and the sometimes convoluted presentations by the other. Something simpler is required.

The issues discussed here arose during work on subsea environmental impact, and its application is to be discussed in a forthcoming paper being prepared for *Underwater Technology* with John Connelly of Metoc plc. A simpler way was sought to compare generic mechanical noise data with audiometry data for multiple species.

Noise presentation - different approaches above and below the water

In addition to the gulf between the sonar theorist and the biologist or lay person, there are differences of approach between acousticians whose interests lie in air or in water. The two media are indeed very different, epitomised by the amazing performance of underwater communications in comparison to that in air. The ATOC trials of the 1990s **(5)** showed how it was possible to send acoustic information 18,000km around the world, whereas most public address systems are limited to a few hundred metres, and the wartime cross-channel acoustic detection was rapidly superseded by radar and sonar.

External random noise often provides the ultimate limitation to long range reception. Reverberation can also be important but the various coding schemes now available in underwater communications can overcome such signal deterioration. In deep water, the reverberation is often unimportant in comparison with the background random noise. This is particularly so when calculating the range limits for reception on ships which are themselves noisy.

There is a considerable volume of data on ship noise emission levels, although much of this is of restricted availability, either because of its military significance, or because of commercial competition. However, even the summary data available are still complex, and cannot readily be compared with the more widely understood air noise data.

The effects on biological receptors compared with those on electronic receivers

Airborne noise analyses are dominated by the effects on 'biological receptors', mostly human, since there is little application for acoustic ranging in air. The typical 'man in the street' considers all decibels to be the language of the acoustic expert. Indeed most decibels quoted are probably sound pressure levels in dB(A), so this generalisation is justified. The dB(A) scale incorporates some degree of human receptor performance into the measurement itself.

Underwater, the dominant usage is different. The effects on creatures underwater have received much less attention or standardisation. For those measuring random noise, a major concern is the effect on sonar instrumentation for which the 'A' weighting is irrelevant.

The communications systems developed over the past few decades are now moving away from the 'pings' of simple FSK (frequency shift keying) dominant in the last century, but there is an inheritance from the use of single frequency tones, often uniformly spaced in frequency. This scheme is associated with electronic receivers which use the radio technology of heterodyne reduction to 'baseband', and subsequent filtration through a fixed low pass RC filter **(3)**. In this case it makes sense to space the channels uniformly.

However, whereas the filter bandwidth of a heterodyne system is well known, at least to the designer, the same cannot be said of a biological system. The important signal-to-noise ratio depends on this filter bandwidth for both man-made and biological systems, but the latter is not in general well known.

continued on page 22

The presentation of random noise

Why do underwater acousticians do it differently?

continued from page 23

The second Y axis for *Figure 1* showing the values in W/Hz is simpler to understand, at the expense of the use of many zeroes. The flat region at 0.06W/Hz now clearly gives 12 watts total to 200Hz, and 24 watts across all frequencies. Note that the conversion between axes is approximated for clarity on both *Figures 1* and *2*.

The estimation of noise output from available power

The simplification of a total acoustic output power can be linked to the finding that the efficiencies of ships as sources are usually only a few parts per million (*see below*). Such a rule of thumb allows various anthropogenic noise sources to be estimated from the size of their power supplies (engines *etc*). Such data are much more readily available than data on acoustic output, and can therefore be used as the basis of a 'coarse cut' environmental planning scheme. Naturally there will be exceptions to such a simple rule, but as with other such rules, it can provide a simple background against which they can be set.

This single value input can be used to generate a red/white spectrum if the transition frequency is set by knowledge of the characteristics of the source.

Extension to other mechanical sources

One concern with Urick's data source is that it does not cover the additional noise created by modern underwater machinery such as ROVs, or the large thrusters mounted on dynamic positioning (DP) vessels much used in modern subsea developments. Some of the numerous commercial noise surveys made by the author and his colleagues provide support for the use of the same procedure. The 'efficiencies' of ROVs and DP thrusters are also found to be of the order of parts per million, typically less than 3ppm, in support of similar statements on shipping by both Urick and Greene, so the simple statements could be said to apply to 'inadvertent noise production by well-maintained machinery'. This is rather surprising when considering the overwhelming significance of these noise levels for acoustic positioning systems, as used for example by DP ships **(15, 16, 17)**.

If a transition frequency is assumed, it becomes possible to convert the power value into spectral data to facilitate comparisons. The relatively low power of inadvertent emissions from well-designed mechanical devices needs to be compared with other sources designed to create sound, such as the intermittent but intense noise of seismic airguns, or the occasional huge peak power output of subsea explosions.

The third octave spectrum

As discussed earlier it is better to plot the noise spectrum using third octave bandwidths when considering the effects on biological receptors. One interesting consequence is that the red/white Urick noise model now appears as a conical peak *(Figure 2)*. The white noise is a rising line as the bandwidth increases, and the red noise a corresponding descending line on the other side of the transition frequency (200Hz in this case). This output is from a spreadsheet into which the user can enter the total

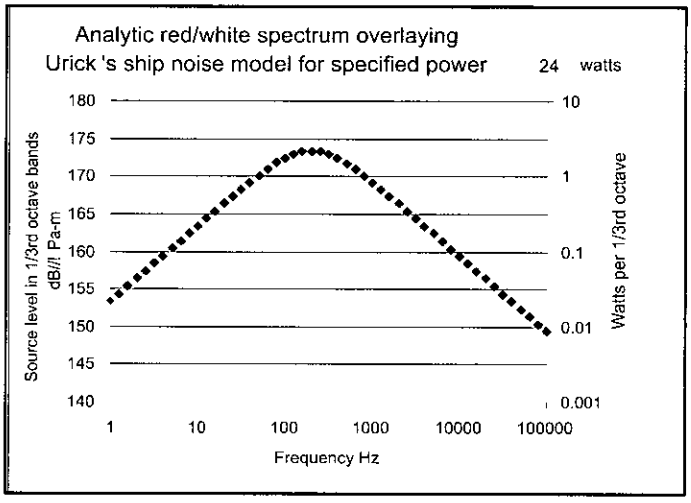


Figure 2

noise power, which gives spectral data points for third octave contiguous bands. The spreadsheet was developed as part of the work for Metoc plc.

Here the two-part Urick model is overlaid by a single analytic form. This is a low pass (LP) filter power response as produced by a resistor capacitor divider **(3)**. Data points for the power in each third octave band are now shown uniformly spaced on this log frequency scale (strictly at tenth-decade intervals, ratio 1.2589 rather than 1.2599).

The power per third octave is

$$\frac{0.2316}{(\pi/2)*(f/ft+ft/f)} \text{ W}$$

where W is the total watts and *ft* the transition frequency

Factor 0.2316 is $2^{1/6} - 2^{-1/6}$. It is used to calculate each third octave bandwidth from the band centre frequency f. Factor $\pi/2$ normalises the response. The peak value is W/13.6.

Noise from a modern cargo ship - the effects of speed

Figure 3 shows much more recent data by Arveson **(6)** with data for different speeds.

The 25,515 ton cargo ship *Overseas Harriette* was measured using the US noise range AUTEC in 1980. The revised keel aspect directional data in the *Figure* was published in 2000. They are presented as third octave band

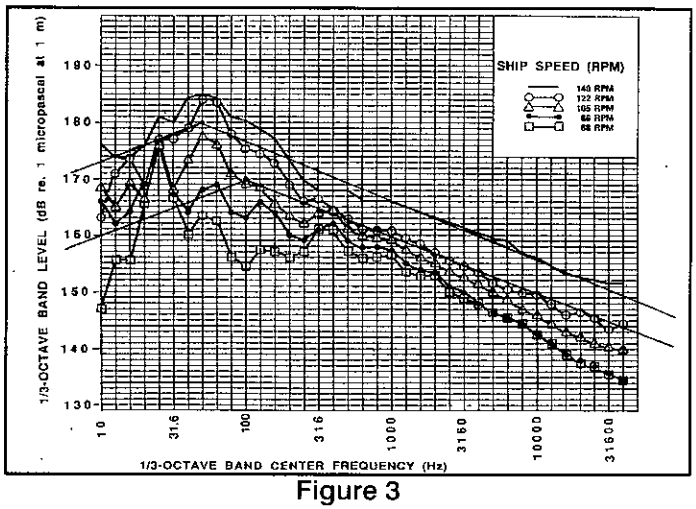


Figure 3

values, with various narrow band tonal and directional data given in additional results not shown here. Two trial fits to a Urick red/white spectrum have been made, one peaking at 180 dB//μPa·m in the 50Hz band, the other at 170dB//μPa·m in the 31.5Hz band. The former corresponds to 70 watts total at 140 rpm (if omnidirectional), whilst only about 7 watt total is emitted at 86 rpm. The rated engine power is 8.4MW, so the output efficiency at high speed is of the order of 8 parts per million, but less than 1ppm at low speed. Whilst such data is clearly approximate, its simplicity is a virtue.

Alternative analytic spectra – why is ship noise 'red'?

The data fit to a 'red' spectrum is clearly significant. The pragmatic LP filter response has no physical basis, but a similar 'red and white' characteristic is shown by the power transmissibility of a critically damped vibration isolator. This could prove more physically relevant to noise from hull mounted machinery. For this simple mechanical model, *ft* is the resonant frequency of a single mass, mounted on a spring with a critical level of viscous damping **(4,** *p676***)**. However, a better explanation is likely to involve the water-damped response of the hull.

Noise emissions from research fishing vessels

A limit to fishing research vessel noise was specified by the ICES working group **(10)** in 1995. If such a vessel is too noisy, the measurements of fish stocks are too low, as the fish flee. The proposed noise specification is shown by the bold line, with similarity to the Urick model. High frequency noise is shown falling at -6.5dB/octave (*cf* -6dB/oct for 'red' noise) above the transition at 1kHz and at -0.5dB/oct below (a 'pink tinge'). The acceptable limit of acoustic output power was thus determined.

Alternatively the data from the ICES figure 23 (reproduced here as *Figure 4*) can be fitted to different red/white models (light lines). One is fitted to an ICES defined data point, a spectrum level of 132dB//(μPa·m)²/Hz at 150Hz, also

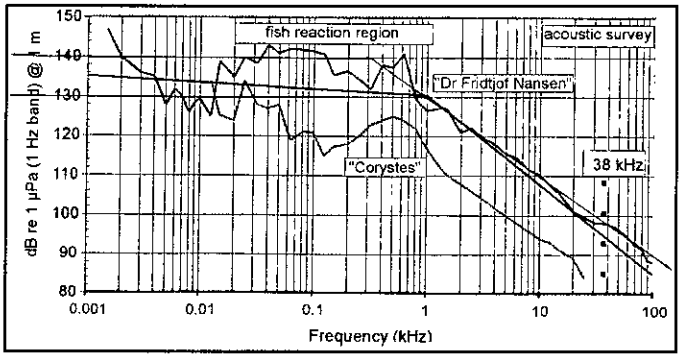


Figure 4

using their transition frequency of 1kHz. The result is approximately 0.25W. A second is fitted to the more noisy ship data at 140 dB//(μPa·m)²/Hz up to 350Hz and gives a power of approximately 0.57W, deemed excessive for this work.

Comparison with audiometric data

In order to assess the effects of sound on the environment the source data has to be converted to values for acoustic pressure. Using a proportional band spectrum the model can then be directly compared with the audiometry data from biological receptors as this becomes more available. Work in this field is ongoing with recent measurements casting some doubt over some extreme values measured earlier **(13)**. Some comparisons made in earlier work have failed to understand the significance of the measurement bandwidth, and it is critical that such misleading data be countered **(2** *p27***)**.

The conversion of source data to pressure data requires a propagation model. Whilst the simple spherical spreading of the source level model is adequate at short ranges or in deep water, models become much more complex in shallow water and are dependent on a site survey. However, bounds can be put to some aspects by considering the maximum likely transmission occurring in calm but well-mixed water when surface ducting is most effective. Further details of the way in which these assumptions can be used for an early stage predictive model will be given in the joint paper referred to above.

Conclusions

By concentrating on a physical representation, Urick's approximate but easily understood model can be used to estimate the environmental significance. This can be done using readily available data, and in advance of the refinement of the audiometry. This is summarised as:

1 The Urick 'red/white' ship noise model allows the total acoustic power estimates to be converted to a simple two part spectrum, or to a similar analytic function with a finite integral.

2 The use of proportional band data is then appropriate for comparison with audiometric data for the species of concern.

References

Books

1 *Principles of Underwater Sound* (3rd edition) Urick R J, McGraw Hill 1983

2 *Marine mammals and noise* Richardson W J, Greene C R, Malme C I, Thomson D H, Academic Press 1995

3 *The art of electronics* Horowitz P, Hill W, Cambridge University Press 1989

4 *Handbook of Acoustics* Crocker M J, J Wiley & Sons 1998, section 55 by Ungar E E

Journals and conference proceedings

5 Munk W H, The Heard Island feasibility test, *JASA 96(4)* p2330 1994

6 Arveson P T, Vendettis D J, Radiated noise characteristics of a modern cargo ship, *JASA 107(1)* p 118 2000

7 Barger J E, Hamblen W R, The airgun impulsive transducer, *JASA 68(4)* p1038 1980

8 Goold J G, Fish P J, Broadband spectra ... of airgun emissions, *JASA 103(4)* p2177 1998

9 Greene C R, Characteristics ... of drilling in the Beaufort Sea, *JASA 82(4)* p1315 1987

10 Mitson R B (Ed), Underwater noise of research vessels, *Rpt #209 International Council for Exploration of the Sea*, Copenhagen 1995

11 Dobbins P F, Goodson A D, Shallow water biomimetic sonar concepts, IoA Symposium on BioSonar Systems and Bio Acoustics, *Proc IoA 26(6)* 2004

12 Howell D M, Nedwell J R, A species-specific sound level meter, *Proc IoA 26(6)* 2004

13 Au W W L, Harbour Porpoise Acoustics, the Dave Goodson memorial lecture, *Proc IoA 26(6)* 2004

14 Hazelwood R A, Robinson S P, Acoustic power calibration in reverberant tanks, *Proc IoA 20(3)* 1998

15 Hazelwood R A, Kelland N C, Smedley N J, One man's signal is another man's noise, *Hydro*, September 1998

16 Hazelwood R A, Measuring machinery noise in the ocean, *Acoustics Bulletin vol.27 no.1* January 2002

17 Hazelwood R A, Measuring deep ocean machinery noise, *Proc IoA 25(1)* 2003

Internet

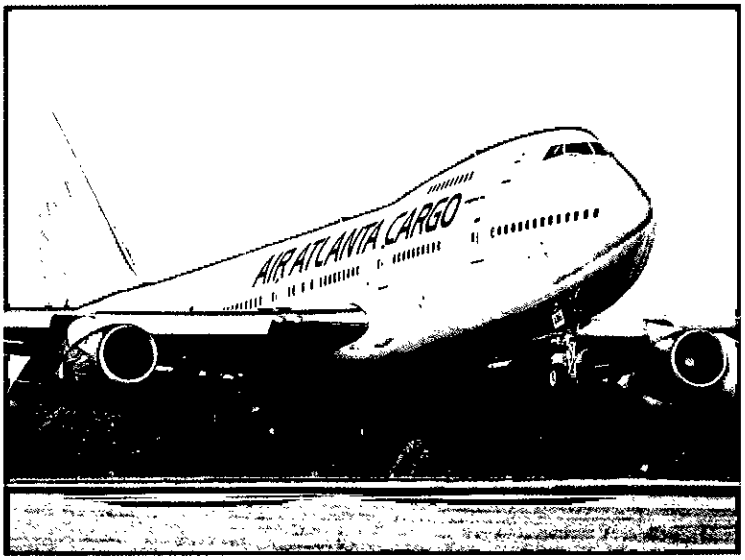
18 An extensive web site on 'pink' or '1/f' noise is at www.nslij-genetics.org/wli/1fnoise/ with bibliography maintained by Wentian Li, covering a variety of authors' ideas on sound sources and their spectra

Dick Hazelwood MIOA *is with R & V Hazelwood Associates, Guildford, Surrey*

The airline view of noise mitigation

Continuous descent approach procedures

K M Morris



The mitigation of noise from aircraft operations around an airport is a collaborative affair relying on a number of different bodies working together to reduce noise levels for communities local to the airports. This involves such diverse groups as airspace and airport regulators, Air Traffic Control, airports and, of course, aircraft operators. There are also many ways in which these various groups can either help, or hinder, the introduction of noise mitigation measures. This was why a framework to identify four of the most significant facets of aircraft noise mitigation - known as the 'Balanced Approach' - was developed by the International Civil Aviation Organisation (ICAO).

