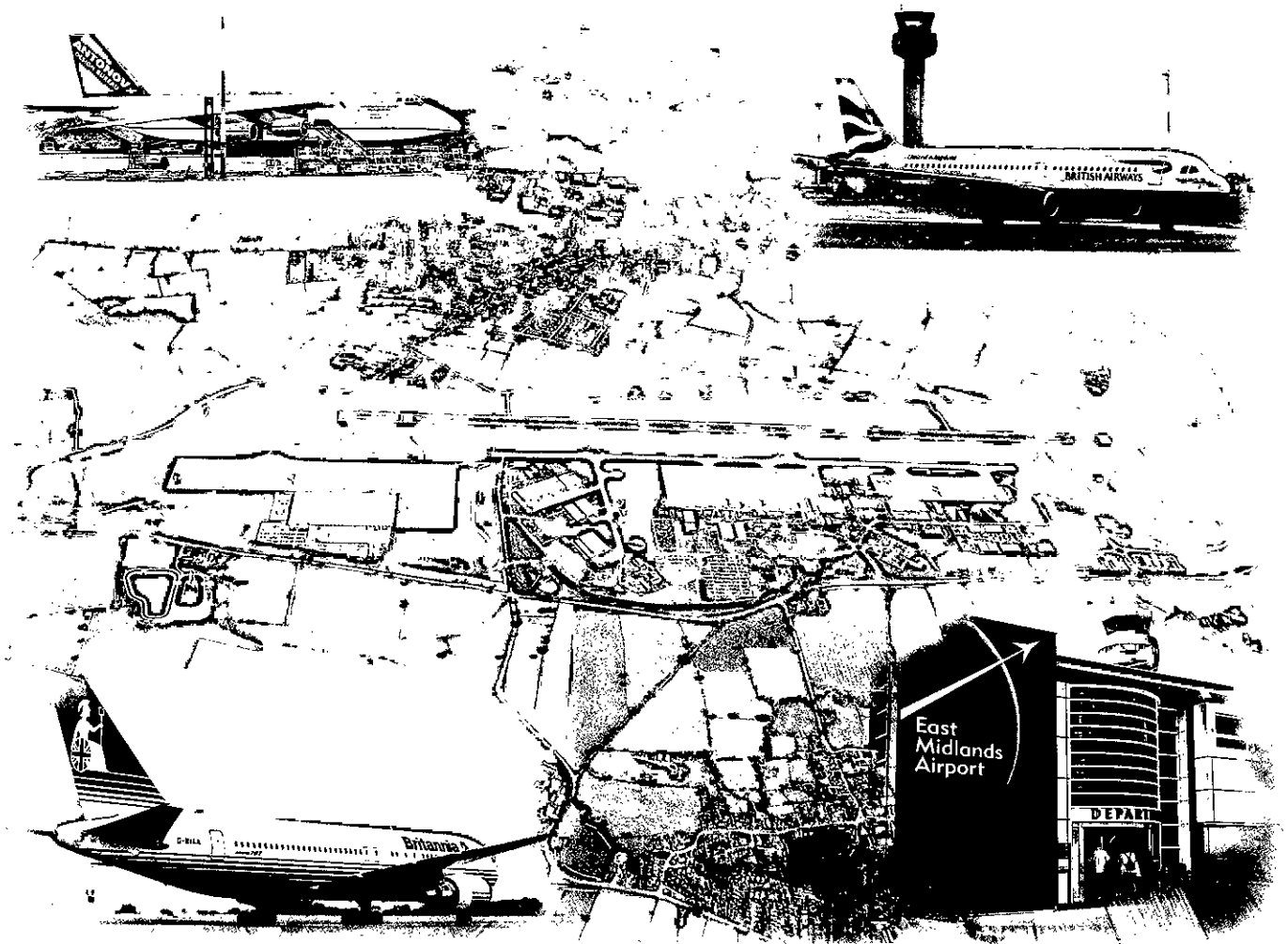


Acoustics

BULLETIN

VOL 26 No 4 JULY/AUG 2001



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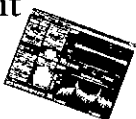
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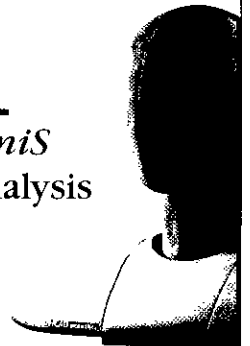
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BULLETIN

Vol. 26 No. 4 JULY/AUG 2001

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 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.

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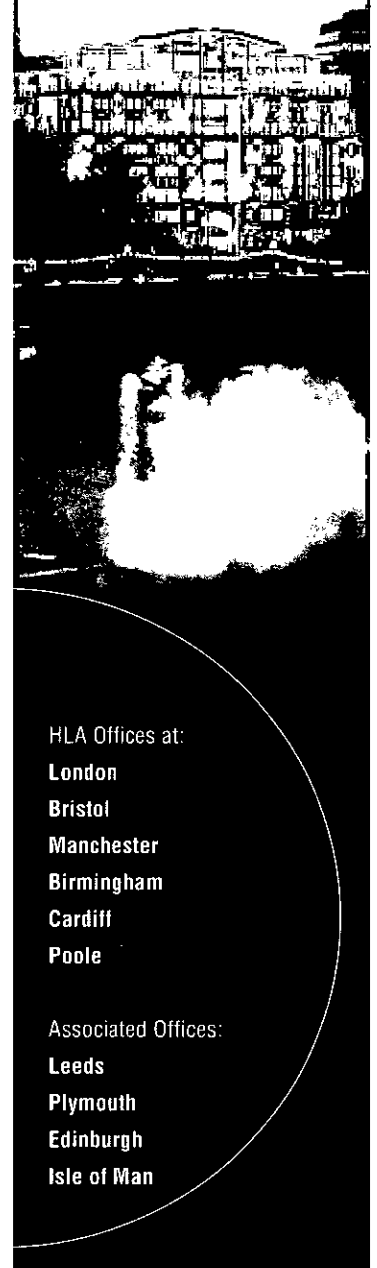
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**Dear Members**

As I was happy to report to you in the last Acoustics Bulletin steps have been taken to join the new-look European Acoustics Association. The next meeting of the Association's Board takes place in Rome in the first week in September, and we are looking forward to full participation again from now on.

Plans are well underway for the Institute's Spring Conference, which in 2002 is being held at the University of Salford and being organised by Y W Lam and Keith Attenborough. A call for papers appears in this issue of Acoustics Bulletin and a page has been set up on the Institute's website (click on '2002 Spring Conference').

The meeting is to be a celebration of acoustics and great UK acousticians - an ambitious undertaking! You will recall that Keith is coupling the EPSRC Theme Day to this meeting and the idea is to make everyone aware of exactly what is going on in acoustics in the UK at the moment - and to speculate, perhaps, on future directions.

I urge you to help the organisers make this our 'best ever' Spring Conference and respond enthusiastically to the organisers' hard work!

With best wishes

Mark Tatham

IOA Council: Annual Report 2000

GENERAL REVIEW OF ACTIVITIES

The operation of the Institute is guided by Council through Standing Committees concerned with Membership, Meetings, Publications, Education, Medals & Awards, Professional Development and Research Co-ordination. There is also a Committee of the Engineering Division. Each Regional Branch and Specialist Group also has its own elected Committee. A summary of the activities of each Committee follows.

STANDING COMMITTEES

Membership Committee

There were the usual four meetings, and a total of 237 individual applications (all grades) were considered, including potential new members and transfers between grades; 164 were approved (83 corporate, 81 non-corporate) including ten reinstatements. Twelve new sponsoring organisations were welcomed although four resigned. However, 82 individual members resigned, three died, and a further 91 names were removed for non-payment of fees. There was a net loss in individual membership of 11; compared with the previous year there were fewer elections and more losses in the grade of Associate Member, but the changes in the other grades were similar.

The Institute's revised *Code of Conduct* was issued early in 2001 following amendments necessary as a result of changes in the Engineering Council's *Code of Conduct*. Two *Code of Conduct* cases were resolved during the year. The revision of the membership application forms and the related administrative processes has continued and this will be completed during 2001.

Meetings Committee

The year 2000 saw the Meetings Committee commence a period of transition. As part of this process a meeting of representatives of the Institute's Groups and Branches was held in February at which the proposed changes to the Committee's Constitution were outlined. The proposals were approved at that meeting and secured the approval of Council later in the year.

The new, smaller, Committee consisting of Stephen Turner, Jeremy Newton and Ken Dibble, now has to take the work on to the next stage and provide an overall strategy regarding the meetings held by the Institute. This phase of the work is under way and it is expected that proposals will be available early in 2001.

It is timely to record particular thanks to Neil Spring and Richard Tyler who were regular attendees of the Meetings Committee before these changes occurred, but who are now assisting with the organising of meetings within their Specialist Groups.

Whilst going through this transition, the usual round of meetings occurred in 2000, including successful major conferences at Liverpool in April and, for the second year, at Stratford-upon-Avon in the Autumn. In addition a variety of

Table 2: Group Membership

Group	1999	2000
Building Acoustics	492	460
Electroacoustics	109	101
Environmental Noise	648	613
Industrial Noise	411	386
Measurement & Instrumentation	97	93
Musical Acoustics	90	85
Physical Acoustics	71	64
Speech	89	79
Underwater Acoustics	136	124

one-day meetings and workshops was held, as well as a range of evening meetings run by the Regional Branches. It is most encouraging that there are so many people within the Institute who have the ideas for meetings and then put the time in to make them happen.

During last year, a small sub-committee under the enthusiastic leadership of Bernard Berry tried to secure short-listing for holding *Inter-noise 2004* in this country. Unfortunately, probably because it would have been only eight years since we last hosted this conference, our bid was unsuccessful.

Publications Committee

The year 2000 saw great change for the Publications Committee. In June, Cathy Mackenzie and Roy Lawrence (CMMS) indicated that they were unable to enter into a new form of contract for the production of the *Bulletin* and a ten-year period of unstinting service ended with their work on the November/December 2000 issue.

In addition to six editions of the *Bulletin*, our annual *Register of Members* was published in 2000, as was our second edition of the *Buyers' Guide*.

Production of the *Bulletin* has been re-structured for 2001. Following extensive research, the Institute appointed a St Albans based company, International Labmate Limited, to provide design, layout and reprographic services and to sub-contract the printing services. The *Bulletin* has been re-designed and was unveiled with the circulation of the January/February 2001 edition.

A new Editor has been appointed: he is Ian Bennett who has been a Member of the Institute since 1983. His appointment commenced with the March/April 2001 edition. Associate Editor, John Tyler, kindly agreed to be acting editor for the January/February 2001 edition. An Editorial Board has been set up to solicit regular editorial material for the Editor. Our Librarian Alison Hill resigned in May and Library services are currently being covered by existing office staff. The future development of the Library is being considered by the Library Working Group, which will report in 2001.

Education Committee

The Education Committee had another successful year in 2000 and the *Diploma in Acoustics and Noise Control* and the *Certificates of Competence* continued to recruit and train acousticians at all levels.

Peter Wheeler accepted the position of part-time Education Manager and took up his duties in January 2001, combining this with his current responsibilities as Engineering Division Manager. He brings to the job considerable experience of higher education and will be giving his immediate attention to the need to improve our quality assurance procedures for all our education courses. This is a priority so that alignment of our programmes with any national Credit Accumulation and Transfer System (CATS) scheme will be in place once the Government make the final decision on the CATS format.

Table 3: Branch Membership

Branch	1999	2000
Eastern	245	247
Irish	92	93
London	554	562
Midlands	329	345
North West	266	261
Scottish	125	125
South West	203	201
Southern	423	433
Yorks/Humberside	141	178

Table 1: Institute Membership

Grade	1999	2000
Hon Fellow	17	16
Fellow	229	222
Member	1270	1294
Associate Member	691	676
Associate	122	111
Student	46	45
Totals	2375	2364
Key Sponsor	3	3
Sponsor	25	24
Institutional Subscriber	5	14

During the year, three centres - University of Derby, University of the West of England and the University of Ulster - were re-accredited to run the *Diploma in Acoustics and Noise Control* following inspection visits by Education Committee delegations. Accreditation procedures and the frequency of inspection visits for all courses are currently under review. There were some changes in the Diploma examiners; Bob Peters took on the role of project moderator following the retirement of Brian Leyland and John Walker moved from Transportation Noise examiner to Deputy Chief examiner. John Bowsher retired from his role as Deputy Chief examiner after many years of dedicated work in raising the standards of the Institute examinations and the Education Committee is very indebted to John for his efforts.

Following a decision to revise the structure of the Diploma, progress has been made towards a new syllabus for the Diploma in September 2001. As part of the new structure it is planned to introduce a new module on Environmental Noise Assessment into the programme. Once the new syllabus is finalised work will start on the revision of the Distance Learning notes; this work will require funding by the Institute if it is to be enacted within a sensible time scale.

In September 2001, a *Course Handbook* was issued to all Diploma students for the first time. The Handbook guides students through all stages of the Diploma and includes advice on examination and projects. It is proposed that this Handbook will be made available on the Institute web site in 2001.

The short courses in *Workplace Noise Assessment* and *Environmental Noise Measurement* had a successful year, with recruitment figures slightly up from 1999. There was a 10% increase over 1999 with 115 candidates taking the *Certificate of Competence in Workplace Noise Assessment*. The revised HSE Guidelines for Noise at Work assessments meant that a new course syllabus was produced in 1999 and this also led to revised guidance notes for practical tests and reports which were issued to all centres during 2000. This involved a considerable amount of work for our Chief Examiner, David Bull and we are grateful for his efforts.

The revised guidelines also provided the opportunity to run refresher seminars and three one-day meetings were held towards the end of the year in London, Birmingham and Leeds. The events were run by Andy Watson, David Bull and Bob Peters and were attended by over 90 delegates. This was a very good response and an important link with the industrial marketplace.

In order to reduce costs and workload, it was decided to reduce the number of examinations to two per year. From 2001 there will be examinations in May and November. Three members of the Committee, Alan Dove, Graham Custard and Kiri Kyriakides, resigned during the year and were replaced by Robert Harris and Brian Leyland.

The Certificate of Competence in Environmental Noise Measurement Committee met twice during the year and carefully considered matters arising from moderation of candidates' papers as well as the wider business of the Institute's education brief. Of particular concern were standardising conditions for practical examinations, off-site

delivery of the course and the ever-worrying question of maintaining academic standards. The syllabus for the Certificate was reviewed and revised.

The Committee was deeply saddened to learn of the death in November of Peter Barnett. Peter had been a founder member of the steering group and therefore a participant in the drafting of the first syllabus for the qualification. Peter's breadth and depth of knowledge and robust determination to uphold academic standards were invaluable. He will be very much missed.

No examinations for the *Certificate of Competence in the Measurement of Sound Transmission within Buildings* were held during the year. Progress was made towards the introduction of a new Certificate Course in the *Management of Occupational Hand Arm Vibration*. An Advisory Board has been formed under the chairmanship of Tim South and five centres have been accredited to run the new programme. It had been hoped that the first courses for this Certificate would run in time for an examination in November 2000, but in the event none of the accredited centres recruited sufficient participants. The first examinations were therefore scheduled for April 2001, and the number of enquiries from potential candidates has been increasing. The post of Chief Examiner for this Certificate still needs to be filled.

Medals and Awards Committee

The 2000 *Rayleigh Medal* was awarded to Prof Victor Krylov for his pioneering work in the field of Rayleigh waves and their application in science and engineering. The presentation is due to be made at the 2001 AGM meeting in London, where he will give his medal lecture on 'Ground vibrations from road and rail traffic'.

The Autumn Conference at Stratford-upon-Avon was the venue for presenting the 1999 *RWB Stephens Medal* to Prof David Hothersall, whose medal lecture was entitled 'Design criteria for efficient noise barriers', and the 2000 *Tyndall Medal* to Prof Y W Lam, whose lecture was 'The modelling of noise from industrial buildings - from inside to outside'. The *AB Wood Medal 2000* was awarded to Dr Gary Heald for his outstanding research work in underwater acoustics. The medal was presented at the April 2001 Acoustical Oceanography meeting in Southampton, where his lecture subject was 'High frequency sea bed back-scattering and sediment discrimination'.

Reproduced Sound 16 at Stratford-upon-Avon proved to be a fitting occasion to confer an Honorary Fellowship on Dr Roy Lawrence for his outstanding services to the Institute. Roy had instigated the successful *Reproduced Sound* series of annual conferences and over the years has made an enormous contribution to the very fabric of the Institute. Many tributes were made to Roy and Cathy Mackenzie (already an Honorary Fellow since 1998), which were enjoyed by them, their family and their many friends present at the conference.