This article describes briefly the four elements of the Balanced Approach identified by ICAO. It then goes on to consider the concepts behind reducing approach noise levels by application of the continuous descent approach (CDA) procedure, an aspect of one of the elements of the Balanced Approach, and potential future developments in airspace management that could help improve the noise climate around major airports.

The 'Balanced Approach' to noise mitigation

Recognising that there are many ways of mitigating noise from aircraft, and that cooperation and collaboration between the many groups involved with aircraft operations is an essential part of any noise mitigation option, a framework for identifying and applying these options was developed at the international level by members of ICAO's Committee on Aviation Environmental Protection (CAEP).

CAEP identified four elements that should be taken into account when considering noise mitigation options for aircraft noise:

- *reductions at source;*
- *land use planning measures;*
- *operational restrictions*; and
- *operational procedures.*

It should be emphasised that all four of these elements should be treated together and that there is no order in which they should be taken individually. It is important to do the complete analysis as there are often conflicting requirements for certain options, and trade-offs that could affect the final outcome. The result should be a comprehensive analysis of the best, most effective and cost beneficial measure, or combination of measures.

A holistic approach is essential as there can be many interdependencies, and the reductions using only one aspect can have undesirable effects on others potentially negating any beneficial environmental effect and under certain circumstances even making things worse.

Reductions at source

Reduction of aircraft noise at source is essentially achieved by specifying new noise standards for aircraft more stringent than those they replace. This has been achieved at the international level by the introduction of limits at the three measuring points outlined in Annex 16 volume 1. This document contains a number of 'Chapters' each relating to different aircraft types, but for most transport category aircraft types, the so called Chapter 2 and Chapter 3 standards are those which are applicable. At the CAEP/5 meeting of 2001, a new standard was proposed which used the concept of a cumulative margin to the existing Chapter 3 limits of 10 EPNdB. This will be incorporated into a future version of Annex 16 as a new Chapter 4 - the existing Chapter 4 being moved to the next available, probably Chapter 13.

The other aspect of this element of the Balanced Approach is that of fleet renewal. The costs of this should not be underestimated, as the cost of a single new aeroplane varies from $35m to $230m and up, depending on type, before adding seats and buying spares. Airlines have invested heavily in fleet renewal as a result. British Airways alone spent around $10 billion during the last ten years, resulting in a significant improvement via this aspect of the Balanced Approach.

Land use planning measures

Effective land use planning and management measures are an essential part of any noise mitigation process, as otherwise the significant gains made by other methods are lost because of the encroachment of conurbations towards the airport. This has been recognised by many of the developed countries, and planning restrictions are common in order to protect developments of new houses, which would expose new residents to airport noise. Unfortunately this is one area where the UK appears to be dragging its heels, and although a recent White Paper set out requirements for noise insulation schemes, it contained nothing related to land use. The only real hope at the moment is that the current review of PPG24 will result in something more binding to help protect local people from noise by providing real measures to restrict inappropriate housing development.

Operational restrictions

Operational restrictions for aircraft are in use at a number of airports; these usually take the form of restrictions to the 'noisier' aircraft types during sensitive periods of the night or day. This area is fraught with potential difficulties mainly regarding international obligations and rights issues, as was highlighted by the recent disagreement over hush-kits. A potential trade war with the USA was eventually solved by a new internationally agreed position at ICAO. This has since been enacted into European law by Directive 2002/30/EC **(1)**, and into UK legislation as *The Aerodromes (Noise Restrictions) (Rules and Procedures) Regulations 2002* **(2)**.

The essence of this legislation is that any new noise regulations in the UK (and Europe) restricting aircraft operations have to be based on the noise levels measured during certification, and must not apply to aircraft that had greater than a 5 EPNdB cumulative margin to the Chapter 3 limits, meaning that restrictions could be applied only to the so called 'marginal Chapter 3' aircraft.

Operational procedures

The fourth and last element to be discussed is that of operational procedures. Before a new aircraft type enters service, operators plan out the Standard Operating Procedures (SOPs) that will be used for the aircraft in operational service. This is done in conjunction with the aircraft manufacturer and regulating authority, which has to approve the procedures before they can be used. A number of different restrictions have to be taken into consideration such as the operating characteristics of the aeroplane, commonality with other types operated by the airline (so that aircrew trained on other types can also be trained on, and fly, the new type), operating restrictions required by international regulations for reasons of safety and airspace management, and the various restrictions and characteristics of the airports to which the aircraft will operate, including (among others) noise abatement rules.

UK airlines have to abide by the European regulations outlined in JAR OPS1, which mandates the requirements of the ICAO document *Procedures for Air Navigation Services: Aircraft Operations*, commonly referred to as PANS-OPS **(3)**. For departures, PANS-OPS requires *inter alia* that for each aircraft type an operator may have only one 'normal' and one 'noise abatement' departure procedure.

Throughout the life of the operation, these procedures are reviewed and, where necessary, modified or changed to suit the prevailing requirements. An example of such an exercise carried out on the British Airways Boeing 747 fleets was reported at a recent Institute of Acoustics meeting **(4)**.

Operational approach procedures

At the other end of the flight, approach procedures are set mainly by airspace design and air traffic control requirements, with very little latitude available to the operator or pilot other than to follow the instructions given to them by air traffic control as accurately as possible. However, owing to the restriction of having to follow a 3° glide-slope close to the airport, reductions in arrivals noise did not match the advances that were being made for departures as a result of the increases in aircraft performance.

In 1994, the UK Government's Aircraft Noise Monitoring Advisory Committee (ANMAC), decided to investigate the options for reducing noise from arriving aircraft, and a special Technical Working Group was set up. This group consisted of technical representatives from all the relevant stakeholder groups including the Department for Environment, Transport and the Regions, National Air Traffic Services, Directorate of Airspace Policy, BAA, British Airways and the Heathrow Airport Consultative Committee. One of the main considerations was the feasibility of setting approach noise limits, though it was noted that operators were quite constrained and as a result there was frequently little scope for pilot discretion. In conclusion, a limit based monitoring system would be unworkable.

The group concluded that, for the initial and intermediate approach (from holding beacon to glide-slope capture, *ie.* from about 6,000 feet to 2,500 or 3,000 feet), the main cause of noise variability was whether or not extended level segments were being flown. If level flight was involved, the height above the ground and the aircraft's behaviour (decelerating, or flying at constant speed) during this level segment were also important. For the final approach, the evidence suggested that keeping the aircraft as 'clean' as possible, for as long as possible commensurate with safety, was the most useful noise mitigation technique **(5)**.

This was not really a very surprising conclusion, as in practice it means keeping the aircraft as high as possible for as long as possible from the holding stack until it intercepts the glide-slope, and then flying the least noisy configuration following this fixed path to the runway. The requirements of following the former philosophy are encapsulated in the technique called the 'continuous descent approach' (CDA); and latterly the 'low power, low drag' (LPLD) procedure.

Continuous descent approach

The CDA procedure is not a new concept, and was originally developed as a fuel efficiency measure during the fuel crisis of the 1970s; indeed at the airports where it is allowed, CDA has been British Airways' standard procedure since 1974. Much more recently the concentration on mitigating approach noise levels has renewed interest in the procedure from another point of view.

The basis of this procedure is fairly simple in concept. A constant descent flight path is followed from the bottom of the holding stack to the intercept with the extended glide-slope *(Figures 1 and 2)*. This avoids the 'normal' practice of descending to cleared levels followed by long level segments. A double benefit to noise levels on the ground is:

continued on page 28

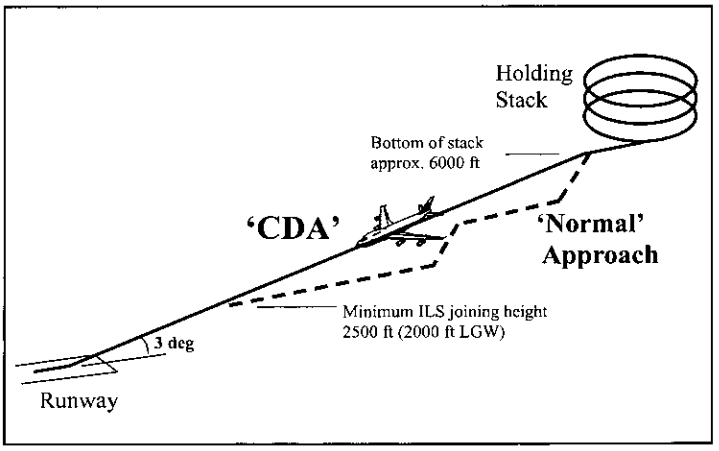


Figure 1

The airline view of noise mitigation

Continuous descent approach procedures

continued from page 27

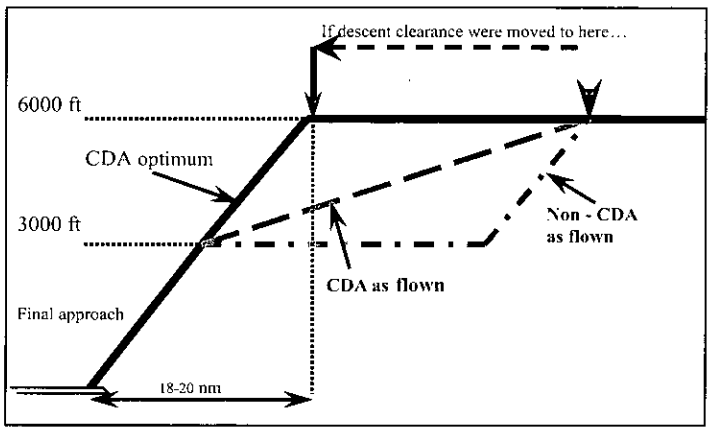


Figure 2

1 The avoidance of level segments below the initial height when leaving the stack means that the aircraft always follows a higher flight-path; and

2 As the aircraft is descending the power levels are lower than are necessary for level flight.

From early in the ANMAC Technical Working Group study, it was recognised that the issue of completing CDAs at the London airports was not quite as straightforward as had at first been thought. There were some aircraft such as the Airbus Industrie A320 types that used level segments to slow the aircraft to comply with ATC speed controls. The noise levels from such aircraft whilst carrying out this manoeuvre were no greater than during a CDA, and so a pragmatic definition of a CDA was drawn up. The definition now used at the London airports for monitoring and feedback, which also takes account of the height effects of differing atmospheric pressure, is:

- ❑ No level flight
- ❑ One phase of level flight not longer than 2.5 nautical miles

(i) For monitoring purposes, owing to the constraints of the GEMS system and the different elevations at airports, CDA achievement will be monitored from a height of 5,500 feet above aerodrome level (aal) at Heathrow, Gatwick and Stansted airports.

(ii) 'Level flight' is interpreted as any segment of flight having a height change of not more than 50 feet over a track distance of two nautical miles or more, as recorded by the airport NTK system.

The achievement of a CDA is not the responsibility of one person alone, but rather the combination of a number of factors, each of which is controlled wholly or partly by different stakeholder groups. For the operating crew to be able to set up the correct rate of descent to enable a CDA, they require knowledge of the route they will be required to follow and the correct track 'distance to go'.

Unfortunately, there are problems with both of these, as the required tracks from the holding stacks to the glide-slope intercepts are not published as part of the UK AIP, and indeed there is no fixed routeing: Air Traffic Control (ATC) uses this portion to ensure adequate aircraft separation by 'lengthening' approach routes (ironically enough, see below the P-RNAV RIAPs, in the Heathrow trial). Because it is difficult to estimate distances for simple curved or 'trombone-shaped' approach paths, ATC tends to overestimate the 'distance to go' for safety reasons. If the estimate was greater than 2.5 nautical miles, a CDA would not be possible, which was usually the case.

Descents are easier to manage for those crews that operate frequently into the London airports, as they build up experience of the track that they will most likely be required to follow at particular times of the day, and can then adjust their interpretation of the advice given by air traffic controllers in setting up their descent. For infrequent visitors to the London airports, however, this is not the case and the effects are aptly demonstrated by the fact that home-based carriers normally show better adherence to the CDA profile than other airlines *(Figures 3 and 4)*.

An Industry Code of Practice **(6)** was drawn up following the ANMAC Technical Working Group recommendations, so that all stakeholders were aware of the issues and how they fitted into the bigger picture. As a result CDA adherence has improved significantly, and now averages around 80% at Heathrow Airport. Further optimisation of the descent profile is still possible. Delaying to the optimum the point at which the descent clearance is given (18 to 20 nautical miles out) would ensure that the aircraft always remained as high as was possible, taking advantage of the extra distance to attenuate the aircraft noise levels *(Figure 2)*. This was recognised in the ANMAC Technical Working Group report **(5)** and in later studies **(7)**. The GEMS system is currently being updated to enable feedback to be given to ATC so that they can refine the point at which they give descent clearance and thus improve the CDA potential.

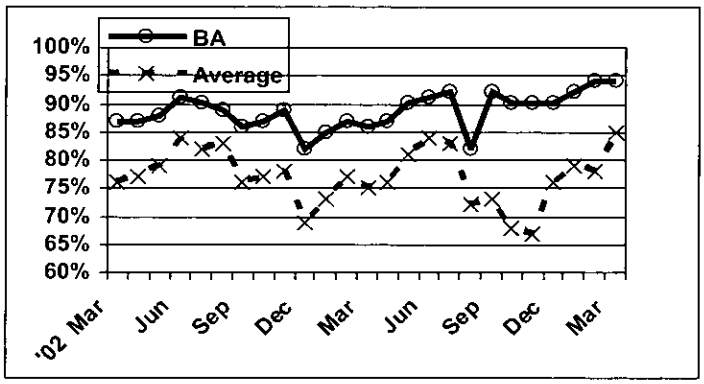


Figure 3

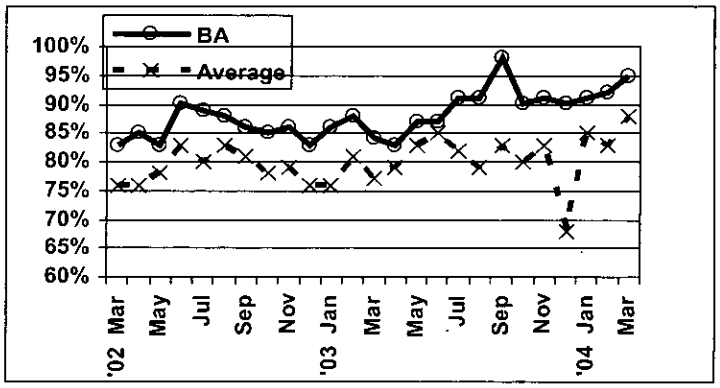


Figure 4

Low power, low drag

Low power, low drag procedures are broadly defined as a noise abatement technique where the crew delays the extension of flaps and undercarriage until the final stages of the approach. This must fit in with the requirements of ATC speed control instructions (for maintaining adequate separation), and the safe operation of the aircraft.