Prof Adrian Fourcin was also awarded an Honorary Fellowship in 2000 in recognition of his distinguished work in the field of speech and hearing. It is hoped that a suitable occasion to present the award will be found in 2001. Other awards made during the year have included the Institute's best diploma student prize to Geoff Young, the Association of Noise Consultants prize for best diploma project also to Geoff Young, and the joint Institute/ISVR Prof Douglas Robinson prize which was awarded to Miss I Tsui.

Professional Development

During 2000 the Institute's Professional Development Scheme changed considerably. Rather than amassing 'hours' of CPD, the members are now encouraged to prepare a career plan which includes professional development as its main tool to achieve goals. It was decided to discontinue the charge made for being a member of the CPD Scheme, and to encourage all members to plan their careers and training.

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A document has been produced which describes the Scheme, and an article appeared in the *Bulletin* during the summer. Information has also been available at the Autumn Conference and the Reproduced Sound Conference. Although the Scheme has changed, there is still a need for members to record their professional development, so that they can provide proof of their progress. A form for this purpose can be downloaded from the Institute's web site.

The Institute continues to provide certificates of attendance at conferences and seminars for those who require them. It has been decided that an important part of the Scheme will be to encourage employers to play a part, and the Committee will be pursuing this facet of the Scheme during the next year. For the year ahead, we shall continue to publicise the Scheme and urge all members to take part.

Table 4: Details of Employment

Employment category	1999	2000
Architectural Practice	11	11
Consultancy	567	536
Industry/Commerce	277	262
Education	197	184
Public Authority	423	389
Research and Development	184	170
Other	52	48
Retired	63	57

Research Co-ordination Committee

Towards the end of 2000, the Institute established this new standing committee under the chairmanship of Keith Attenborough. An early objective is to work with the EPSRC to organise a Theme Day on research in acoustics, to be held as part of the Institute's Spring Conference in 2002. To make the most of this opportunity, and to fulfil its longer term co-ordination role, the committee's first task is to create a database of current and recent research in acoustics.

Engineering Division

2000 has been a year of major achievement for the Engineering Division. The Committee met four times during the year and ten CEng Professional Review Interviews (PRIs) were held. The Division's *Policy and Procedures Manual*, required under Engineering Council rules, was developed and issued. The Manual contains an internal audit process with implementation plan. The Engineering Council Audit visit took place on 1 August. The Panel was very impressed and encouraged with our progress and we have been granted a full four-year licence with few constraints.

A new Engineering Council Representative has joined the Committee - Tom Blaney, a CEng and CPhys, who has recently retired from a senior post at NPL. Tom succeeds Mervyn Leach of the Nuclear Engineers, who was very helpful to the Institute in developing the work of the Division and in preparing for audit. Tom has played a very active part in the Division's work since his appointment in August. Richard Tyler, our internal auditor, carried out the first internal audit of the operation of the Division. Some potential procedural improvements were suggested and a number of minor non-compliances were identified.

Considerable progress has been made towards the introduction of SARTOR 3 procedures. These new procedures, introduced by the Engineering Council last year, require that candidates demonstrate their professional development achievements against defined generic competencies. This will lead to more structured interviews, with clearly defined baseline criteria for levels of achievement

for candidates in all thirty-seven institutions. All current CEng/ IEng candidates have been provided with guidance for the preparation of their reports. There is more work to be done to prepare guidance to candidates in relation to specific acoustical engineering competencies.

The Institute has joined, and contributed to, the inter-institutional initiative in developing PRI Assessor training materials, lead by IIE. PRI training packs were prepared and issued to all Engineering Division Committee members and assessors in January 2001. Training sessions for PRI assessors were held. These focused on the assessment of the SARTOR 3 competence and commitment requirements, in particular their scoring.

Closer working arrangements have been developed with IMechE professional development and membership departments and new processes for IPD guidance and assessment were evolved and agreed. The task for the Division now is to maintain and develop the flow of candidates for CEng/IEng registration. There are some forty current 'live' candidates and more than 100 Stage 1 registrants. Letters have been sent to all 'live' candidates and a similar letter is being sent to the Stage 1 younger engineers. The flow of enquiries from the letters that are now sent to new Institute members and to upgraded members after their adoption at each Council meeting is increasing.

The Engineering Council/Royal Academy of Engineering review of the *Universe of Engineering*, chaired by Sir Robert Malpas, was published during the year. This review seeks to identify the breadth of engineering practice and possible new growth areas. Following a lively discussion with Sir Robert, several acoustical themes, ranging from speech recognition and active control to music technology, were identified by the report as examples for the future growth of engineering. Following representations with the Higher Education Funding Council for England (HEFCE) last year, the Institute has been accepted as a nominating body for HEFCE University Research Assessment Exercise Panel Members in engineering.

The joint Institute/IMechE degree accreditation visit to ISVR took place in March. Barry Gibbs acted as the Institute's assessor. The accreditation was carried out using IMechE procedures, with the Institute members playing a full part in the assessment process.

Colin English succeeded Bob White as Chairman of the Engineering Division at the November meeting. Bob White was thanked for his twelve years of service to the Committee as PRI Assessor and, latterly, as Chairman. Alex Burd and Richard Bines also retired from the Committee after many years' service. The Committee is keen to involve more CEng and IEng Institute members in its work, either as committee members or as PRI assessors, and anyone interested is asked to contact the Office.

SPECIALIST GROUPS

Building Acoustics Group

The Building Acoustics Group held a one-day meeting in January 2000 on the acoustic design of cinemas and large leisure complexes. This meeting was attended by over 60 delegates and began with a visit to the IMAX cinema in Waterloo. This was followed by a series of papers on technical issues and a forum on various practical issues.

The Building Acoustics Group was also very active in the organisation of the Spring Conference *Acoustics 2000 - Research into Practice* held in Liverpool. Bob Craik presented a keynote address on the application of statistical energy analysis to large structures such as buildings and this was followed by several sessions on low frequency noise in buildings, building

services noise, sound insulation in buildings and base isolation of buildings. The annual general meeting of the Building Acoustics Group was held during this conference.

After many years of service Jeff Charles resigned from the committee and Nick Antonio and Carl Hopkins were elected. A one-day meeting was held in October on *Nursing acoustics: acoustics in hospital design*. The meeting included presentations and discussions on the effect of noise and vibration on patients, staff and sensitive medical equipment.

Electroacoustics Group

The Electroacoustics Group was responsible for arranging the RS16 conference held at the Stratford Victoria Hotel, Stratford-upon-Avon in November. Robin Cross acted as Chairman of the organising committee and the theme was *Sound Reinforcement*. A visit backstage to the Swan Theatre and the main Royal Shakespeare Company Theatre was well supported. Jeremy Dunn, Sound Manager, gave a fascinating insight into the complex tasks involved in planning a new production.

It was particularly fitting that RS16 was chosen as the occasion to present Roy Lawrence with an Honorary Fellowship, since he had been instrumental in starting the series of conferences originally at the Hydro Hotel, Windermere.

The outstanding contribution to the work of the group made by Peter Barnett, who died shortly after RS16, merits special mention and it is hoped to establish an annual memorial lecture and prize in Peter's memory.

Environmental Noise Group

The Environmental Noise Group continued to maintain its momentum during 2000. A seminar/workshop on PPG24 and PAN56 was held in May at Strathclyde University, and was well attended. A seminar/workshop on the proposed revision to MPG11 was held in July at Birmingham. Despite short notice, it was well attended and useful feedback was obtained and passed to the DETR.

The working party which is drafting the Code of Practice on the control of noise from pubs and clubs is continuing to meet on a regular basis, and it is hoped to issue a document soon. The Environmental Noise Group continues to provide significant input to the joint Institute/IEA Guidelines on Noise Assessment, and slow but sure progress is being made on this document.

Industrial Noise Group

During the year, the Industrial Noise Group held its first AGM following its reformation in February 1999. The Group organised the Autumn Conference attended by some 70 delegates, and 21 speakers, plus session chairmen. During the summer and autumn, the Committee was involved in surveying the Industrial Noise Group's membership with the aim of ascertaining what they expect from membership of the Group. If appropriate, changes will be sought (bold, radical, and even uncomfortable if necessary). The Committee hopes to report back in 2001.

Measurement and Instrumentation Group

The Measurement and Instrumentation Group continued to thrive and organised three successful events during the year. The Group's first ever two-day meeting, *Measuring Noise Outdoors*, was held on 1 and 2 March at the Shuttleworth Collection and the nearby Swan Hotel in Bedford. It passed off well, although the measurement sessions on the first day were a little delayed due to rain. The difficulties in co-ordinating the 'live exhibits' of vintage aircraft and vehicles comprising the Shuttleworth Collection with the measurement expected from the delegates were possibly underestimated by the meeting organisers, but the feedback from the questionnaires was mostly favourable.

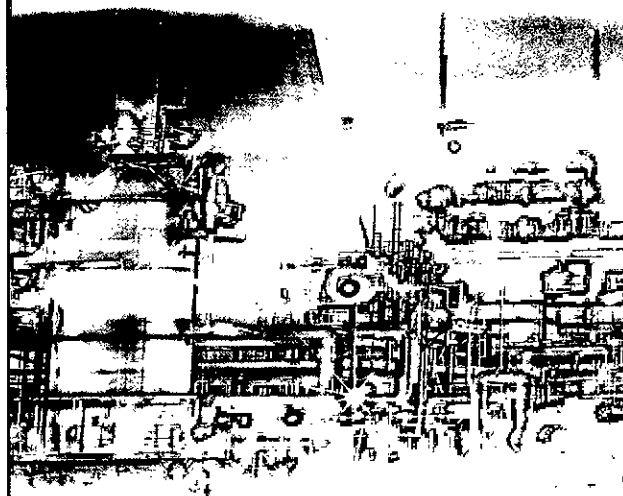
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IOA Council: Annual Report 2000

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The next meeting took place on 27 June at the Royal Society in London. Entitled *Shaking all over*, it was essentially a rerun of the very successful *Getting a Grip on Hand-Arm Vibration* meeting held last year but with changes to include some work on whole body vibration and the medical effects and diagnosis and treatment of diseases caused by vibration. The update seemed valuable to all those present.

The third event was a meeting on *Sound Power Measurement* held on 24 October at Bushey House in the grounds of NPL. Considering the impending requirements for many additional items of machinery to be labelled with their sound power levels, it was a little disappointing that more people did not attend, but the quality of the presentations and the ensuing discussion made a very worthwhile meeting for those present. A full programme of meetings for 2001 is already planned.

Musical Acoustics Group

Year 2000 was again relatively quiet for the Musical Acoustics Group, which has not been involved in any conferences or meetings. The Group has, however, been working towards implementing the follow-up actions arising out of the 1999 Industry Focus Meeting on Musical Acoustics, and a report on the meeting and future plans will be issued shortly.

Physical Acoustics Group

(Joint with Institute of Physics)

The Physical Acoustics Group Committee held four meetings during the year. The traditional Group Annual Review Meeting and AGM *Physical Acoustics 2000* took place on 24 October at the Institute of Physics HQ in London. The programme

included ten oral presentations followed by the Group's AGM. According to the Group's Committee, the meeting was a success, and those who attended found it very useful. The Group's 2001 Annual Review Meeting is planned to take place at the Institute of Physics HQ in London. Other events planned for the future by the Group include a one-day meeting, *Ultrasonic Spectroscopy for Material Characterisation*, to be organised in the framework of the Institute of Physics Annual Congress 2001, and a series of Anglo-French meetings on Physical Acoustics (AFMPA). It is proposed that the first AFMPA will be held in 2001 in France. The exact date, venue and the final format of the meeting is still under discussion with the Committee's counterparts at the SFA (Societe Francaise d'Acoustique).

Speech Group

The main activity of the group during the year was the organisation of the Spring 2001 conference, entitled *Workshop in Innovation in Speech Processing (WISP 2001)*. The committee held two meetings at Institute HQ to discuss the format and organisation of the conference, which took place at the Stratford Victoria Hotel, Stratford-upon-Avon, in April 2001. About thirty submissions were received (including two from the USA, one from Australia and some from other European countries) of which twenty-four were selected to form the conference programme. Four distinguished speakers would also give keynote presentations. Advance publicity was mainly carried out by e-mail and the conference web site.

The Group held a meeting in January at Birmingham University, organised by Martin Russell, and entitled *Speech Production and Automatic Speech Recognition*. Eight papers were presented and the attendance of almost seventy was extremely good. The Speech Group AGM took place after this meeting and was attended by about twenty-five members. The Committee reported its ideas for the WISP 2001 conference to the Group and comments from members were generally supportive. It was expected that the 'WISP 2001' conference would be the main focus of the Group's 2001 activity, but other ideas for one-day meetings were under consideration.

Underwater Acoustics Group

Following the decision taken in 1999 not to hold any Group Conferences in 2000 because there were other major meetings being held elsewhere in the world, the Group's activities were concentrated on future plans. Two major Conferences were scheduled to take place in 2001, *Acoustical Oceanography* at Southampton in April and *Underwater Bio-Sonar Systems and Bioacoustics* at Loughborough in July; organisation of these, each with an A B Wood Medal address, was well under way.

James Dunn was elected as Chairman of the Committee in place of Peter Dobbins who remains on the Committee. Judith Bell from Heriot-Watt University was elected to serve on the Committee.

The long-running question of a second Underwater Group book to follow on from the very successful one on 'Transducers' by Denis Stansfield was resolved by deciding to offer the separate chapters as contributions to the *Bulletin*, subject to the authors' permission and necessary updating.

REGIONAL BRANCHES

Eastern Branch

The Eastern Branch had another good year with seven technical meetings and one social meeting which, due to popular demand, was another cruise on a Thames sailing barge down the River Orwell. This attracted the full complement of 50 people.

Table 5: Meetings Attendance in 2000

Topic, Date and Venue	Attendance
Cinema Acoustics 19 January, National Film Theatre, London	70
Measuring Noise Outdoors 1-2 March, Shuttleworth Collection and Swan Hotel, Bedford	46
Spring Conference 2000: Research into Practice 17-18 April, University of Liverpool	167
Sound Insulation after Baxter & Mills 24 May, Commonwealth Conference Centre, London	70
Shaking All Over 27 June, Royal Society, London	43
MPG11 Workshop 10 July, Aston Science Park, Birmingham	24
Nursing Acoustics 12 October, Commonwealth Conference Centre, London	29
Measurement of Sound Power 24 October, NPL Teddington	28
Autumn Conference, Industrial Noise 11-12 November, Stratford Victoria Hotel, Stratford-upon-Avon	77
Reproduced Sound 16 17-19 November, Stratford Victoria Hotel, Stratford-upon-Avon	88
Workplace Noise Assessment Seminar 21 November, Commonwealth Conference Centre, London	24
Workplace Noise Assessment Seminar 30 November, Chamberlain Tower Hotel, Birmingham	32
Workplace Noise Assessment Seminar 7 December, The Queens Hotel, Leeds	45

The four committee meetings held during the year were used to a greater extent to plan the technical meetings. As always the committee tried to provide a wide cross-section of topics with venues spread across the Eastern Region. In March, Peter Mapp gave an illustrated talk at Colchester entitled *Getting the Message Across*. This was followed by *Noise Impact Assessment*, presented by Stephen Turner at Ipswich and *Tent Sound Insulation* by David Barrell at Braintree. An *Instrumentation Afternoon* was held at Bury St Edmunds and *Automotive NVH* was Tim Saunder's topic at the meeting held at Group Lotus plc, Norwich in September.

Noise and the Law was Jim Duke's topic at Colchester and finally a talk by Nick Hill, *Surface Sound Technology*, took place at Cambridge. The last-mentioned was combined with the AGM which was very poorly attended. This was disappointing especially as the Committee needs input from members on what topics they would like to see for future meetings. Excluding the AGM and the Orwell cruise, the average attendance was 21.

Irish Branch

The first meeting of the year was held in Dunmurry in March in conjunction with the DETR Seminar *Action against Noise*. The guest speaker, John Hinton, gave a presentation on the Institute's draft Code of Practice on the control of noise from pubs and clubs, highlighted with examples from his own experiences in Birmingham. The Branch AGM followed during which David Bull, the Institute's Vice-President, Groups and Branches, conducted the election of officers after which he spoke to the meeting on the current activities of the Institute. In June a very successful meeting was held at the Odyssey Centre, Belfast, a project supported by the Millennium Commission. This facility, situated in the inner harbour area, includes an indoor stadium which houses up to 10,000 spectators, a group of cinemas including an IMAX theatre, and a shopping arcade.