It may at first seem fairly straightforward to require an aircraft to be flown 'clean' for the maximum time possible, then using the minimum flap consistent with the speed controls required by ATC, and then finally lowering the undercarriage at the last possible moment during the approach. In practice, however, there are other requirements which limit the ability of the crew to follow the procedure because they set the criteria under which the aircraft must be operated.

The ICAO PANS-OPS document requires (for noise abatement approach procedures) that '...the aeroplane shall not be required to be in any configuration other than the final landing configuration at any point after passing 5nm...' before the threshold. On a 3° glide-slope, this corresponds to a height above the airfield of about 1,500 feet.

To comply with these PANS-OPS standards, the undercarriage would normally be selected no later than about 2,000 feet in order to satisfy the requirements for a stabilised approach, avoiding a messy 'rushed approach' and reducing the likelihood of a go-around.

In some instances, the speeds required by ATC can have an effect on the ability to fly LPLD procedures. One example results from the systems and design of the Boeing 737. For this aircraft, the normal ATC requirement to fly at 160 knots requires the use of flap 15 to provide an adequate margin to the aerodynamic stall. On this aeroplane type, flap 15 is the scheduled landing flap with one engine inoperative, and as thus the selection of flap 15 with the landing gear up is accompanied by an audible warning in the cockpit which cannot be cancelled.

Most aircraft do not suffer from this quirk, and as a result LPLD procedures are common practice amongst operators. It does illustrate, however, that the design of some aircraft types and the speed controls applied by ATC can adversely affect their ability to perform LPLD approaches.

Potential noise abatement in the future

The future of approach noise abatement procedures potentially centres on the optimisation of CDA profiles. New technology for air navigation systems now becoming more available in modern aircraft allows fixed routeings to be followed without recourse to what were previously essential ground-based navigation aids. What is more important is that, because of the inherent tolerances in the older fixed ground-based aids, the adherence to routeings can be improved significantly with the new equipment.

The system currently being developed for CDA optimisation at Heathrow Airport is Precision Area Navigation or P-RNAV for short, though there are others. A trial was initiated on 12 June 2003 **(8)** with British Airways aircraft in the London TMA, consisting of trial P-RNAV initial approach procedures and an associated trial P-RNAV standard arrival route (STAR) entering UK airspace via 'LOGAN' and the Lambourne hold.

The trial STAR and P-RNAV are designed to allow a continuous descent for an aircraft arriving in UK airspace

continued on page 30

The airline view of noise mitigation

Continuous descent approach procedures

continued from page 29

at 25,000 feet (actually FL250), and following a continuous descent, through the hold and glide-slope intercept right down to the runway. This would allow an advanced optimised CDA to be flown whilst at the same time catering for eventualities which would require the descent to be paused at the hold. Currently, because of the complexity of the airspace environment, the trial is only active in the night-time period, for aircraft leaving Lambourne between 23:30 and 06:00 local time.

To date, the P-RNAV trials at Heathrow have been very successful, with around 100 aircraft having taken part. At present, only British Airways is involved, but it is hoped that soon other carriers such as Virgin Atlantic will also be included. The lateral track-keeping adherence has been very accurate at less than 1 nautical mile, and in most cases less than half a mile *(Figure 5)*, and CDA profiles have been followed very well. Some new 'estuary' routes will soon replace the current routes, which will reduce the amount

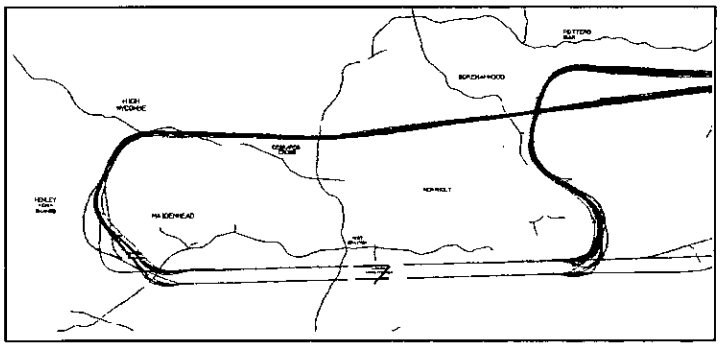


Figure 5

of time the aircraft passes over land when descending from the east. At the same time, small changes will be made to overcome minor issues identified during the trial.

P-RNAV allows significantly more consistent tracks to be flown, so noise preferential routeings (NPRs) could possibly be defined for arriving aircraft as well as departures. There is some debate about current UK Government policy, which is to concentrate noise. Several forums are debating a contrary approach involving the dispersal of flight tracks.

If the policy were to change, P-RNAV could still be a useful tool to help mitigate the noise climate under approach flight paths at airports. This is because P-RNAV gives consistency of flight as illustrated by *Figure 5*, but does not in itself reduce noise levels. There is potential to develop multiple P-RNAV initial approach procedures so that aircraft are routed along consecutive paths, thus spreading out the noise and allowing periods of respite to centres of population close to the airport. An illustration (only) of the concept of such a system, based on the 'Barnes' RIAP, is shown in *Figure 5*. Here parallel base legs from the 278 radial of the Lambourne VOR give the separation and dispersion of the flight tracks, leading to greater dispersal of the approach noise.

Conclusions

Significant improvements have been made to the source noise levels from aircraft as operators have invested heavily in newer, quieter aircraft types, but this is only one part of

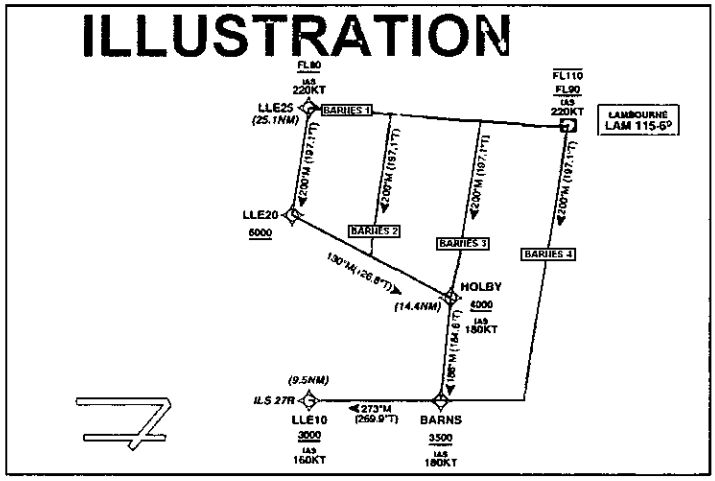


Figure 6

the ICAO balanced approach to noise mitigation. Land use planning measures, in particular, have not been adequately addressed in the UK, unlike other developed countries such as France.

Operational procedures have been optimised for both departures and arrivals, but the extent to which they can be defined depends on many other requirements set by safety and regulatory considerations. For arrivals, a combination of continuous descent approach procedures coupled with the low power, low drag technique has been identified as the optimum noise abatement method.

Advances in navigation system technology such as P-RNAV allow a greater level of consistency in track-keeping. As a result, noise from aircraft in the intermediate approach phase can be channelled down routes over sparsely-populated areas, or spread out along a number of routes to minimise the over-flights of specific population centres. The decision depends on Government policy to concentrate or disperse the noise: in the UK this is currently to concentrate the noise down routeings over sparsely populated areas.

No one part of the industry is solely responsible for mitigating aircraft noise, and all stakeholders in the industry need to work together to ensure that the optimum reductions in noise arising as a result of the airport are minimised.

References

1 Directive 2002/30/EC of the European Parliament and of the Council, *Official Journal of the European Communities* 26 March 2002

2 The Aerodromes (Noise Restrictions) (Rules and Procedures) Regulations 2003, Statutory Instrument 2003 No.1742, HMSO 2003

3 ICAO, Procedures for Air Navigation Services: Aircraft Operations, Volume 1 - Flight Procedures, Part V, 3.2.1. (DOC 8168), ICAO 1993

4 Flindell I H, McKenzie A R, Knowles A, Morris K, Heathrow Departures Noise Study, *Proc. IoA Vol.20 Part 1*, 127-134 Cranfield 1998

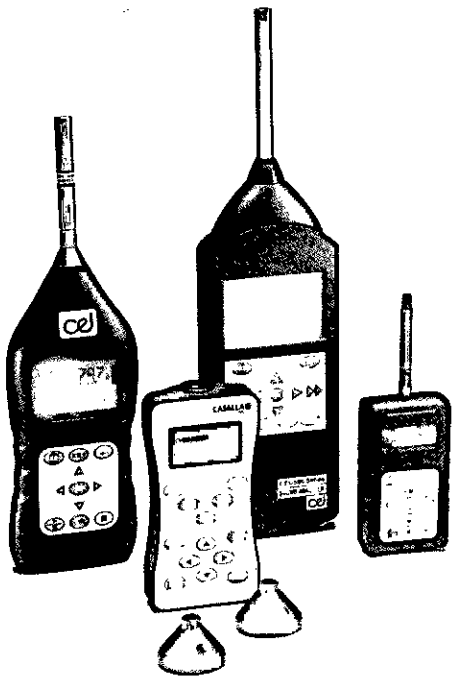
5 ANMAC Technical Working Group, Noise from Arriving Aircraft: Final Report of the ANMAC Technical Working Group, Westward documedia December 1999

6 Noise from Arriving Aircraft: An Industry Code of Practice, BAA 2001

7 Flindell I H, McKenzie A R, Porter N D, Heathrow Airport Arrivals Noise Study, August 2001 to December 2002, Report LHR2003/07, Ian H Flindell & Associates July 2003

8 Supplement to the United Kingdom AIP, S12/2003, National Air Traffic Services Ltd, April 2003

K M Morris, *Environmental Affairs, British Airways, Harmondsworth, UB7 0GB*



Heard the one about the Casella CEL range of high quality acoustic instruments for the workplace, health and safety and environmental noise? It's the biggest range from the UK's biggest manufacturer.

- Leading edge acoustic technology
- Intuitive, ergonomic design
- Full UKAS calibration facilities

Like the sound of things so far? Contact Casella CEL, the leading specialist in noise monitoring, right away.

Call: +44 (0)1234 847777

Fax: +44 (0)1234 841490 info@casellacel.com www.casellacel.com

CASELLA CEL

Think environment Think Casella

Casella CEL, Regent House, Wolseley Road, Kempston, Bedford MK42 7JY UK

Assessing amplified noise

The effectiveness of statistical parameters

D Patel and R Vasudevan

The use of objective criteria for the assessment of neighbour noise has historically been avoided by enforcement agencies. The Noise Act 1996 **(1)** for the first time introduced a requirement for the use of objective criteria in assessing neighbour noise. However the resource implications resulting from employment of these criteria mean that only a handful of local authorities have used them, as found in a review of the implementation of the Noise Act carried out in 2001 **(2)**.

Section 42 of the Anti Social Behaviour Act 2003 provided an amendment to the Noise Act 1996 allowing local authorities to monitor, and take action against, night-time noise offences using the powers of the Act without providing a full 23:00h to 07:00h, seven days a week service **(1)**.

A night-time noise offence is assessed by the use of a measurement protocol developed by the Building Research Establishment (BRE) **(3)**. Following field tests, the recommendations submitted to the (then) Department of Environment (DoE) were as follows:

Noise emitted from the offending dwelling is to be measured as a continuous $L_{Aeq,5min}$ within a 15-minute period. The underlying noise level is then determined, such that it is not exceeded for any 0.6s period within a window of between one and five minutes. This equates to the $L_{A99,1min}$, $L_{A99,5.2min}$, and $L_{A99.8,5min}$. The recommendation was also made that the measurement protocol be kept under review, and that consideration be given to the use of C-weighting and shorter (125ms) L_{eq}.

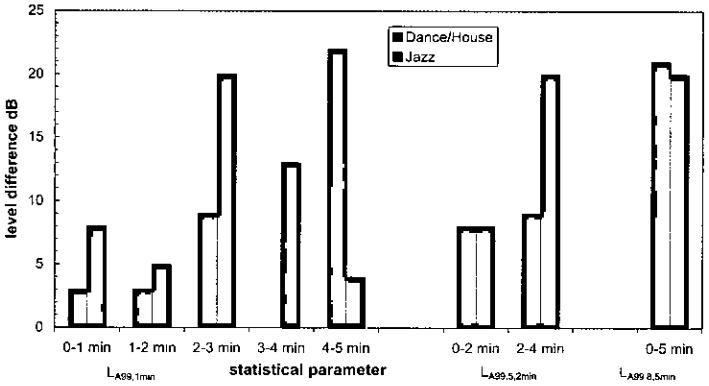


Figure 1: Comparison of the level difference between the 'offending' and 'underlying' noise levels for dance and jazz music

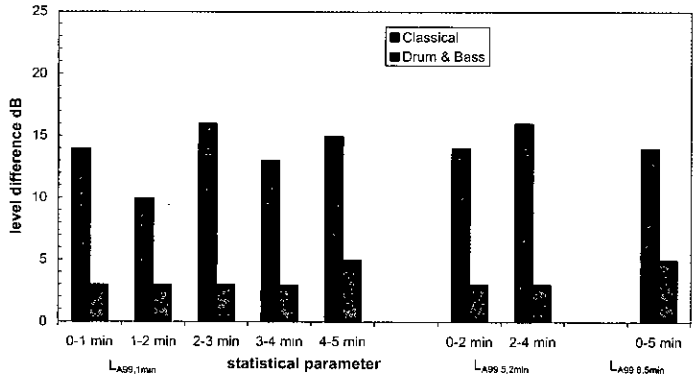


Figure 2: Comparison of the level difference between the 'offending' and 'underlying' noise levels for classical and drum-and-bass music

Assessment of the use of L_n parameters

Measurement of music using the Night Noise Offence Measurement Protocol

Measurements were taken with music being played in the ground floor living room of a converted Edwardian terrace house, the receiving room being immediately above. The music was played on a Pioneer XD-Z63M midi stereo with two S-Z73 loudspeakers. The loudspeakers were placed in opposite corners of the room at a height of 0.5m facing the centre of the room. Four pieces of music were chosen to reflect different musical genres and to allow analysis of the effects those types of music may have on the assessment of any offence. The genres were jazz, dance/house, drum-and-bass, and 'classical'.

All measurements were taken with an integrating sound level meter (Bruel & Kjaer 2260, which is a type 1 instrument) conforming to the relevant standards BS EN 60804 and BS EN 60651. All readings were taken in accordance with the measurement protocol detailed in DoE Circular 8/97.

A five-minute sample of each type of music was transferred to computer software for analysis. The following L_n parameters were obtained: five $L_{A99,1min}$ values, two $L_{A99.5,2min}$ values, and the (overall) $L_{A99.8,5min}$ for each piece, for comparison with the noise emanating from the offending dwelling, which would be based on the $L_{Aeq,5min}$.

For the assessment using the $L_{A99,1min}$ and $L_{A99.5,2min}$ parameters the particular sample segment analysed was found to be the determining factor. This was particularly so with one-minute measurements. *Figure 1* shows the difference between the measured $L_{Aeq,5min}$ and L_n parameters.

The decision as to whether or not an offence was determined using $L_{A99,1min}$ was subject to variation depending on which minute of $L_{Aeq,5min}$ was selected. Unsurprisingly, the parameter which produced the most reliable result was $L_{A99.8,5min}$ as this contained the entire measurement sample.

One unexpected result was the failure of 'drum-and-bass' music to produce an offence. *Figure 2* shows the level differences compared with the classical track.