During the evening a presentation was made by Robin Mark, who had organised the event, on *The Acoustics of the IMAX Theatre*. John Barrow of Marshall Haines Barrow, Architects, described the design of the arena whilst Michael McLoughlin of Farrans Gilbert-Ash led members on a tour of the facility. Owing to organisational difficulties, Branch meetings in Sligo and Dublin had to be cancelled. The Branch Committee met on four occasions during the year.

London Branch

The London Branch had another buoyant year consisting of a successful one-day conference, several informative visits, the annual dinner, and a full programme of evening meetings. In all, ten events were held throughout the year. These consisted of six evening meetings held at the offices of Symonds Group in Holborn, an evening visit to Warner Brothers' new premises, a half-day visit to Luton Airport, a one day conference held at the Commonwealth Conference Centre and the annual dinner held at Corts in Central London. Attendance at the meetings and functions was good and generally on a par with last year's figures, ranging from 25 to 40 members per evening meeting. It has been noticed that there is a general core group of members (10 to 20) attending these meetings on a regular basis, with the remainder being new attendees or people who attend occasionally depending on the topic under discussion.

The half-day visit to Luton Airport proved to be a very interesting and informative afternoon. The visit included a tour of the new terminal, and information was presented on noise monitoring, control systems and topical issues such as night-time noise.

The day conference on the subject of sound insulation held in May at the Commonwealth Conference Centre was another popular meeting. In particular, the conference focused on the

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3-7 December	Adaptive Methods

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2002

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Information regarding the above courses may be obtained from Maureen Strickland ISVR, The University of Southampton, Southampton, SO17 1BJ, England.

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implications of the Law Lords' judgements that noise of ordinary life could not be held a nuisance, irrespective of the lack of sound insulation which could render it intolerable to a neighbour. A number of papers were presented on this issue and a passionate debate ensued.

The evening visit to Warner Brothers' new premises in Holborn was another very successful meeting. Dion Hanson gave a presentation on the development of Dolby noise reduction, from the early systems to the present-day use of full digital sound. An entertaining evening was enjoyed by all at the annual dinner held in Corts in Holborn. There was a pleasant atmosphere in the restaurant with good quality food. The evening was completed by an entertaining after-dinner talk by Richard Cowell.

A diverse range of subjects was presented at the evening meetings. These included noise mapping by John Hinton, the development of instrumentation by Dudley Wallis, underwater acoustics by Dick Hazelwood, two talks on noise from clubs by Philip Dunbavin and Ken Dibble, and a talk to end the year on the Millennium Dome - *A sound investment* - by Angela Thompson. A full programme was planned for 2001 and we look forward to continued support from our members.

Midlands Branch

The Midlands Branch held four evening meetings and organised a half-day workshop during the year 2000. The first evening meeting was held at Birmingham University on the 23 March when John Shelton gave a presentation on noise measurement instrumentation entitled *Smoke and Mirrors*. The second evening meeting was held at Birmingham University on 20 June. Because of the late unavailability of the

advertised speaker, members of the Midlands Branch Committee gave three short presentations. Mike Fillery spoke on *Motor Racing Noise*, John Hinton gave an update on the proposed *EC Environmental Noise Directive* and John Grant spoke on *Noise from a proposed outdoor musical event*. The third evening meeting was held at Coventry Town Hall on the 27 September when Nicole Porter gave a presentation on *The Adverse Effects of Night-time Noise*. The fourth and final evening meeting was held at Birmingham University on the 14 November when David Trevor-Jones gave a presentation on *Ground Vibration: BS.6472 Revisited and Reviewed*. The half-day workshop run by W S Atkins was held at Derby University on 14 September. The purpose of the event was to allow members to get some 'hands-on' experience of noise mapping software. The Branch AGM was held prior to the fourth and final evening meeting on 14 November. During this meeting Deborah Webb's resignation from the Committee was accepted and two new members were elected onto the Committee, namely Kevin Howell and Alan Whitfield. John Hinton and Mike Fillery continue as Chairman and Secretary respectively.

North West Branch

The branch got off to a successful start in February 2000 with a presentation by Peter Hepworth of Hepworth Acoustics on the draft Code of Practice on the noise from pubs and clubs and an insight into how the working party was developing the document. In March, Keith Attenborough of Hull University reviewed the methods for determining the ground effects for outdoor sound propagation and provided valuable comment as to their accuracy.

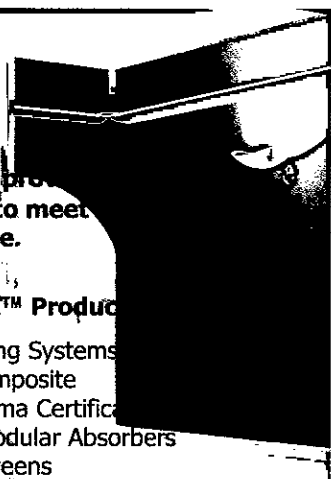
The guidelines for community noise from the WHO were the subject of a well attended workshop in April led by Paul Freeborn, Stanger Science and Environment and Nick Antonio, Arup Acoustics, which left a number of unanswered questions on the basis of some of the noise levels proposed. Dragging some members into the Millennium, Mel Kenyon of Martec presented *Noise on the Net* in May.

The Branch social event was organised by Jo Webb, Arup Acoustics, who arranged a trip in July to the Royal Exchange Theatre in Manchester to see 'Mrs Warren's Profession'. The visit was preceded by a description of the acoustics of the theatre from Joan Faria of Arup Acoustics. In July Trevor Cox of Salford University presented a very interesting talk on acoustic diffusion, a subject in which Trevor has a great deal of experience. The AGM planned for September had to be postponed owing to the 'fuel crisis'. The re-convened AGM was held prior to the presentation in October by David Trevor-Jones on the proposed updates to BS.6472. David also provided some useful background to the basis of the guide.

A presentation by Brian Ross, Principal Administrator, Urban Environment European Commission DEX1, on the *EU Directive relating to the Assessment and Management of Environmental Noise* was organised at short notice but had to be cancelled as Brian was detained in Brussels. However, the European theme was continued at the last meeting of the year presented by Bernard Berry of NPL, who described the development of dose-response relationships between noise and various health effects.

Scottish Branch

The Scottish Branch was fairly active this year. The last report published in the *Bulletin* was a late report on the 'Inaudibility' debate and, as members are aware, the debate continues. In May 2000 the Branch hosted a half-day workshop on PAN56 at which Bernadette McKell and Nigel Cogger gave presentations on different aspects of the guidance. The workshop was very well attended with some good feedback on problems encountered with the guidance.



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In July there was a joint meeting with the Govan Law Centre on the *Legal and Technical Remedies for Sound Insulation*. This meeting was in response to the uncertainty of the ramifications of the 'Baxter and Mills' case in Scotland. Mike Dailly of the Govan Law Centre gave his legal interpretation on what 'Baxter and Mills' meant in Scotland. The Scottish Branch is also indebted to Dani Fiumicelli from the London Borough of Islington who presented his thoughts on the case from an enforcement officer's perspective and as always his presentation was both informative and entertaining.

☐ Southern Branch

The Southern Branch held one meeting during the year, when Bernard Berry gave a presentation on *Health Effect-Based Noise Assessment Methods*. The meeting took place at the Basingstoke and Deane District Council offices at Basingstoke and was attended by 24 members.

Bernard provided a succinct and interesting summary of the extensive work undertaken with Nicole Porter and Ian Flindell and issued as NPL Report CMAM 16 in 1998. The presentation covered such aspects as the scientific evidence relating to noise and a wide variety of health effects, methods used to assess environmental noise, and an interpretation of the WHO guidelines on community noise. Bernard proposed that noise levels in excess of these guidelines do not necessarily imply significant noise impact and it would therefore be unwise to use them as targets for any sort of strategic assessment. The overall conclusion of the presentation was that it is not possible at present to establish robust health-effects-based assessment methods and that more understanding is needed of the impact of noise on health, rather than basing criteria simply on threshold levels below which no effects are expected. Any effects-based noise assessment method would need to find a balance between the desirable and the affordable and also take account of social, economic and even political considerations. As would be expected, the presentation was followed by a spirited discussion of the implications of the paper.

☐ South West Branch

The first meeting of 2000 was held on 5 May when the existing Committee was re-elected with the addition of Paul Marks of Stanger Science and Environmental. The Committee now consists of Tim Clarke (Chairman) Stan Simpson (Secretary), Steve Peliza (Treasurer), Peter Dobbins, Graham Rock, Mike Squires and Paul Marks. The topic for the evening was *Noise Mapping* and Tim Clarke gave a presentation focused on the Local Authority Perspective of the proposed 'European Directive' which requires noise maps and noise reduction plans. This was followed by case study demonstrations of noise mapping by three of the main software suppliers. A second meeting in December, following the trend from the previous year, was held jointly with the Western Branch of CIBSE on the topic of ventilation system noise. Geoff Leventhall's presentation, entitled *Manufacturers' Noise Data: The Good, the Bad and the Ugly* gave insight into why problems often occur in design calculations and after installation. It was agreed at the meeting that further joint events should be organised in 2001 covering topics that were common to both professions.

Table 6: Institute Personnel at 31 December 2000

COUNCIL		
Officers		
President	Prof M A A Tatham FIOA	Ordinary Members
President Elect	Mr G Kerry FIOA	Prof R J M Craik FIOA
Immediate Past President	Mr I J Campbell MIOA	Prof B M Gibbs FIOA
Honorary Secretary	Dr A J Jones FIOA	Mr C J Grimwood MIOA
Honorary Treasurer	vacant	Prof T G Leighton FIOA
Vice Presidents:		Dr G C McCullagh MIOA
Engineering	Mr C E English FIOA	Prof B M Shield FIOA
Groups and Branches	Mr D G Bull FIOA	Mr A W M Somerville MIOA
		Mr S W Turner FIOA
Committees and Sub-committees		
Education		Chairman
Diploma in Acoustics and Noise Control, Board of Examiners		Dr M E Fillery FIOA
Certificate of Competence in Environmental Noise Measurement		Prof K Attenborough FIOA
Certificate of Competence in Workplace Noise Assessment		Mr D Trevor-Jones FIOA
Certificate in Measurement of Sound Transmission in Buildings		Mr A E Watson MIOA
Certificate in Management of Occupational Hand Arm Vibration		Prof R J M Craik FIOA
Engineering Division		Mr T M South MIOA
Medals and Awards		Mr C E English FIOA
Meetings		Prof M A A Tatham FIOA
Membership		Mr S W Turner FIOA
Publications		Mr J R Dunn MIOA
Professional Development		Mr J G Miller MIOA
Research Co-ordination		Ms S M Bird MIOA
		Prof K Attenborough FIOA
Specialist Groups	Chairman	Secretary
Building Acoustics	Prof R J M Craik FIOA	Mr S G Chiles MIOA
Electroacoustics	Mr K Dibble FIOA	Prof J A Angus FIOA
Environmental Noise	Mr K M Collins MIOA	Mrs D G Connor MIOA
Industrial Noise	Mr A R Raymond MIOA	Mr M D Hewitt MIOA
Measurement & Instrumentation	Mr R G Tyler FIOA	Mr P Hanes MIOA
Musical Acoustics	Dr P F Dobbins FIOA	
Physical Acoustics (Joint with Institute of Physics)	Mr D Cartwright	Dr N Saffri
Speech	Dr S J Cox MIOA	Dr A P Breen MIOA
Underwater Acoustics	Mr J R Dunn MIOA	Dr P D Thorne FIOA

☐ Yorkshire and Humberside Branch

After a period of inactivity, the Yorkshire and Humberside Branch held two successful meetings in autumn 2000. On 19 October members were the guests of Keith Attenborough and his colleagues at the University of Hull. The meeting was entitled *Put a Sock in It* and its subject was the use of porous materials in acoustics. Philippe Leclair explained the more interesting aspects of the behaviour of an acoustic wave travelling through a porous medium. Alan Cummings then concentrated on practical applications of porous materials and finished with some demonstrations of sound control using porous absorbers. As a finale, and to justify the meeting's title, he demonstrated the effectiveness of a metal cylinder stuffed with socks as a silencer! On 23 November David Bull attended the Branch AGM at Leeds Metropolitan University (LMU) in his capacity as Vice-President, Groups and Branches. As well as the normal AGM business of choosing Branch Officers and discussing future meetings, members visited the University's new acoustics laboratory. The design of the facility was the subject of two presentations. Tim South of LMU discussed the requirements of a laboratory for teaching acoustics to a wide variety of students, and explained why such an unconventional location had been chosen on the ninth floor of a building overlooking the city centre. Philip Durell of Philip Dunbavin Acoustics then described, with the aid of a large number of photographs, how he had set about converting the University's requirements into practical specifications. Philip emphasised the importance of attention to detail and of ensuring the integrity of cavities and other structure breaks. Less obviously, he made it clear that an important factor in achieving targets is the establishment of a good working relationship between the acoustic consultant, the site manager, and the tradesmen who put the designs into practice. The AGM supported the aim of organising a one-day meeting during 2001 on Noise and Integrated Pollution Prevention and Control (IPPC). This meeting is likely to be held in South Yorkshire, and a call for papers would appear early in 2001.

Workshop: Wisp 2000

Innovation in Speech Processing

WISP 2001 was the first new-format Speech Group meeting, replacing the biennial IOA Autumn Conference on Speech and Hearing. The two-day workshop included four invited keynote lectures of one hour each and other 20 minute-long presentations. Exhibition space was available but not taken up to anywhere near the same extent as at Windermere.

The workshop was organised into four half-day sessions, each introduced by a keynote lecture. The first session (five papers) concentrated on pattern matching algorithms for Automatic Speech Recognition (ASR).

Geoff Hinton, professor at the Gatsby Computational Neuroscience Unit of University College London gave the introductory keynote lecture combining two associated papers, including that in the proceedings entitled *Training Many Small Markov Models*, with session title *Training Products of Small Markov Models*. The topic was use of many small Markov models, including those combined as factorial or product models, those using discriminative training and others.

Roger Moore (2020speech) gave an equation-free and light-hearted but useful look at the amount of training data used by ASR systems and (perhaps) by people in learning how to speak, compared with their performance.

Nick Wilkinson (Birmingham University) spoke on combining sub-band ASR recognisers using an approach closely related to Parallel Model Combination (PMC); the paper also covered the comparison of acoustic features including and excluding formants.

Joe Frankel (CSTR at Edinburgh University) discussed the use

of articulatory features for ASR with evaluation on a speech database with simultaneous capture of acoustic waveform and articulatory measurements.

H Nock (Cambridge University) gave a paper on various algorithms for combining loosely-coupled Hidden Markov Models (HMMs) of the sort used for sub-band HMMs.

The second session (nine papers) combined papers on various aspects of

'Callers did not always realise they were talking to a machine and spoke in response'

recognition of natural dialogues, speech recognition and speaker verification in noise, and some other linguistic aspects.

Al Gorin (AT&T Laboratories, New Jersey, USA) gave the keynote lecture on *Semantic Information Processing in Spoken Language*. The topic was interpreting freely spoken human utterances on calls to a telephone company call centre, in response to the prompt 'How may I help you?', and classifying the callers' inquiries into one of 15 types (or 19 types in a variant application). Results were given for a live trial with callers from the general public who did not always realise they were talking to a machine and spoke for several seconds in response to it.

David Milward and **Sylvia Knight** (SRI International's Cambridge Computer Science Research Centre), discussed *Improving on Phrase Spotting for Spoken Dialogue Processing*. **Steve Cox**, (University of East Anglia), gave a paper about work he had done as a visitor to Nuance Communications.

This was on automatic call routing from responses to general prompts, and reported on vector techniques which look at word/phrase occurrences for each call type, but

ignore word order. Sophisticated mathematical techniques were described.

Mark Huckvale (UCL) spoke about

Learning on the Job: The Application of Machine Learning within the Speech Decoder. A system was developed that automatically learned how to winnow hypotheses from an ASR system, using linguistic constructs to improve performance.

Doug Peters (Nuance) reported on work done whilst with Nortel Canada, on *Data-Driven Clustering and Integration for Speech Recognition*. This was new work on

clustering of enrolment data from individual speakers, to give improved recognition performance. A major difference from prior work (such as 'eigenvoices') was clustering separately for different phonetic classes.

Michael Wong (Birmingham University) gave a paper on *Text-Dependent Speaker Verification under Noisy Conditions using Parallel Model Combination*. He showed a significant performance improvement in experiments where noise was added to speech after recording.

Andrew Morris (Dalle Molle Institute for Perceptual Artificial Intelligence (IDIAP)) spoke on *From Missing Data to Maybe Useful Data: Soft Data Modelling for Noise Robust ASR*. This theoretical and experimental paper compared hard and soft decision approaches to Missing Data Theory (MDT).