The offending level from drum-and-bass was one of the highest, with a $L_{Aeq,5min}$ of 50dB, but the proxy for the

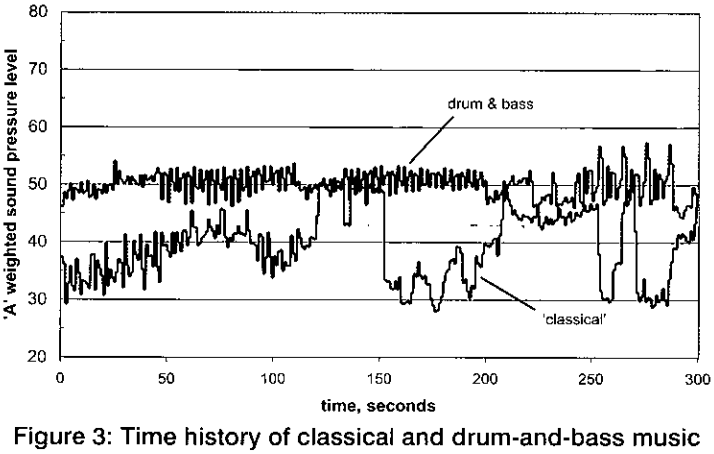


Figure 3: Time history of classical and drum-and-bass music samples

underlying noise level $L_{A99.8,5min}$ was only 45dB. This produced a maximum difference of only 5dB as shown in *Figure 2*. The reason for this can be found in the analysis of the time profile for the measurement shown in *Figure 3*.

Considerably more variation in level occurred in the classical piece than in drum-and-bass. The presence of significant troughs in the time history shows that the sound level dropped by 10dB or more, for at least 0.6s at a time, at several points during the playback. This was not the case for drum-and-bass as the track consisted of samples superimposed upon a regular and consistent drum beat.

Applying the existing measurement protocol to detect the underlying level in music that does not vary significantly with time may therefore indicate a potential deficiency in the protocol.

Possible alternative assessment methods

The suitability of C-weighted L_n parameters as a possible approach to overcome this problem was investigated. Further measurements were made using an extended measurement time of ten minutes. The data were analysed using computer software to obtain statistical parameters. Two five-minute L_{Ceq} values were used for each measurement and compared with the corresponding $L_{C99.8,5min}$ index. In addition, the $L_{Ceq,10min}$ was also compared with the $L_{C99.9,10min}$ which is by definition the level exceeded for 0.6 seconds.

Figure 4 shows the level difference between C-weighted parameters for the classical and drum-and-bass samples used.

The period of measurement is again a factor in determining whether or not a 10dB difference has occurred. The use of C-weighting, however, produces a significantly different result for the drum-and-bass track.

There are two possible factors contributing to this result. Firstly, the music was played for a longer period of time during which the fall in level between tracks gave an overall level decrease of over 10dB (even though the end of one

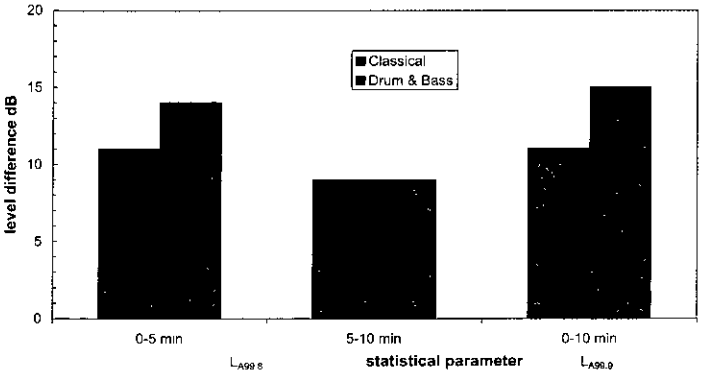


Figure 4: Level differences between C-weighted L_n parameters and L_{Ceq}

track was superimposed onto the next in such a way that there were no gaps between them, *ie* they were 'mixed').

Secondly, another factor can be seen in the time history of the music. *Figure 5* shows the effect of using C-weighting on the recorded level. The low frequencies are not weighted

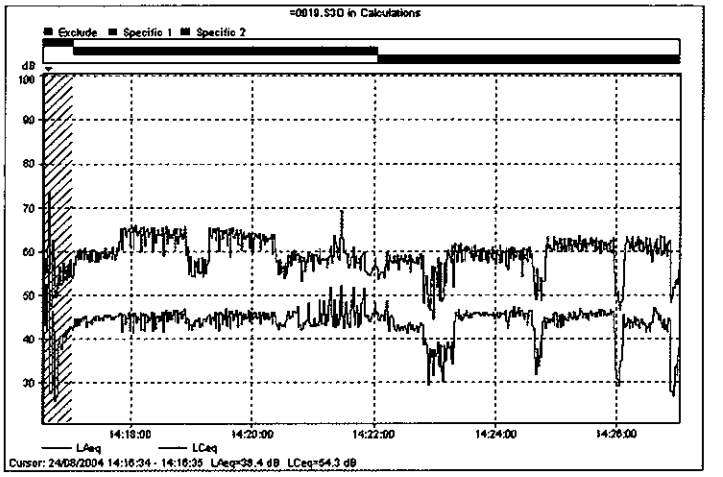


Figure 5: A-weighted and C-weighted time history of a drum-and-bass track

out, so the measured level is greater, resulting in a higher L_{eq} relative to the L_n index.

Conclusion

The use of the measurement protocol for assessment of a night noise offence under the Noise Act 1996 will be an effective tool in dealing with neighbour noise in a quick and effective manner. However, a problem arises when an assessment is attempted of music having a constant underlying level and not varying greatly over time.

Using shorter L_n parameters was found unreliable, since the decision about whether or not an offence was established depended on the period of measurement. By increasing the effective measuring time to $L_{A99.8,5min}$ a thorough representation of the music was possible.

The failure of the drum-and-bass track to give rise to an offence suggests that C-weighting and a longer L_n parameter may be more appropriate for the assessment of music containing high noise levels at low frequencies coupled with regular and repetitive beats.

Since the measurement protocol was developed almost ten years ago, the importance of acoustics within local authorities and the availability of analytical tools have increased. With the real possibility that the measurement protocol for night noise offences will be used more frequently, a review of the protocol may now be appropriate.

References

1 Department for the Environment, Food and Rural Affairs (DEFRA) Noise Act (as amended by the Anti-social Behaviour Act 2003) DEFRA circular NN/31/03/2004

2 Department for the Environment, Food and Rural Affairs (DEFRA) Review of the Implementation of the Noise Act 1996 (2001)

3 Grimwood C, A review of the BRE involvement in the night noise offence measurement protocol, *Proceedings of the Institute of Acoustics* (1997)

D Patel, *Environmental Health, London Borough of Brent, Wembley, Middlesex, HA9 6BZ*

R Vasudevan, *NESCOT, Ewell, Surrey, KT17 3DS*

Commons Written Answers

1 November 2004

Road noise

Mr Fallon: To ask the Secretary of State for Transport how much has been spent by the Highways Agency on main road noise protection measures in each of the last five years; and how much is planned to be spent in each of the next three years.

Mr Jamieson *[holding answer 25 October 2004]*: The Highways Agency has invested in three separate noise protection measures. These are concrete road resurfacing, noise fencing and bunds, and secondary glazing. The total approximate cost of noise mitigation measures for the last five years is £163 million. The detailed breakdown of this figure is set out in the following tables.

In addition, new road schemes will have included noise mitigation measures within the scheme design. It is not possible to separate this element from the overall scheme costs. Planned major maintenance schemes involving carriageway resurfacing now use lower noise materials.

Concrete resurfacing

	Cost £M
1999–2000	7.5
2000–01	6.0
2001–02	0
2002–03	50.1
2003–04	78.0
Total	141.6

Noise fencing and bunds

	Cost £M
1999–2000	n/a
2000–01	3.6
2001–02	6.5
2002–03	5.9
2003–04	4.7
Total	20.7

Secondary glazing

	Cost £
1999–2000	0
2000–01	3,400
2001–02	205,987
2002–03	121,363
2003–04	98,230
Total	428,980

Forward programmes of work are agreed on an annual basis and it is not possible to give an explicit indication of the amount to be spent on noise protection measures over the next three years.

2 November 2004

Train horns

Bob Spink: To ask the Secretary of State for Transport *(1)* if he will make a statement on the Rail Safety and Standards Board review of the use of train horns and noise pollution; *(2)* in what circumstances the use of train horns will be restricted on approaching unmanned pedestrian level crossings.

Mr McNulty: The Rail Safety and Standards Board (RSSB) is responsible for specifying the requirements for when and where train horns must be used and Network Rail is responsible for deciding how train operators comply with them. The RSSB's Review concluded with a number of recommendations effective from 6 November 2004.

FROM HANSARD

The main recommendations are that the minimum permissible level for train horns will be reduced by up to eight decibels and the sounding of train horns when entering a tunnel and at frequent intervals when passing through long tunnels will no longer be necessary.

It will still be necessary for train drivers to sound horns at all times, day or night, whenever anyone is seen on or near a line on which a train is travelling; when approaching any pedestrian crossings; where shunting movements are taking place and staff may be on the line; during failures of signalling equipment or other degraded operations and in an emergency. The sounding of horns between the hours of 23:30 and 07:00 is not permitted, when drivers are approaching an automatic level crossing or an open level crossing except as an emergency. These standards take into account the need to ensure effective safety management whilst also aiming to alleviate the noise disturbance experienced by residents living near railway lines.

The minimum permissible level for train horns will be reduced by up to eight decibels

8 November 2004

Noise (environmental pollution)

Brian White: To ask the Secretary of State for Transport which agencies are responsible for monitoring noise and environmental pollution at motorway service stations.

Mr Jamieson: Motorway service areas are operated privately. The local planning authority, which in general will have approved the development at a site, is responsible for monitoring noise and environmental pollution at an individual service area. The Environment Agency may monitor the releases to foul sewer or surface waters from an MSA, depending on the size of the releases.

Mrs May: To ask the Secretary of State for Transport what studies have been undertaken to determine the noise effects of mixed mode runway operation at Heathrow.

Charlotte Atkins: Analysis of the noise impacts of a variety of possible mixed mode scenarios is set out in a supporting document to 'The Future of Air Transport' White Paper entitled *ERCD Report 0308: Revised Future Aircraft Noise Exposure Estimates for UK Airports*. This is available from the DfT's website (www.dft.gov.uk). Further analysis of the potential for mixed mode operations at Heathrow is being taken forward as part of the Project for the Sustainable Development of Heathrow. 'The Future of Air Transport' makes clear that further development of Heathrow will only be considered on the basis that it results in no net increase in the total area of the 57dB(A) noise contour compared with summer 2002 (an area of 127km^2). It also commits the Government to public consultation ahead of any introduction of mixed mode operations at Heathrow.

9 November 2004

Heathrow

Mrs May: To ask the Secretary of State for Environment, Food and Rural Affairs what representations she has received on the methodology for drawing up a noise map for Heathrow.

Alun Michael: My right hon. Friend, the Secretary of State, has not received any representations on the methodology for drawing up a noise map for Heathrow.

Mrs May: To ask the Secretary of State for Environment, Food and Rural Affairs what plans her Department has to publish *(a)* a strategic noise map for Heathrow, *(b)* an action plan to manage noise issues around Heathrow and *(c)* a public consultation on plans to manage noise levels at Heathrow.

Alun Michael: Strategic noise maps and action plans for Heathrow and other specified airports will be produced as part of the requirements of Directive 2002/49/EC on the assessment and management of environmental noise (the Environmental Noise Directive). There will be public consultation on the action plans as this is also a key requirement of the Environmental Noise Directive. Details of proposed options to transpose the Directive will be put out to public consultation in due course.

Noise from aircraft using Heathrow is regulated by my right hon. Friend, the Secretary of State for Transport, under s.78 of the Civil Aviation Act 1982. The DfT's Stage 1 consultation on night-time restrictions from 30 October 2005 closed on 29 October and the second stage of this consultation process will be undertaken in due course.

Daytime noise at Heathrow was considered in last year's consultation on 'The Future of Air Transport in the UK-South East', and 'The Future of Air Transport' White Paper (Cm 6046) set out in paragraphs 11.52 and 11.53 the Government's view that all practicable steps should be taken to prevent any deterioration in the noise climate there.

Mrs May: To ask the Secretary of State for Environment, Food and Rural Affairs when her Department will start the work to produce a strategic noise map for Heathrow.

Alun Michael: Details of our proposed options to transpose the Directive will be put out to public consultation in due course. That will include proposals regarding the competent authorities for the production of strategic noise maps for airports under Directive 2002/49/EC

continued on page 36

CAREER OPPORTUNITIES

The PDA group of companies are respected and well established in the field of acoustics, having a reputation for the quality and speed of our service to clients. This has lead to a significant growth in our workload and we are now looking for several Consultants and Senior Consultants.

Consultants

PDA are looking for at least two Consultants to be based at our offices in Warrington. You should have two years experience, show good initiative, and be able to work effectively in a professional and enthusiastic team. Experience in architectural acoustics and environmental noise is desirable together with enthusiasm for these areas. You should have a working knowledge of current standards and procedures and you should have good spoken and written communications skills.

Senior Consultants

PDA are looking for a number of Senior Consultants to be based in satellite offices throughout the country and in particular in Bristol, Birmingham and Newcastle-upon-Tyne. A minimum of five years experience is desirable, in addition to excellent business development, and client liaison skills. Candidates should have hands on experience in delivering services in architectural, environmental, planning and the residential property sectors. You should be able to demonstrate a robust understanding of prevailing standards and procedures, and will have mature spoken and written communication skills.

The salary for Consultants is in the range £23,000 to £35,000, Senior Consultants £35,000 to £45,000, depending on age, qualifications and experience, plus a substantial benefits package that includes a profit related bonus.

Candidates making applications should state which position they are applying for. Applicants for the position of Senior Consultant should identify the area of the country in which they would wish to be based. In the first instance please e-mail your CV to philipdunbavin@pdaltd.com or by mail to:

Mr. P. R. Dunbavin

Group Managing Director

PDA

Vincent House, 212 Manchester Road, Warrington WA1 3BD
Tel: 01925 418188 Fax: 01925 577116
Web: www.pdaltd.com

All applications will be treated in strictest confidence

FROM HANSARD

continued from page 34

on the assessment and management of environmental noise (the Environmental Noise Directive).

A pilot project to produce noise contours for Heathrow in terms of noise indicators required by the Environmental Noise Directive (L_{den}) was carried out in 2003 by the Civil Aviation Authority for DEFRA as part of the development of the National Ambient Noise Strategy. These contours have been published and can be seen at www.defra.gov.uk/environment/noise/mapping/aviation/index.htm

In addition daytime noise contours for Heathrow are produced annually for the Department of Transport.

10 November 2004

Acoustic screening

Mr Robathan: To ask the Secretary of State for Transport what the cost was of the acoustic screening erected within the last three years on both sides of the M1, north and south of Junction 11; what noise-level studies led to their installation; and what the results of those studies were.

Mr Jamieson: In September 2003 the Highways Agency completed the first phase of a scheme to provide acoustic fences on both sides of the M1 at Junction 11 at Luton. Because of the cost and complexity of the scheme, the work is being carried out in two phases. The cost of completing Phase 1 was £2.4 million. Phase 2 is due to start this month with completion expected in April 2005. The cost for Phase 2 is estimated at £1.9 million.