O Farooq (Loughborough University) gave a paper entitled *Modified Discrete Wavelets Features for Phoneme Recognition*. This was aimed at improving recognition of plosives, where acoustic analysis based on typical short-time Fourier transforms was thought to provide too much time smoothing.

Mark Huckvale (University College London) spoke on *Experiments in Applying Morphological Analysis in Speech Recognition and their Cognitive Explanation*. A comparison was given of three ASR systems with different lexical decoders: one using word trigrams, one morph trigrams and one a combination, the last giving the best results. The paper gave an interesting discussion of the human perceptual effects of morph occurrence priming.

The third session (seven papers) was

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concerned with human perception and (for ASR) prosodic, durational and segmental aspects. **Chris Darwin**, Professor of Experimental Psychology at Sussex University, gave the keynote lecture *Auditory Grouping and Attention to Speech*. This was concerned with cues for distinguishing multiple sound sources based on time differences at the ears, onset time differences and speech distortions or artificiality.

R Hughes from Keele University and hospital ENT department (co-author Prof **Bill Ainsworth** from the university) gave a paper on *Syllable Perception in the Presence of Background Noise by Normal and Hearing Impaired Listeners*. The effect studied was the accuracy of perception of plosives with masking noise.

Earlier work had shown that noise starting synchronously reduced intelligibility, compared with earlier noise onsets. The experiments reported here showed a more complicated picture, with the effect being level dependent and less obvious or absent for the hearing impaired.

Olivier Crouzet (Keele University) presented *On the Implementation of Phonological Constraints in Computational Models of Speech Identification*. This paper was concerned with human speech perception, and reported experiments to investigate whether certain perceptions (placement of syllable boundaries and phoneme detection) make use of lexical processing or not.

Mark Tatham (Essex University) spoke on *Intrinsic and Adjusted Unit Length in English Rhythm Synthesis*. This paper reported on investigation of rhythm and isochrony in a read passage in English, with a view to improving durational aspects of synthetic speech.

Fred Cummings (University College Dublin) gave a paper entitled *Using Synchronous Speech to Minimise Variability*. This paper covered an investigation into reducing variability in recordings of read speech, by requiring the readers to

speak in synchrony with each other. Thus the recorded speech would have less non-linguistic (expressive) variability affecting

the wanted linguistic information.

Alan Wrench (Queen Margaret University College Edinburgh) discussed *A New Resource for Production Modelling in Speech Technology*. This described speech recognition experiments using the MOCHA-TIMIT dataset of simultaneous recordings of speech, articulatory sensor and laryngograph signals.

A Tams (Essex University) gave a paper on *Towards a Process Model of Intonation*. This was concerned with improving intonation for Text-to-Speech (TtS) synthesis of broadcast news. The fourth and final session (seven papers) was introduced by **Deb Roy's**

(MIT Media Lab) keynote paper: *Situation-Aware Spoken Language Processing*. This was concerned with spoken language acquisition by a robot equipped with a camera on an actuated arm and audio input/output.

The robot was treated in a similar way to a very young child learning in a play environment with its mother (and this human situation

was subject to controlled studies). This is very different from 'teaching' speech recognition by typing spoken utterances to their orthographic transcriptions.

The robot was shown to 'learn' the 'names' of objects it could 'see' (eg a cup) and also some description (eg red). It could 'speak' (by replaying appropriate parts of recorded utterances of its 'tutor') the description of what it currently could 'see', and could 'search for' and 'view' an object suitably described by speech.

The other papers in this session were concerned with various aspects of acoustic analysis of speech signals.

Bruce Millar (Australian National University) gave a paper on *A Reassessment of Temporal Information in Speech Processing*.

This looked at 'alternative' acoustic analysis measures, including source-synchronous (ie pseudo pitch-synchronous) analysis, formant analysis, analysis not linked to a fixed (and over-coarse) frame rate, and the link between acoustic features and phonetic analysis.

Korin Richmond (Edinburgh University) presented *Mixture Density Networks, Human Articulatory Data and Acoustic-to-Articulatory Inversion of Continuous Speech*. This was on acoustic-to-articulatory inversion (for improved front-end analysis, eg for speech recognition)

using both a Multi-Layer Perceptron (MLP) and Mixture Density Network (MDN). Results were reported on a dataset of

simultaneous acoustic and articulatory signals.

Gavin Smith's (Cambridge University) paper, *Segmentation of Speech Waveforms according to Open and Closed Phases using Duration Modelling*, reported on analysis of glottal cycles into open, closed and primary excitation time portions, using a three-state semi-Markov model operating on just the acoustic waveform. Results were judged against electroglottography waveforms.

Jon Barker (Sheffield University) discussed *Linking Auditory Scene Analysis and Robust ASR by Missing Data Techniques*. This paper looked at

aspects of MDT, including combining noise masks with harmonic masks.

Philip Jackson (Birmingham University) gave a paper on *Uses of the Pitch-Scaled Harmonic Filter in Speech Processing*. It was concerned with acoustic analysis of both periodic and aperiodic components of signals, especially relevant to voiced consonants and breathy vowels, and described ways

of integration with 'standard' acoustic analysis methods such as MFCCs and linear predictive analysis. **A Hatis** (Sheffield University)

'The robot was treated similarly to a very young child learning in a play environment'

presented *A Two Dimensional Kinematic Mapping between Speech Acoustics and Vocal Tract Configurations*. This paper was on real-time analysis and display of vowel sounds in terms of 'height' and 'frontness'. The presentation included demonstrations, with singing, and was a suitably dramatic end to the two day workshop.

The workshop proceedings are in a single A4 volume, covering all 28 papers in 332 pages. Typically there were around 10 pages per paper, which is usefully generous. Copies of the proceedings are available from the IOA, including CD-ROM covering 26 of the papers, for a price of £30 to members. The workshop dinner on the Monday evening was preceded by a sherry reception for the 53 delegates, plus some partners. An IOA Honorary fellowship was to have been presented to **Professor Adrian Fourcin** FIOA at the dinner; unfortunately he was unable to attend so the presentation was postponed to a later IOA event. Commenting personally, the new workshop format struck me as quite acceptable, although with a somewhat different emphasis from the Windermere conferences. I certainly would not be against this becoming an annual rather than biennial event. Thanks are due to the organisers, **Steve Cox**, Speech Group Chairman, and **Martin Russell**.

Nigel Sedgwick
Cambridge Algorithmica Ltd

'Copies of the Workshop proceedings are available from the IOA in printed or CD-Rom version'

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Rayleigh Medal 2000

Victor V Krylov began his initial training in radio-physics and electronics in 1969 when he became an undergraduate student at Moscow Power Engineering Institute (Technical University). He received his MSc in this discipline in 1975 and spent some time in industry researching ultrasonic and surface acoustic wave devices of signal processing.

In 1977 he started his PhD studies in the Department of Acoustics in the Faculty of Physics at Moscow MV Lomonosov State University under the supervision of Prof V A Krasilnikov. The subject of his research in this period was theory of propagation and scattering of Rayleigh surface acoustic waves in media with inhomogeneous boundaries.

As a result of this research, he published several important papers on Rayleigh wave propagation at very high frequencies, when the effects of surface



New definitions, 'ground vibration boom' and 'trans-Rayleigh trains', have been introduced into the scientific language.

The theory was experimentally confirmed in 1997-1998 on the new high-speed Gothenburg to Malmo line in Sweden, where at some places the Rayleigh wave velocity was as low as 45ms⁻¹ and train speeds of only 160kmh⁻¹ were sufficient to observe the effect. It is now recognised that, with the increase of operating train speeds, this phenomenon will represent a serious problem for many countries in Europe, America and Asia.

Other important achievements in this period were Victor's works on environmental low-frequency noise and on localised vibrations of immersed wedge-like structures. In particular, he predicted the existence of localised elastic waves in immersed solid wedges. Such waves may become essential for some applications in aerospace and marine engineering. This theory has since been confirmed experimentally in the USA and France. Prof Krylov's contributions to research in

Professor Victor V Krylov

tension and surface elasticity and density should be taken into account. Some other papers of this period considered Rayleigh wave propagation and scattering on curved and statistically rough surfaces. In 1981 he received his PhD in Physics and Mathematics (with specialisation in Acoustics) and joined the staff of the Department of Acoustics at Moscow University.

Working in the Department of Acoustics as research scientist and then senior research scientist with teaching responsibilities, Victor continued his theoretical and experimental investigations of Rayleigh surface waves and began to study acoustic emission from cracks developing in brittle solids.