In March 1999 the Government established revised criteria and a ring-fenced annual budget of £5 million to deal with some of the most serious and pressing cases of traffic noise on existing trunk roads. A written reply to a parliamentary question raised by Jonathan Shaw MP, published on 11 November 1999, Official Report, column 681, contained a letter from Lawrie Haynes, the then chief executive of the Highways Agency, identifying those locations where previous concerns about noise had been expressed which were found to satisfy the new criteria (the location list known as the 'Hansard' list). The MI between Junctions 10 and 11 and between Junctions 11 and 12 were included on the list.

In September 1999, the agency commissioned its managing agents to carry out a detailed study of noise conditions between Junctions 10 and 12 of the MI at Luton. The study report identified 772 properties in an area chiefly concentrated around Junction 11 with a noise greater than 68dB(A). The report concluded that through the provision of noise barriers over extended lengths and varying in height between two and three metres, it would be feasible to provide substantial noise reducing benefits for many properties. About 280 properties would receive a noise reduction of at least 3dB, equivalent to a halving of the traffic. Another 492 properties would receive a smaller but nonetheless tangible benefit as a result of the scheme.

10 November 2004

Road noise

Mr Robathan: To ask the Secretary of State for Transport what funds are available to his Department for noise mitigation on motorways; whether these funds are dedicated to noise mitigation measures; whether they are ring-fenced for acoustic barriers and quieter surfaces; and if he will make a statement.

The average cost per mile for resurfacing a standard dual carriageway (assumed as two lanes in each direction) with a quieter surface is £500,000

Mr Jamieson: Under the ten-year plan, 60% of the strategic road network, including motorways, is to be treated with quieter road surfacing in line with maintenance need. These resurfacing works are funded from a roads renewals budget, the value of which varies annually.

A list of locations having serious and pressing noise problems, but where there was no early prospect of quiet surfacing being installed as part of planned maintenance, was announced on 11 November 1999. Measures to relieve noise problems at these locations, by providing either acoustic barriers or quieter surfacing as appropriate, have been funded from an annual £5 million ring-fenced budget.

I gave more specific details of the overall strategy for dealing with noise mitigation on the strategic road network in the adjournment debate on motorway noise in Leicestershire held on 30 March 2004. Noise mitigation measures installed as part of a new road construction scheme, which may include measures such as earthwork bunds and secondary glazing, are funded from the overall budget assigned to the scheme.

Norman Baker: To ask the Secretary of State for Transport what the average cost per mile is of resurfacing a standard dual carriageway with the new quieter surface.

Mr Jamieson: The average cost per mile for resurfacing a standard dual carriageway (assumed as two lanes in each direction) with a quieter surface is £500,000.

15 November 2004

Sonic boom (North Norfolk)

Norman Lamb: To ask the Secretary of State for Defence if he will make a statement on the results of his Department's investigation into the cause of the sonic boom heard in North Norfolk on 8 November.

Mr Caplin: The investigation into this reported sonic event is still ongoing; however, indications are that the aircraft that caused the event was a French Air Force Mirage operating in a military air-range over the North Sea. It is believed that the aircraft was approximately 18 miles off the coast when the event occurred.

2 December 2004

Road noise

Iain Wright: To ask the Secretary of State for Transport how much his Department has spent on noise reduction barriers to reduce noise from roads in each of the last seven years.

Mr Jamieson: Figures for the last seven years are not available. Spend on noise reduction barriers that are provided in conjunction with highway improvement schemes are not separately identified in the scheme cost. Spend on the installation of noise barriers provided retrospectively on older trunk roads that commenced in 2000, has been met by the £5 million per year ring-fenced allocation.

2 December 2004

Road works

Mr Goodman: To ask the Secretary of State for Transport

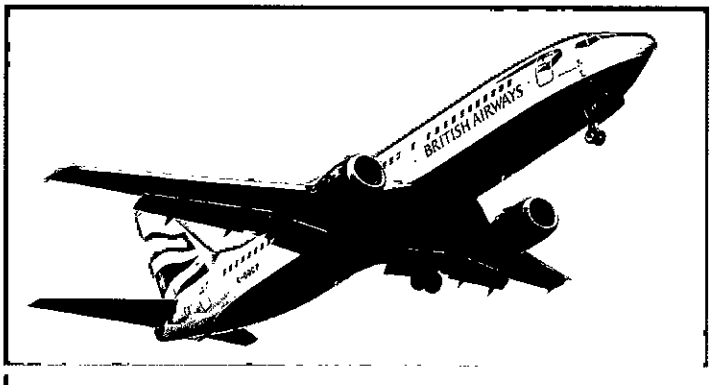
1 How much and what proportion of the Highways Agency budget for 2004-05 is expected to be spent on *(a)* noise barriers and *(b)* other environmental programmes in *(i)* maintenance and *(ii)* non-maintenance programmes;

2 What route mileage of *(a)* road surface and *(b)*noise barriers is expected to be installed by the Highways Agency and its operators in *(i)* 2004-05, *(ii)* 2005-06 and *(iii)* 2006-07.

Mr Jamieson: The Highways Agency does not have available all data in relation to noise barriers and other environmental measures in the format requested. However, it is known that approximately £8.5million will be spent on noise barriers in the current financial year. This figure is about 0.5% of the Highways Agency's published business plan total programme budget.

The total approximate cost of environmental measures for the current financial year is £20 million. This figure includes measures such as wildlife fencing, badger runs and landscape planting. Although some of the measures are noise related, it is not possible to break down the costs to extract these.

The cost of noise mitigation measures included in maintenance schemes cannot



It is the Government's view that all practicable steps should be taken to prevent any deterioration in the noise climate at Heathrow

be separately identified. However, when building new roads or re-surfacing existing ones, quieter noise surfacing is used where possible.
The approximate route length to be replaced or newly built in the current financial year is 400km. The approximate length of noise barriers to be installed in the same period is 32km. Figures are not yet available for 2005-06 and 2006-7 as budgets are yet to be confirmed.

7 December 2004

Road works

Mr Goodman: To ask the Secretary of State for Transport what criteria are used by the Highways Agency to determine whether *(a)* treatment of stretches or routes for non-maintenance reasons is included in the annual budget of the Highways Agency and *(b)* such treatment includes noise barriers.
Mr Jamieson: The annual budget of the Highways Agency is agreed by Ministers taking account of the resources available for transport and competing priorities from the different programmes. Within that budget, priority is given to maintaining the strategic network, reducing congestion and improving safety, in accordance with the key targets set by the Highways Agency. A ring-fenced annual budget of £5 million is allocated to treating noise problems at identified sites. Priorities for resurfacing of concrete roads ahead of maintenance need, subject to the availability of funding, were set out in the Secretary of State's announcement of 1 April 2003. The Highways Agency's budget and programme will be set out in its Business Plan, due to be published in the new year.

7 December 2004

Planning regulations (noise levels)

Mr Gordon Prentice: To ask the Deputy Prime Minister if he will include the decibel level of amplified calls to prayer as a criterion under planning regulations; and if he will make a statement.
Keith Hill: *Planning Policy Guidance Note 24 on Planning and Noise* outlines the considerations to be taken into account in determining planning applications for development which will either generate or be exposed to existing noise sources. The guidance states that noise impacts can be a material consideration in the determination of planning applications. A local planning authority may impose planning conditions which could specify a limit of new noise sources. The guidance does not set noise limits for any particular type of development and there are no plans to specify the decibel level of amplified calls to prayer in planning guidance.
Of course, such conditions can only be imposed on new developments. Complaints about noise from pre-existing sources would have to be dealt with by a local authority under the regulations for statutory noise nuisance. These regulations are the responsibility of the Department for Environment, Food and Rural Affairs.

Will the decibel level of amplified calls to prayer be a criterion under planning regulations?

The Highways Agency estimates that overall 27% of the trunk road network has been resurfaced with quieter surfaces

14 December 2004

Road noise

Mr Chope: To ask the Secretary of State for Transport what percentage of the trunk road network has been resurfaced with quieter surfaces pursuant to the policy announced on 17 October 2001; and what percentage will be resurfaced in each of the next three years.
Mr Jamieson *[holding answer 9 December 2004]*: The Highways Agency estimates that overall 27% of the trunk road network has been resurfaced with quieter surfaces. The Highways Agency is currently reviewing the programme for quieter surfaces over the next three years.
Mr Chope: To ask the Secretary of State for Transport how many of the schemes for resurfacing concrete trunk roads with quieter materials which were announced by the Highways Agency on 17 October 2001 have been completed; and at what cost.
Mr Jamieson *[holding answer 9 December 2004]*: The announcement on 17 October 2001 detailed a list of concrete road schemes planned for resurfacing, together with confirmation that further studies were underway to identify additional sites that met the criteria for quieter surfacing. In all, 19 schemes have been completed at a total cost of £141.6 million.
Mr Chope: To ask the Secretary of State for Transport if he will list the trunk roads with concrete surfaces which have been opened since June 1988; what the results were of noise surveys in respect of each; and whether the actual noise levels recorded were significantly higher than those predicted at the time of the public inquiry.
Mr Jamieson *[holding answer 13 December 2004]*: The surveys that the Highways Agency undertook on trunk roads with concrete surfaces opened since June 1988 measured the average noise levels arising from vehicles and compared these with the average predicted noise levels used at public inquiry, or public consultation where no inquiry was required. The differences between measurements and predictions for these roads are given in the following table:

Road	Road length (km)	Noise difference (dB)
MI8: Junction 5–6	2.3	1.3
M20: Junction 9–8	20.4	3.0
M23: Junction 10–9 northbound	1.3	-0.7
M1-A1 Link	15.5	5.2
A11: Besthorpe-Wymondham Bypass	13.7	3.1
A13: A1306 to M25 J30	3.0	0.6
A27: Chichester-Havant	13.8	4.6
A30: Honiton-Exeter	16.2	3.7
A34: Peartree-Weston	8.0	5.7
A35: Tolpuddle-Puddleton	7.2	2.6
A50: Doveridge Bypass	4.0	4.5
A50: Derby Southern Bypass	0.5	1.0
A50: Foston-Hatton-Hilton Bypass	3.6	-0.4
A52: Bottesford Bypass	4.8	1.7
A249: M2-Iwade	7.9	1.6
A419/A417: Cirencester and Latton Bypasses	14.2	5.0
A483: B5445 to Welsh boundary	3.1	2.6

The criterion of significance applied to differences in noise levels is 3dB and this criterion was met by eight of the roads surveyed.

16 December 2004

Motor racing

Mr Drew: To ask the Deputy Prime Minister if he will make a statement on the planning regulations which permit motor racing events on farms or other land holdings; and what restrictions apply, with particular reference to the ability to control similar events on other holdings in an area.
Keith Hill: Part 4 of the *Town and Country Planning (General Permitted Development) Order 1995* (the GPDO) grants a general planning permission for the temporary use of land for up to 28 days in any calendar year, subject to a number of restrictions and conditions. The general permission for motor sports, however, is limited to not more than 14 days in total, in recognition that they may,

continued on page 38

FROMHANSARD

continued from page 37

in some locations, cause problems such as parking, environmental damage, and noise. The use of land for motor sports for greater than 14 days would generally require an application for planning permission.

Unless a planning condition or other legal obstacle (such as a restrictive covenant) affects the situation, development permitted by the GPDO cannot be prevented except by the local authority using its powers under Article 4 of the GPDO to withdraw permitted development rights.

However, the Office of the Deputy Prime Minister's guidance to authorities emphasises that these powers should be used only in exceptional circumstances. They are intended for use where there is a real and specific threat to the proper planning or amenities of a limited area.

Whether to make a direction is entirely a decision for the local planning authority, though in the case of directions made under Article 4(1), approval by the Secretary of State is necessary for the direction to take effect.

Commons Oral Answers

16 November 2004

Noise disturbance (Plas Derwen)

Mr Huw Edwards *(Monmouth) (Lab)*: If the minister will meet the chief executive of Network Rail to discuss noise disturbance to residents of Plas Derwen, Abergavenny, from the nearby railway maintenance plant.

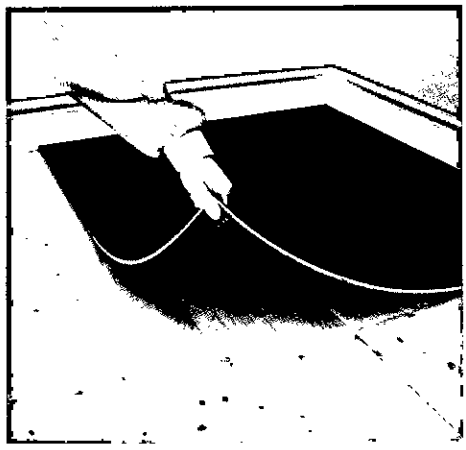
The Minister of State, Department for Transport (Mr Tony McNulty): Under the terms of its network licence enforced by the independent Office of Rail Regulation, Network Rail is obliged to secure the efficient and economical stewardship of the network in accordance with best practice. The operation and development of facilities at Abergavenny sidings is an operational matter for Network Rail, and I understand that it has offered to meet my hon. Friend to discuss the matter further. I wish him well with that meeting.

Mr Edwards: I am grateful to my hon. Friend. When he meets Network Rail's chief executive, will he tell him that my constituents find the noise of the double tamper locomotives sited at Abergavenny unbearable through the night? They feel that the guidelines which were agreed with Carillion and other contractors are not being followed, and that the plant could be better sited at Pontypool. Will my hon. Friend ask Network Rail to look into the issue and ask that its chief executive meet me, because I have repeatedly asked to meet him?

Mr McNulty: As I understand it, Network Rail notifies local residents and the environmental health officer at Monmouthshire County Council in advance whenever night work is planned at Abergavenny sidings. Network Rail endeavours to implement measures to mitigate the effect of its operations. In the first instance, I suggest that my hon. Friend meet the Network Rail regional manager, who has offered to meet him. I will be happy to receive a response from my hon. Friend about the success or otherwise of that meeting. Then we might take matters further.

New BS and ISO Standards relevant to acoustics

BS ISO 226:2003	Acoustics. Normal equal-loudness-level contours
BS EN 150389-8:2004	Acoustics. Reference zero for the calibration of audiometric equipment. Reference equivalent threshold sound pressure levels for pure tones and circumaural earphones
BS EN ISO 2151:2004	Acoustics. Noise test code for compressors and vacuum pumps. Engineering method (Grade 2)
BS EN ISO 3745:2003	Acoustics. Determination of sound power levels of noise sources using sound pressure. Precision methods for anechoic and hemi-anechoic rooms
BS EN. ISO 5136:2003, BS 848-2.5:2003	Acoustics. Determination of sound power radiated into a duct by fans and other air-moving devices. In-duct method
BS ISO 10494:1993	Gas turbines and gas turbine sets. Measurement of emitted airborne noise. Engineering/survey method
BS EN ISO 10846-4:2003	Acoustics and vibration. Laboratory measurement of vibro-acoustic transfer properties of resilient elements. Dynamic stiffness of elements other than resilient supports for translatory motion
BS EN ISO 11205:2003	Acoustics. Noise emitted by machinery and equipment. Engineering method for the determination of emission sound pressure levels in situ at the work station and at other specified positions using sound intensity
BS ISO 13372:2004	Condition monitoring and diagnostics of machines. Vocabulary
BS ISO 13374-1:2003	Condition monitoring and diagnostics of machines. Data processing, communication and presentation. General guidelines
BS EN ISO 13473-1:2004	Characterisation of pavement texture by use of surface profiles. Determination of mean profile depth
DD ISO/TS 13474:2003	Acoustics. Impulse sound propagation for environmental noise assessment
BS ISO 14695:2003, BS 848-6:2003	Fans for general purposes. Method of measurement of fan vibration
BS ISO 15665:2003	Acoustics. Acoustic insulation for pipes, valves and flanges
DD ISO/TS 15666:2003	Acoustics. Assessment of noise annoyance by means of social and socio-acoustic surveys
BS ISO 16902-1:2003	Hydraulic fluid power. Test code for the determination of sound power levels using sound intensity techniques. Engineering method - Pumps
BS ISO 17359:2003	Condition monitoring and diagnostics of machines. General guidelines
BS EN 1032:2003	Mechanical vibration. Testing of mobile machinery in order to determine the vibration emission value
BS CEN/TS 1793-5:2003	Road traffic noise reducing devices. Test method for determining the acoustic performance. Intrinsic characteristics. In situ values of sound reflection and airborne sound insulation
BS EN 13023:2003	Noise measurement methods for printing, paper converting, paper making machines and auxiliary equipment. Accuracy grades 2 and 3
BS EN 13487:2003	Heat exchangers. Forced convection air cooled refrigerant condensers and dry coolers. Sound measurement
BS EN 60704-2-6:2004	Household and similar electrical appliances. Test code for the determination of airborne acoustical noise. Particular requirements for tumble dryers
BS EN 60704-2-9:2003	Household and similar electrical appliances. Test code for the determination of airborne acoustical noise. Particular requirements for electric hair care appliances
BS EN 60942:2003	Electroacoustics. Sound calibrators
BS EN 61672-1:2003	Electroacoustics. Sound level meters. Specifications
BS EN 61672-2:2003	Electroacoustics. Sound level meters. Pattern evaluation tests



Sound Reduction Systems

Soundproofing to meet Building Regulations

The *Acoustilay* acoustic flooring underlay system has provided one developer with peace of mind when it comes to meeting Building Regulations Approved Document E (2003). It was chosen by Harrow-based Parkville Developments on the advice of **Sound Reduction Systems'** Southampton-based advisors and stockists, Exton Construction Supplies. This was the first time Parkville had used the product to achieve compliance with Building Regulations, but partner and contracts manager Rob Jordan was delighted with the results. He said: "We simply flew through the necessary independent acoustic tests. We were very relieved because the installation involved pot and beam floors which can be tricky to tackle in terms of controlling noise effectively."

Rob added that, while Parkville had used other acoustic systems in the past, the company was very impressed with the results achieved. Carpet could be fitted directly on to *Acoustilay*, which also cut down labour and time costs because it was so easy and quick to install. Another job involving wooden floors was shortly to begin, and they were considering repeating the system to achieve similar results.

Supplied in 1200mm by 1200mm tiles, *Acoustilay* can be used for contract or domestic installations, and is laid directly onto the existing floor having been cut to size or shaped with a standard trimming knife. Carpet may be laid directly on top using gripper or adhesive.

Further details: Sound Reduction Systems tel: 01204 380074 or Exton Construction Supplies tel: 01489 788911, web: www.soundreduction.co.uk

Castle Associates

Seminars on new Noise and Vibration Regulations

With the new European Physical Agents Directives for noise and vibration at work in place and UK law set to change in 2005, now is the time to find out more, says **Castle Associates.** The company is running a series of one-day seminars at some interesting and unusual venues, focusing on both the Noise at Work and the *Human Vibration* sections of the *Physical Agents Directive*.

With over 30 years experience in the noise and vibration industry, Castle trainers understand the complexity of the subject and appreciate that not all is crystal clear. For this reason one-day seminars will be held in March 2005 at Newcastle Football Club and Leeds Royal Armouries.

Dianne Hamblin, training manager from Castle said that anyone from an organisation where noise or vibration could be an issue would find the seminar very useful for breaking down the new directives into plain English, and for evaluating the implications for their company.

The programme for each day is divided into two sessions, with noise featured in the morning, and vibration throughout the afternoon. For more details and a brochure either phone Castle on 01723 584250 or visit the website at www.castlegroup.co.uk, where on-line booking is available.

Bruel & Kjaer

Measuring anti-social behaviour noise moves a step closer to helping resolve disputes

The introduction of new anti-social behaviour legislation, coupled with new, easy-to-use noise measurement technology, such as the **Bruel & Kjaer** *Type 2237ENA Controller*, is enabling local authorities, housing associations and landlords to be more flexible in the steps they can take to resolve domestic noise complaint investigations.

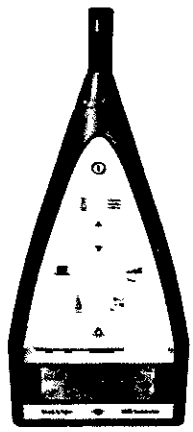
The combination of new simple-to-operate equipment and a more flexible approach to local enforcement provides powerful tools for those wishing to take swift, effective steps to deal with inconsiderate noisy neighbours who play amplified music or pursue prolonged noisy DIY activities at night time.

The recent legislation means that local authorities are now able to retain receipts from Fixed Penalty Notices for night noise offences to fund noise measurement activities with equipment like the *Type 2237ENA Controller*. Under the new legislation any noisemaker who is believed to have committed an offence under section 4 of the Noise Act 1996 (involving their failure to comply with a 'warning notice' served on them under Section 3 of the Act) will have the choice of paying a £100 fixed penalty instead of submitting to prosecution for the alleged Section 4 offence, conviction for which may incur a fine of up to £1000. Local authorities have a new power to retain income from night noise fixed penalty notices.

For the purposes of a night noise offence, the permitted level is determined in accordance with the following protocol. In any case where the underlying level of noise does not exceed 25dB, the permitted level shall be 35dB. Otherwise, in any case where the underlying level of noise exceeds 25dB, the permitted level shall be 10dB in excess of the underlying level.

The *2237ENA Controller* is designed to take even novice users step-by-step through noise measurement procedures in compliance with the Noise Act 1996. The instrument is a Type 1 sound level meter designed to be quick and simple to use when taking measurements to assess domestic and general environmental noise complaints. Fully documented results can be easily printed on-the-spot, complete with calibration data to comply with the Act's measurement protocol.

In its Noise Act mode the instrument simultaneously measures the offending noise level and the underlying noise level over a five-minute period. The instrument is designed to prompt operators to guide and remind them of the correct measurement and calibration procedures. Up to 80 records of measurement results can be stored. Each record includes the date and measurement time together with the noise parameters relevant to the selected operational mode. Measurement results may be recalled to the display, printed on a portable battery-operated printer or transferred to a PC in spreadsheet-compatible format.



Fabio Fineschi, the company's internal sales engineer, explained that the data captured by the *2237ENA* helped to resolve many complaints cost-effectively without the need to go to court. For those situations where the matter could not be resolved out of court then the instrument provided the necessary noise measurement documentation to enable a successful prosecution under the relevant Anti-Social Behaviour legislation.

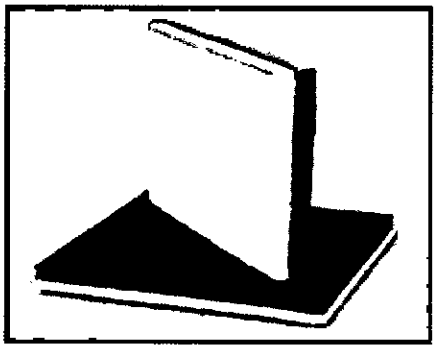
For more than 60 years Bruel & Kjaer has been a noise measurement innovator, pioneering numerous breakthroughs in environmental noise monitoring and working with local authorities throughout the UK to help them solve noise measurement problems.

Further details: Nicola Parker tel: 01438 739000 fax: 01438 739099 e-mail: ukinfo@bksv.com web: www.bksv.co.uk

Hodgson & Hodgson Group

SoundMat offers affordable acoustic flooring

The introduction of *SoundMat* by **Hodgson & Hodgson Group**, offers effective sound insulation in an affordable high-performance acoustic underlay that can be quickly and simply rolled out on existing timber and concrete floors or cut to fit timber stairs. *SoundMat* is manufactured from a high-density polymeric barrier bonded to a resilient layer of acoustic felt and is designed to reduce both airborne sound and noise transmission through new and existing floors or stairs. It is ideal for domestic and commercial applications and can be used as an additional layer of sound insulation when replacing carpets with hard floor finishes like laminates, hardwood or ceramic tiles. It is suitable for use at normal building temperatures and is ideal for extensions and loft conversions, where improved sound insulation within the property is required.



Floors where it is to be laid merely need to be structurally sound, have no loose boards and be dry, clean and dust-free. Once existing loose-laid floor coverings have been removed (including gripper rods, carpet tacks *etc*) and the floor surface is flat and level, SoundMat can be fitted.

Tests have shown that its performance comfortably exceeds British Standard requirements for tensile strength, static loading and resistance to breaking and cracking, as well as compression after dynamic loading. Results suggest that the product can reduce impact noise by more than 29dB when laid on a concrete floor, and its versatility ensures successful use with a wide range of different floor finishes.

Specific floor constructions will experience differing levels of noise reduction. The company is able to discuss potential improvements in acoustic performance according to each customer's individual circumstances.

Chairman Glynne Balshaw-Jones, says that his group of companies is widely known as a supplier and installer of quality acoustic building products including floors, walls, ceilings and doors. However, by talking to architects, builders, developers and householders, a need was quickly identified for high-performance acoustic flooring that could be installed almost instantly within existing buildings. *SoundMat* was invented to fit that bill at a price everyone could afford.

The product is available through a national network of stockists, distributors, builders' merchants and specialist carpet fitters.

Further details: tel: 01606 75076 fax: 01606 74315 web: www.acoustic.co.uk

LMS International

Offers Caterpillar solutions for noise and vibration engineering

LMS will provide Caterpillar with its *Virtual.Lab* and *Test.Lab* solutions for noise and vibration engineering. They will be used to optimise the vibration comfort and noise performance of new designs, from the early virtual prototype stages up to the final prototype validation. LMS is known at Caterpillar for its comprehensive approach to noise and vibration engineering, the productivity of its solutions, and the flexibility of the SCADAS III data acquisition platform on which the software runs.

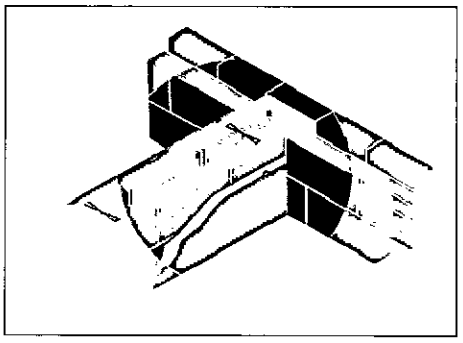
Competitive pressure continuously forces off-highway manufacturing companies to optimise the noise and vibration performance of their products, and to respond pro-actively to changing customer requirements and ever-stricter legislation. The *Test.Lab* system strongly supports engineering teams in tackling these complex challenges. The product combines state-of-the-art capabilities, ease of use and a complete coverage of key noise and vibration applications.

This increases its operational efficiency in pinpointing and correcting vibration problems, and in analysing and optimising the dynamic properties of designs.

In off-highway engineering, the role of noise and vibration testing is no longer limited to the qualification and optimisation of physical prototypes in the late development stages. Using *Virtual.Lab*, engineering teams analyse the correlation between finite element (FE) models and test models, and improve the former's accuracy. In addition, the system helps them build hybrid simulation models, combining FE models and test-derived models of components and subsystems. This supports the accurate simulation and efficient optimisation of a design's noise and vibration performance before committing to virtual prototype testing.

LMS describes itself as an engineering innovation partner for companies in the automotive, aerospace and other advanced manufacturing industries. The objective is to enable customers to get better products faster to market, and to turn superior process efficiency to their strategic competitive advantage. The company delivers a combination of virtual simulation software, testing systems, and engineering services. Its efforts are focused on the mission-critical performance attributes in key manufacturing industries, including structural integrity, handling, safety, reliability, comfort and sound quality. The company is certified to ISO9001:2000 quality standards and operates through a network of subsidiaries and representatives in key locations around the world.

Further details: Bruno Massa tel +32 16 384 200 e-mail: bruno.massa@lms.be



Celcon

Candidate Robust Detail

Evidence shown by the achievement of a **Celcon** *Thin-Joint* system Candidate Robust Detail, in terms of sound insulation, has shown it outperforms other masonry constructions.

Candidate Robust Detail (CRDMW8), covering thin layer mortar with aircrete blockwork for Separating and Flanking walls, is now at the final stage of approval. The Board of Directors of Robust Details Limited has given its approval for the Candidate Robust Detail MW8 to be issued as a Part E compliant Robust Detail. Although it will not be possible to register the use of this construction until the end of January 2005, the details of CRDMW8 are shown in the illustration.

This approval, once complete, will add to the existing Robust Detail E-WM-6 offering a thin-layer mortar separating wall construction Robust Detail, a construction capable of achieving a mean airborne performance which is at least 50dB DnT,w+Ctr. This is 5dB better than the mean airborne Part E performance standard which is 45dB min DnT,w+Ctr. This Candidate Robust Detail is expected to achieve full Robust Detail status at the end of January 2005. Until this final version of the new Robust Detail document is published it will not be possible to register plots using this construction. The board of Robust Details Limited has stated this will minimise uncertainty amongst Robust Detail customers and others.

Details of the Candidate Robust Detail (CRDMW8) follow:

Separating wall

12.5mm plasterboard on dabs (nominal 8kg/m^3)

Render coat - scratch finish (6mm minimum – nominal 8mm)

Minimum 100mm Celcon Standard (thin layer mortar – 2mm)

Minimum 75mm clear cavity

Minimum 100mm Celcon Standard (thin layer mortar – 2mm)

Render coat - scratch finish (6mm minimum – nominal 8mm)

12.5mm plasterboard on dabs (nominal 8kg/m^3)

Flanking walls to the above

Masonry outer leaf

Cavity closer

Minimum 100mm Celcon block (thin layer mortar – 2mm)

Further details: www.celcon.co.uk

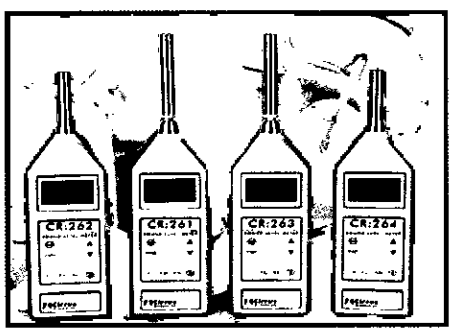
Cirrus Research

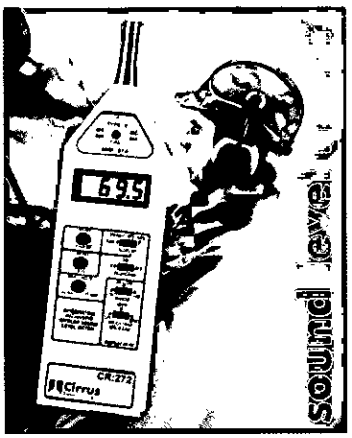
A simple-to-use sound level meter for noise at work measurements

Noise in the workplace remains a major health and safety issue, particularly with the introduction of new Control of Noise at Work Regulations in early 2006. Employers need to be active in assessing the risk of hearing damage to their staff.
The *CR:272* from **Cirrus Research** provides all the measurement functions required for a comprehensive noise assessment, whilst remaining simple to use. The layout and switches on the instrument have been designed to be used by operators who may only need to carry out measurements occasionally.
With the imminent changes to workplace noise regulations, accurate measurement of noise level is as important as ever. The *CR:272* is the ideal tool to ensure compliance with both current and future legislation. The unit can be supplied on its own, or as a complete measurement kit which includes all the accessories required for operation.

CR:260 Series makes noise measurement easy

Cirrus Research has released a new range of easy-to-use sound level meters, designed to meet the needs of health and safety professionals. The *CR:260 Series* consists of four different instruments. The *CR:262* and *CR:261*, Type 2 and Type 1 respectively, provide for the measurement of L_{eq}, L_{CPeak}, L_{max} and L_{min}. The *CR:264* and *CR:263* add octave band filters.





The new range of instruments has been designed to provide just the essential features needed to comply with Noise at Work Regulations. Many users just need the essential functions from a sound level meter, and are looking for something simple and easy to use.
The instruments can be upgraded to the '+' version, which allows up to 100 measurements to be stored and downloaded to the *Deaf Defier 3* software. In the case of the *CR:263* and *CR:264*, upgrading to the '+' version also allows the software to help select hearing protection devices.

New doseBadge version

The company has also introduced a new version of the *doseBadge* personal noise dosemeter system. The new *CR:110A doseBadge* has an increased measurement range, logging of true peak(C), a new NiMH battery system and an increased infra-red communications range. The configuration of the *doseBadge*, including criterion level and exchange rate, can be adjusted independently, essential in an instrument used for noise measurements across the world.
There are no cables or controls, reducing the risk of tampering or misuse, and the small physical size and weight means that the person wearing the *doseBadge* will quickly forget that it is there. This also helps to reduce the risk of tampering or shouting into the microphone, a common problem with all noise dosemeter measurements. Recent additions to the user base of the product include fire and rescue services, airlines and musicians, for all of whom the small size and weight has provided key benefits.
The new version of the *doseBadge* advances the idea of a small, lightweight personal noise dosemeter to a new level. Over the nine years since its introduction, new functions and software have been added, and the latest *CR:110A* includes many features that have been requested by customers and distributors around the world.
The imminent Control of Noise at Work Regulations will mean that many more workers are exposed to levels above the first and second action levels, and this device allows employers to make an assessment of the risk with the minimum of effort and time. Using several at once allows the employer to gather more data quickly and efficiently, which then results in more information being available on which to base the risk assessment.
The new *doseBadge* is complemented by a revised reader unit, the RC:110A. This features an increased infra-red range and a USB connector to facilitate the downloading of data to the new dBLink3 software.
Introduction of the CR:110AIS, an ATEX and EEx certified version of the unit, which will

further expand its areas of use, is planned for early 2005.
Further details: James Tingay
tel: 01723 891655 fax: 01723 891742
email: sales@cirrusresearch.co.uk
web: www.cirrusresearch.co.uk

UK Timber Frame Association

Part E solutions guidelines published

The UK Timber Frame Association (UKTFA) has come up with definitive technical guidance for designers and specifiers of timber frame systems. The 48-page document, *Resistance to the Passage of Sound*, contains robust details and site-tested solutions to make compliance with Approved Document E (England and Wales) of the Building Regulations 2000 easier to achieve.
The publication addresses the requirements for residential properties and looks at floor and wall design, including party walls, party floors, internal walls and intermediate floors. Examples of specific details are given, including solutions to traditionally weak areas for sound insulation such as junctions and service areas. Sound absorption in corridors, hallways, stairwells and entrance halls providing access to residential properties is also dealt with.
Inevitably, the main focus of the document relates to timber frame party walls and party floors, which are now strictly controlled in order to provide residents with protection from noise in other parts of the building. To simplify the solutions, the party wall is divided into three separate layers, and the party floor into eight separate layers, each with its own set of performance requirements. For each layer, a range of product variables is identified to enable the specifier to 'pick and mix' materials and arrive at a solution that suits the particular project.
Timber frame internal walls and intermediate floors are addressed using a similar approach. The appendices provide additional information on a range of subjects, including the acoustic performance of timber party floors supported on masonry walls, the different plasterboard types and surface masses, and links to other information sources.
Further details at www.timber-frame.org where a contact form can be found. Non-members of UKTFA requiring *Resistance to the Passage of Sound* will be charged £5 per copy to cover administrative costs.

Casella CEL

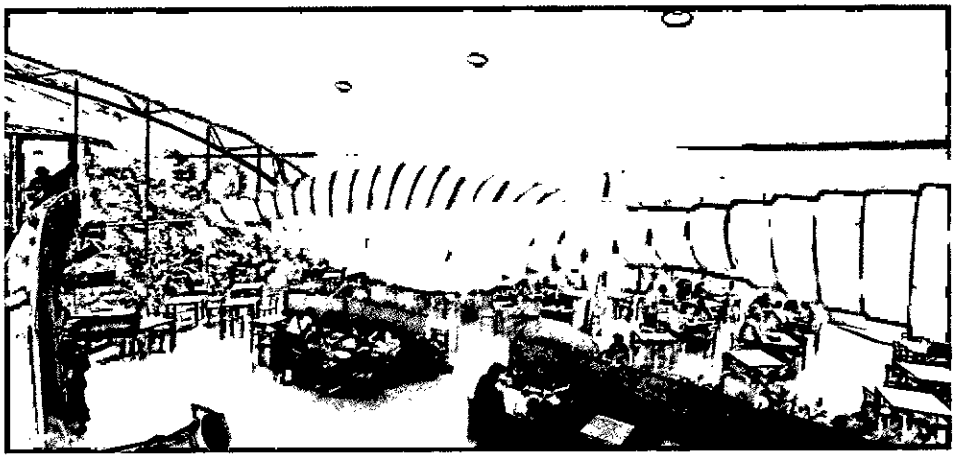
Eden Project benefits from latest technology

Visitors to the £100million Eden project in Cornwall, the staff who work there and the people living nearby are all benefiting from state of the art noise measurement technology from **Casella CEL**.

The project's Technical Services Team took delivery of a *CEL-490* sound monitor, and trained its environmental monitoring technician Steve Nicholls in its use. The idea was to undertake monitoring in a variety of locations where excessive noise has been, or could be, a problem.

The equipment has been successfully used in the ticketing hall where the noise is created by the sheer volume of visitors, together with sounds from various exhibits within the acoustically-poor building. The identification of noise sources allowed acoustic screens to be positioned effectively.

As the Eden Project has progressed from its horticultural and botanical beginnings to a greatly enhanced facility catering for widely differing events, the meter has demonstrated its versatility. To give just two examples, it confirmed that noise levels produced by pop and rock concerts held in the 'Pit' open-air arena would not be intrusive to residents living 500m away, and during work on a 100-tonne piece of Cornish granite that is to form the centrepiece of a new educational resource centre, noise was monitored and kept within acceptable levels.



Steve Nicholls explained that the purchase of the equipment and the subsequent training had been calculated to be financially more prudent than ongoing employment of acoustical consultants.

With its emphasis on environmental monitoring, the meter and frequency analyser's single measurement range of 140dB eliminated one of the most common causes of measurement errors - range adjustment. A simple 'point-and-shoot' operation produced all necessary statistical parameters, provided a time history of the noise levels at a selectable time interval down to 10ms, and reduced the time spent in analysis.

Further details: tel: +44(0)1234 844100
fax: +44(0)1234 841490
e-mail: info@casellacel.com
web: www.casellaCEL.com

CEL-490 in use at the Eden Project

Casella CEL

Sound level meter with unique calibration function

The latest version of the EU Noise at Work Directive introduces significantly tighter noise limits and many more businesses will now be required to make workplace noise assessments.

To coincide with these new requirements, Casella CEL has introduced an integrating sound level meter with a unique auto-calibration capability. This function provides a simple and effective route to field calibration ensuring the instrument can measure accurately, but remains extremely easy to use.

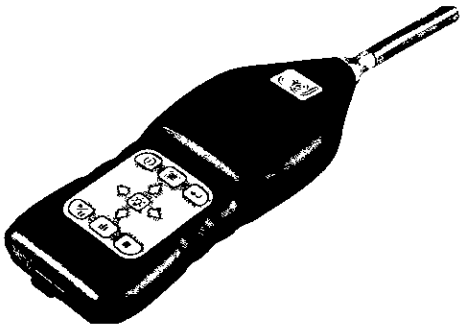
For the first time in this class of product the Digital Signal Processing (DSP) technology normally only found in sound analysers is featured. The instrument uses the signal analysis capability of the DSP technology to detect automatically when a calibration signal is applied, and to automatically undertake a calibration check without the user needing to control the instrument operation. The meter is also equipped with a single-span measurement range up to 140dB so all the action levels in the regulations can be measured simultaneously.

The CEL-430 integrating sound level meter range provides two accuracy grades, and is ideal for any industry or business wanting to monitor noise in order to assess workforce noise exposure. The range can also accurately measure all types of sounds including impact noise.

The limits of the latest EU Physical Agents Directive (Noise) will require many more employers to think seriously about workplace noise measurements. The company is aware that many people who have never dealt with an acoustical instrument before will want to be able to handle it first time without any difficulty. This user-friendly 'Noise at Work' sound level meter is cost effective and very accurate.

The CEL-430 range can be used worldwide as it is compliant with the majority of overseas workplace noise regulations: and the user menu is available in five languages (English, French, German, Spanish and Italian). There is also a supporting software package so that data can be logged and downloaded in real-time to a PC. The meter has a storage capacity of 99 runs, and after all storage has been used the system overwrites the oldest runs first. A run can be for a maximum of 24 hours.

The meters are compliant with the following



international performance standards: EU Sound Level Meter Standards IEC 61672 2002-5, IEC 60651,and IEC 6084, and US Standards ANSI S1.4 1983 and SI.43. There are two accuracy grades in the range: CEL-430/1 (+/- 0.5dB) and CEL-430/2 (+/- 1.5dB). Annual laboratory recalibration is recommended.

The meter weighs 550g with batteries (four type AA alkaline cells), and measures 340 × 100 × 40 mm (width × height × depth) including pre-amplifier and microphone.

Further details: tel: +44(0)1234 844100
fax: +44(0)1234 841490
e-mail: info@casellacel.com
web: www.casellaCEL.com

Engineering Integrity Society Workshop

Human Perception of Combined Sound and Vibration

Tuesday, April 19 2005
Millbrook Proving Ground, Millbrook, Bedford, UK

Taken individually, the human subjective response to sound or vibration can be estimated using well-known methods. There are, however, no generally accepted methods for evaluating the two in combination. Does the sound change the perception of the vibration? What about the other way around? Do separate measures of intensity for the sound and the vibration provide a complete picture of the human response? This EIS workshop, the first on the topic of combined exposures, will address a selection of these issues.

The workshop will be of interest to designers, testing specialists, NVH experts and other individuals who routinely face the problem of evaluating sound or vibration. Particular emphasis will be placed on road vehicle and transport applications. The assembled team of experts will discuss recent theoretical and practical developments, and demonstrations involving a high dynamic bandwidth driving simulator will help to clarify the issues involved.

Theoretical background

- ❑ Subjective equivalence of sound and vibration and vehicles
  J Giacomin and M Ajovalasit (Sheffield University)
- ❑ Human response to combined steering vibration and sound, and fundamentals of cross-modal and contextual interactions
  N Mansfield (Loughborough University)
- ❑ Developing best practice for use of an interactive NVH simulator
  P Jennings (Warwick University)
- ❑ Demonstration in the Sound & Vibration Technology high bandwidth NVH simulator

Measurements and simulation

- ❑ S&VT functional approach to NVH driving simulation
  R. Williams (Sound & Vibration Technology)
- ❑ Application of source path contribution methods to the NVH perception in vehicles
  M Batel and B Ginn (Bruel & Kjaer)

Full vehicle testing

- ❑ Methodologies for the analysis of NVH perceived quality
  V Falasca and F Ferrian (Centro Ricerche Fiat)
- ❑ Vibration and sound as measures of vehicle drivability
  P Schoeggl (AVL LIST GmbH)

For further information and registration please visit our website at http://www.e-i-s.org.uk or contact: Catherine Pinder, Engineering Integrity Society, 5 Wentworth Avenue Sheffield S11 9QX tel (0) 114 262 1155 fax (0) 114 262 1120 email: cpinder@e-i-s.org.uk
Booking forms can also be downloaded directly from http://www.e-i-s.org.uk/Workshop.pdf

NOVEM 2005

The Noise and Vibration - Emerging Methods 2005 conference

Taking place on 18-21 April 2005 at St Raphael on the Côte d'Azur (close to Nice International Airport), this event will focus on emerging techniques in noise and vibration. This gathering of researchers working in the areas of noise and vibration, is intended to promote a substantial exchange of scientific information. The conference is especially targeted at people from research establishments (universities, institutes) and to those from industry who are responsible for developments in the field of noise and vibration control.

The four main topics are:

- ❑ prediction for noise design;
- ❑ novel modelling approaches;
- ❑ innovative material technologies; and
- ❑ advanced identification techniques

NOVEM 2005 aims to promote discussion and exchange, with each of the four days devoted to one of the emerging themes. These will bring together several key specialists within a common keynote forum, which will provide an up-to-date overview and outline the perspectives of the area concerned.

Following these extended keynote addresses there will be contributed papers. The oral presentations will be focused on essentials, but appended with posters for detailed exchanges. The presentations will be merged with prolonged periods of discussion.

Register online

Intending delegates should register online at http://www.insavalor.fr/novem2005
The cost is 400 euro (350 euro for students).

Castle Group

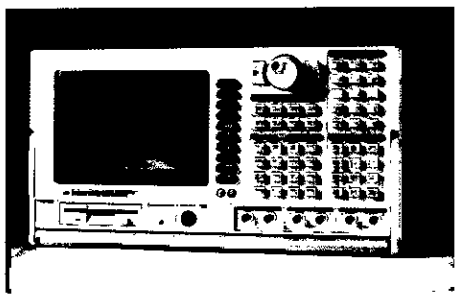
Tailored rental solutions

For flexibility and cost-effectiveness, many organisations take advantage of rental equipment rather than outright purchase.
A service offered by **Castle Group Ltd**, *CastleRent*, has the backing of one of the industry leaders in noise and vibration measurement equipment. This backing, coupled with the latest technology in the noise measurement field, means that customers are safe in the knowledge that they can get expert advice and the right instrument for their particular problem. *CastleRent* can also offer short-term rental for periods from three days.
A full range of equipment is available, from simple sound level meters, to meters with octave band capabilities and in-built hearing protection data. Noise dosemeters can also be rented individually or in kits of five.
For vibration issues the Castle 2000 series of vibration meters is available. These are suitable for general vibration monitoring applications and hand-arm risk measurements. The company says that all its products are available at realistic prices. Rental meters are fully serviced and issued with calibration certificates before despatch, guaranteeing high standards every time.
Further details: Karen Archer or Simon Bull tel: 01723 584250 fax: 01723 583728 email: sales@castlegroup.co.uk web: www.castlegroup.co.uk

British Gypsum

Part E 'Robust Detail' approval for Gyproc SoundCoat

Gyproc SoundCoat, a new quick-setting 'parge' coat product for acoustic sealing of aggregate block separating walls, has been granted approval for use in 'Robust Detail' (RD) constructions. As previously reported in *Acoustics Bulletin*, Robust Details are a means of satisfying the requirements of Approved Document E which avoids the need for pre-completion testing.
Following 30 separate successful site tests, three RD separating wall constructions, based on existing E-WM-3, E-WM-4 and E-WM-5 aggregate blockwork specifications, and incorporating a 6mm thickness of Gyproc SoundCoat in place of the current 8mm sand and cement render, have successfully met the performance requirements.
This means that the new constructions may be submitted as approved constructions under the RD plot registration scheme with immediate effect. They will provide a major time and cost benefit to housebuilders, who will be able to apply lining boards just two hours after the application of shrinkage-free Gyproc SoundCoat, instead of having to wait until sand and cement render is fully dry.
The dry powder product is simply mixed with clean water on site to produce a slurry-like paste, and then applied to a 'rough' finish without any need for significant training of operatives. It can be applied quickly and easily by hand or spray,
Further details can be found at www.british-gypsum.com/homespec Information on Robust Details for the construction industry are at www.robustdetails.com



TTi **Dual-channel FFT signal analyser**

The *SR785*, now available in the UK from **TTi** (Thurlby Thandar Instruments), is a dual-channel dynamic signal analyser which is suitable for analysing both electrical and mechanical systems.
The computational heart is a 32-bit floating-point digital signal processor that delivers a true 102.4kHz real-time bandwidth on both channels simultaneously. Bandwidth is not sacrificed for the number of channels used. Two precision 16-bit analogue/digital converters provide a 90dB dynamic range in FFT mode and a 145dB dynamic range in swept-sine mode, which is enough for the most demanding applications. With up to 800 lines of spectral resolution, the *SR785* allows the user to zoom in on any portion of the 476mHz to 102.4kHz range.
A new and unique measurement architecture allows each input channel to function as a separate analyser with its own span, centre frequency, resolution and averaging modes. This means that the user can view a wideband display and at the same time zoom in on specific spectra. The same measurement architecture provides simultaneous storage of all measurements and averaging modes. Vector-averaged and rms-averaged data, as well as data before averaging, are all available without the need to start the measurement again.
The unit is equipped with a wide selection of averaging techniques to improve the signal-to-noise ratio. Vector averaging will eliminate noise from synchronous signals, while rms averaging reduces signal fluctuations. Peak-hold averaging is also available. A built-in 3.5-inch 1.44 Mbyte floppy disk drive, GPIB and RS-232 interface ports, and a Centronics printer port combine to allow unlimited flexibility in saving, printing, plotting or exporting measurement data. The SR785 costs £9680 plus VAT.

Audio and test measurement system

The *Audio Precision ATS-2*, available exclusively in the UK from **TTi** (Thurlby Thandar Instruments), is a high-quality PC-controlled audio test and measurement system that provides design engineers and technicians with the ability to choose performance capabilities to match specific needs and budgets.
The multi-tone analyser used in the ATS-2 provides comprehensive solutions to a range of audio testing challenges by executing five performance tests in a single acquisition: 2-channel frequency response; noise versus frequency; total distortion versus frequency; inter-channel separation versus frequency; and inter-channel phase response. The system collates all the data required to graph any test result in less than one second.
The interface measurement capability within the system determines whether or not the signal from a digital device meets standards and is compatible with other devices. High-performance measurement capabilities include jitter and FFT of jitter, pulse amplitude, word width, bit activity, sample rate and high-level decoded status bits. Interface stimulus features simulate real-world degradations to measure the effect on the device during testing.
Most settings and readings can be designated as independent or dependent variables, and can be plotted against one another using the comprehensive sweep and graph functions.
Further details: tel: 01480 412451 fax: 01480 450409 email: sales@tti-test.com website: www.tti-test.com

CALM Network meeting discusses strategy for future research on reducing environmental noise in Europe

The European Commission Research Directorate-General recently hosted the annual meeting of the CALM Network in the Management Centre Europe in Brussels

This initiative is the result of a close collaboration between DG Research and DG Environment which is the part of the Commission responsible for the co-ordination of the European environmental noise policy. This close collaboration should ensure that initiatives concerning research on noise reduction are in line with the requirements of the related EU directives, the EU noise policy and other environmental policies of the EU such as air quality.

The CALM network membership has been established with representation from each of the working groups (WGs) that are supporting the development of the Directive on Environmental Noise (2002/49/EC). For an overview of the working groups, see http://europa.eu.int/comm/environment/noise/overviewexpertnetwork.pdf

All WGs gave presentations, except WG Airports.

The meeting's central focus was a presentation of the updated Strategy Paper of the CALM network outlining the plan for future research on reducing environmental noise in Europe. The future noise policy is built on a long-term target based on the Sixth Environmental Action Programme of 2002. The vision supported by CALM for the year 2020 is to 'avoid harmful effects of noise exposure from all sources and preserve quiet areas'.

The major sources of environmental noise to be considered are transportation (road, rail and air traffic) and outdoor equipment.

The structure of the noise research strategy is split into perception-related and emission-related research combining these two goals.

Strategic priorities

Strategic priorities in the future noise research are given to:

- **perception-related studies**, such as advanced computation and measurement methods for more accurate assessment of noise exposure, definition of urban and rural quiet areas, improvements in dose-effect relationships for L_{den} and L_{night}, development of noise indicators considering specific effects, advancing methods of cost-benefit assessment, combining effects between air pollution and noise pollution, improvement and extension of noise valuation method, as well as of the socio-economic instruments for noise abatement; and
- **emission-related studies**, focusing on the further advance of emission-related regulation and support for the development of new technologies and solutions.

During the morning session, hot topics on environmental noise research were discussed. These included presentations on health and socio-economic aspects of noise, noise-exposure assessment methods, as well as reports in recent research noise generated by railways, roads and outdoor equipment.

The afternoon session was outlined by the future-plans presentations of the Research Advisory Councils within the CALM network and reports on national contributions (coming from Germany, France, and the Netherlands) to the European noise research.

The conference programme and the presentations are available on the CALM web site: www.calm-network.com

The various presentations during the meeting initiated fruitful discussions. A frequently-occurring question challenged the connection between research and real action addressing the environmental noise problem. To many participants the links between research needs, research programmes, specific results and implementation remained obscure. Moreover, it was also unclear how the public was involved in setting up CALM's future research targets.

A major gap in the network research seems to be the lack of a holistic approach to noise pollution, which will evaluate the cumulative effect of all noise-producing sources. While some research was done on the health effects of noise on humans, no studies so far have been conducted on the impacts of environmental noise on the ecosystem. The human-centred approach to interpreting environmental conflicts is dominating the research priorities of CALM and thus cutting off aspects of the overall effects on the environment.

Need for research synergy

Drawing his conclusions from the meeting, Mr Patrick Mercier-Handisyde, EC-DG Environment, pointed out the need for more synergy across the various research sectors. He drew attention to the inefficient co-ordination and information sharing between CALM's Research Councils and the national research programmes, resulting in repeated research at national and European levels. The importance of compatibility between CALM's future research targets and national research programmes was given special consideration.

Mr Mercier encouraged the use of the CALM web site and the specialised forums as a platform for scientific discussion and information sharing, and expressed his belief that CALM will develop as a powerful research institution and a funding organisation on noise reduction.

Innovative noise control engineering

The Noise Abatement Society has praised The Banks Group for its work on the noise control of site plant by awarding the company the *John Connell Award for Innovation 2004*. The award was presented by the (then) Home Secretary Rt. Hon. David Blunkett MP to the team at an awards evening in the House of Commons. The award is designed to encourage creative innovation in noise abatement issues that succeed in improving the environment.

The Banks Group, which was founded in 1976 by current chairman Harry Banks, employs more than 400 people in the UK. Its main activities are property development and land reclamation, mineral extraction, renewable energy and waste management. The group operates throughout the UK, with regional offices in the Midlands, North East and North West of England and Scotland.

Banks insulated plant on site

The company established a noise control team to research and design modifications to site plant, not only to create a better working environment for staff, but also to further reduce the possibility of noise pollution outside the site. The company's noise reduction programme substantially reduced the volume of sound emitted by large excavators and dumptrucks used at two of its surface mines in Yorkshire and Northumberland.

The engine compartments of the CAT dumptrucks and Terex excavators on the site have been fitted with acoustic insulation panels as well as exhaust silencers and silencers for the cooling air inlets.

Peter Wakeham, director of the Noise Abatement Society, mentioned that a pair of kestrels had nested on one of the sites and successfully hatched three eggs while work continued close to the nest, illustrating the effectiveness of the noise reduction measures.

Mark Dowdall, divisional director for environment at Banks, spoke on behalf of the company when he said how delighted the team was to have its hard work recognised. They were committed to 'Development With Care' and this was another example of the investment put into this approach.

Members of the Banks team celebrate their award

Institute Sponsor Members

Council of the Institute is pleased to acknowledge the valuable support of these organisations

Key Sponsors

Brüel & Kjær CASELLA CEL Cirrus Research plc

Sponsoring Organisations

Acoustic Air Technology Ltd

Acoustic Consultancy Services Ltd

AcSoft Ltd

AEARO

Allaway Acoustics Ltd

AMS Acoustics

A Proctor Group Ltd

Arup Acoustics

Bridgeplex Ltd (Soundcheck™)

BRE

Burgess - Manning Europe Ltd

Campbell Associates

Castle Group Ltd

Civil Aviation Authority

Eckel Noise Control Technologies

EMTEC Products Ltd

FaberMaunsell

Firespray International Ltd

Gracey & Associates

Greenwood Air Management Ltd

Hann Tucker Associates

Hodgson & Hodgson Group

Industrial Acoustics Company Ltd

LMS UK

Mason UK Limited

National Physical Laboratory

Rockfon Limited

Sandy Brown Associates

Shure Brothers Incorporated

Spectrum Acoustic Consultants

Tiflex Ltd

Wardle Storeys

Applications for Sponsor Membership of the Institute should be sent to the Institute office. Details of the benefits will be sent on request

Institute Diary 2005

15 February
Measurment & Instrumentation Group From DAT to DISK
The Royal Society, London

17 February
Membership
St Albans

24 February
Medals & Awards
St Albans

24 February
Executive

1 March
Engineering Division
St Albans

3 March
Publications
St Albans

10 March
Council
St Albans

12 March
Meetings
St Albans

21 – 22 March
Underwater Acoustics Group Sonar Transducers and Numerical Modelling in Underwater Acoustics
NPL, Middx

22 March
Diploma Examiners Meeting
St Albans

19-20 April
Building Acoustics Group Spring Conference: The Heart of Building Acoustics – what makes it tick?
Oxford

22 April
CCWPNA Examination
Accredited Centre

13 May
CCENM Examination
Accredited Centre

19 May
CCWPNA Examiners & Committee

20 May
CMOHAV Examination
Accredited Centre

26 May
Publications
St Albans

2 June
Membership
St Albans

7 June
CCENM Examiners & Committee

14 June
CMOHAV Examiners & Committee

16 - 17 June
Diploma Examinations

21 June
Research Co-ordination
London

23 June
Distance Learning Tutors & Education

28 June
Engineering Division
St Albans

30 June
Executive
St Albans

7 July
Meetings
St Albans

14 July
Council
St Albans

9 August
Diploma Moderators Meeting
St Albans

15 September
Membership
St Albans

29 September
Medals & Awards & Executive
St Albans

6 October
Diploma Tutors & Examiners & Education
St Albans

7 October
CCENM Examination
Accredited Centre

13 October
Council
St Albans

18 October
Engineering Division
St Albans

18 - 19 October
Measurement & Instrumentation Group Autumn Conference 2005
Oxford

20 October
Publications
St Albans

25 October
Research co-ordination
London

27 October
Membership
St Albans

4-5 November
Electroacoustics Group Reproduced Sound 21
Oxford

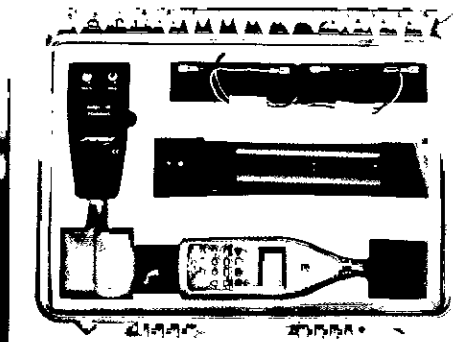
ADVERTISERS INDEX

ANV Measurement Systems

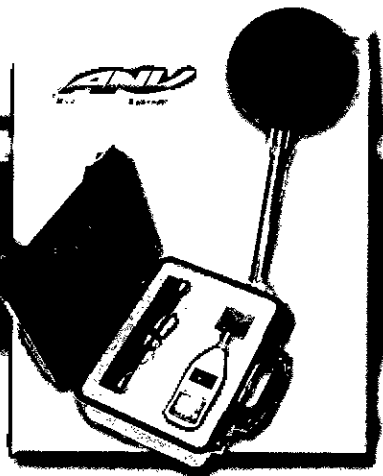
The UK Distributor of RION Sound and Vibration

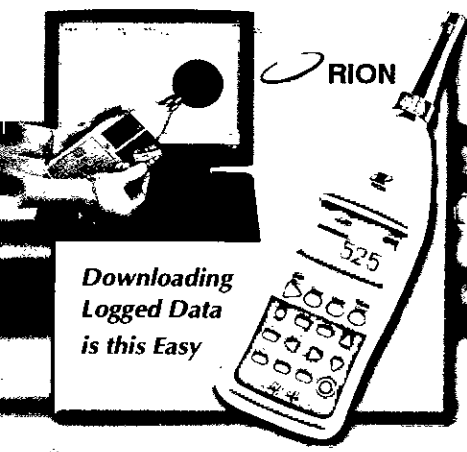
Sales • Hire • Calibration

Easy to Use • Excellent Quality • Exceptional Value



Quick and Easy to Use
Data and audio synchronized in meter
Fast data transfer using compact flash
Software displays synchronized audio and data
Click on file icons for instant audio replay

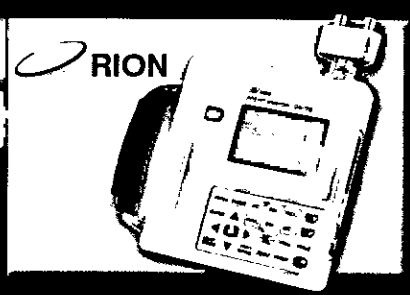




Downloading Logged Data is this Easy

Hire NTL Series
Integrating Sound Level Meters
The Simplest Solution for Environmental, Workplace or Product Noise
Class 1 & 2 with these options:
Simple Data Logging; Audio Recording
Real Time Octaves/3rd Octaves
FFT Narrow Band Analysis

Outdoor Measurement Kit
Simple and Reliable
GSM Download Option

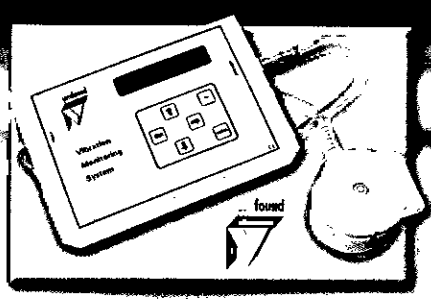


Dual Channel Sound & Vibration Analyser
FFT, Octaves, 3rd Octaves
Correlation & Transfer Function Analysis

NA-27 Class 1 Analyser

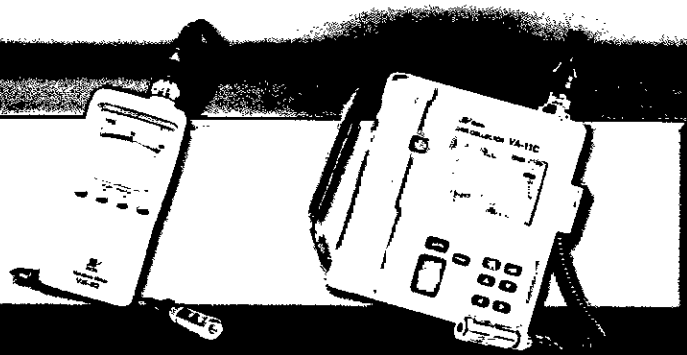
Comprehensive Class 1 Analyser for:
Architectural Acoustics
Environmental Noise
Workplace Noise

Protouch VM System
The Simplest, Most Practical Way to Log Vibration Levels



Rion Vibration Meters & Analysers

Portable
Practical
Easy to Use



ANV Measurement Systems - Hastings House, Auckland Park, Milton Keynes MK1 1BU
☎ 01908 642846 📠 01908 642814
✉ info@noise-and-vibration.co.uk 💻 www.noise-and-vibration.co.uk