Starting from 1982 he also published a series of pioneering papers on laser generation of sound in solids. These have become an important milestone for further international investigations in this area. Other important achievements of that period were theoretical and experimental research on localised vibrations propagating along edges of elastic wedges.

In particular, his theory of localised wave propagation based on a geometrical acoustics approach developed for this particular situation enabled the analysis of wedge-like structures of arbitrary shapes and resulted in predicting some new localised waves, including waves propagating along truncated wedges of quadratic shape. These waves can propagate at extremely low phase velocities and may be important for some practical applications.

During his work at Moscow University, Victor was lecturing *Physical Acoustics* and *Theoretical Foundations of Acoustics* for undergraduate students, and

supervised undergraduate and postgraduate students. In 1984 he won the USSR Highest National Young Scientist Award in Science and Technology (former All-Union Komsomol Prize) for research into surface acoustic wave propagation in complex solid structures.

In 1989 he received his DSc in Physics and Mathematics (Acoustics) from Moscow MV Lomonosov State University and from the Supreme Qualification Commission of the former USSR. In 1990, at the peak of the 'perestroika era', he was awarded a SERC Visiting Fellowship at the University of Edinburgh where he worked in collaboration with Prof D F Parker on the theory of non-linear surface and wedge acoustic waves, before returning to Moscow University in 1991.

In 1993 Victor moved to the UK to join the staff of Nottingham Trent University, where he

was awarded the title Professor of Acoustics in 1994. The main area of his research at Nottingham Trent was *Environmental Acoustics and Vibration*, in particular ground vibrations generated by railway trains and road vehicles.

His previous experience in fundamental physical acoustics helped him to bring new ideas and methods to these areas. In particular, in 1994 he predicted theoretically a very large increase in ground vibrations generated by high-speed railway trains travelling at speeds higher than the velocity of Rayleigh surface waves in the supporting ground. This phenomenon is similar to a sonic boom from supersonic aircraft.

acoustics are reflected in his more than 200 papers and invited reviews. He is author, co-author and editor of five books, including *Introduction to Physical Acoustics* (1984) and *Surface Acoustic Waves in Inhomogeneous Media* (1991, 1995), and the newly published *Noise and Vibration from High Speed Trains* (Thomas Telford Publishing, London). His research was supported by grants from the Royal Society, the EPSRC and the European Commission.

Victor is a Fellow of the Institute of Acoustics, and member of the Acoustical Society of America, the European Mechanics Society, and the Edinburgh Mathematical Society. He has served on the Committee of the UK Physical

Acoustics Group formed jointly by the Institute of Acoustics and the Institute of Physics and has acted as a referee for many academic journals and grant-awarding bodies.

For pioneering research in the theory of Rayleigh surface waves and their applications'

Since 1996 he has been listed in different editions of *Who's Who in the World* and *Who's Who in Science and Engineering* (Marquis Publishing, New Providence NJ, USA), and in *Dictionary of International Biography* and *Men of Achievement* (Cambridge, UK). In March 2001 he took up a Chair in Acoustics and Vibration at Loughborough University.

The Institute of Acoustics is delighted to award the Rayleigh Medal for the year 2000 to Prof Victor V Krylov for his outstanding contributions to acoustics, in particular for his pioneering research in the theory of Rayleigh surface waves and their applications in science and engineering.

NW BRANCH REPORTS

A joint half-day meeting organised by the North West Branch and the Building Acoustics Group was held at Salford University in early April, to discuss the popular *Implications of Proposed Changes to the Building Regulations*. It was well chaired by **Professor Bob Craik** of Heriot Watt University, (Bob seems to have had a lot of practice!).

Dr Les Fothergill (DETR) got the proceedings underway, presenting an outline to the background of the proposals for amending Part E, including the process by which the document is completed. The proposed amendments have been well documented previously (see *Bulletin March/April 2001*). In a well received presentation, Les effectively described the proposals through some robust questioning. Following a short tea break and the Building Acoustics Group AGM, **Nick Antonio** (Arup Acoustics) started a series of short presentations. Nick and **Jo Webb** had processed over 300 results of airborne sound insulation measurements, obtained for various party wall types. They established that the equivalent value to $49D_{nT,w}$ is $44.6D_{nT,w} + C_{tr}$, with no improvement. Therefore to achieve a 3dB improvement, the criterion should be $47.6D_{nT,w} + C_{tr}$, not $45D_{nT,w} + C_{tr}$.

Brian Michael of Northern Counties Housing Association (NCHA) provided a responsible viewpoint. In order to avoid problems, field tests had been performed regularly and design of future party structures based on constructions having a good safety margin in terms of sound insulation performance. In general, NCHA had found that occupiers had over time become more dissatisfied about sound insulation. Complaints of poor sound insulation of internal structures had been received by occupiers of houses rather than flats. Brian provided details of schemes where poor sound insulation, primarily of floors, had been improved.

He also raised the concern of greater low frequency performance of 'at home' entertainment centres and questioned whether an increase of 3dB in sound insulation performance would be adequate to control these sources. At this stage discussions also centred on the practicality of ventilation fans, since occupiers often removed them.

Ray Jones (Building Control, Manchester City Council) identified that the work load for Building Control Department would increase significantly. Perhaps the requirement to test would help the workload associated with internal sound insulation, since if testing became a must, then the need to inspect or check would not be as onerous. However, many Building Control Authorities may have insufficient trained staff suitably qualified to deal with all the new issues, particularly those associated with control of reverberant noise and building envelope insulation.

Sean Smith (Napier University) presented the findings of a four week investigation comparing $D_{nT,w}$ and $D_{nT,w} + C_{tr}$ from data for 1430 tests on a variety of party structures.

It's amazing how much can be packed into a 10-15 minutes slot and Sean achieved it admirably.

Sean's analysis examined nine years of field test data during tests in Scotland. These were broken down by construction type, examining those where failure was likely using the proposed new criterion. He questioned the use of $D_{nT,w} + C_{tr}$, and raised the issue that in Scotland the $45dBD_{nT,w} + C_{tr}$ may be a retrograde step.

Stephen Chiles (Fleming & Barron) welcomed the proposed amendments, but raised a number of issues. These included:

- Proposed use of the minimum value of $49dBD_{nT,w}$ as the starting point and then applying corrections for measurement tolerances and a possible Building Control discretion;
- An increase in the impact sound insulation criterion and more guidance provided for testing with carpets;
- Mandatory testing of site constructions;
- Providing information on types of construction to achieve the required sound insulation performances not in the main text;
- Development of a requirement for horizontal impact.

Blowing in the wind

Blowing in the wind: The assessment of noise from wind turbines was the title of a presentation given by **Malcolm Hayes** (Hayes McKenzie Partnership) to the North West Branch on 10 May 2001. Malcolm has been involved with the expert assessment of noise from wind turbines for some time in different capacities, and readily shared his considerable experience with the meeting.

In light of UK government policy to achieve 10% of electricity generation from renewable energy sources by the year 2010, it was both topical and 'green'.

His presentation started with an audio demonstration of noise levels from a wind farm at some distance, to be slightly foxed by the level of sound from modern air conditioning which masked the presentation and placed in perspective the levels of noise from wind farms that need to be considered. From the data presented it was very clear that, power for power, two-bladed machines are considerably noisier than three-bladed. This is due to the greater tip speed required from a two-bladed machine. We were also given an insight into the size of some of the turbines, with blade diameters up to 80 metres. Malcolm went on to review the various legislation and guidance documents applicable to wind farms in the UK and Europe, focusing on the ETSU report *The assessment and rating of noise from wind farms*. He explained the philosophy, detail and some of the potential pitfalls in using the document

Finally, Professor Craik skilfully led the audience through a number of questions, which were decided on by a show of hands. A value of $52dBD_{nT,w}$ was agreed as being the absolute minimum value. Because the majority of the attendees had not seen sufficient evidence or were not sufficiently well acquainted with C_{tr} , no decision could be reached on whether this was an appropriate amendment. Hence, the proposed correction factor to take account of C_{tr} could not be agreed. However, it was generally felt that improved sound insulation at lower frequencies was required.

It was agreed that the sound insulation values for all dwelling types should be the same, since Building Control has a discretionary power for lower values to be achieved in refurbishments.

The ventilation requirements in habitable rooms with sealed windows were also discussed as to whether the Part F requirements of *The Building Regulations* were for health only or for both health and welfare. Thanks are due to **Geoff Kerry** and Salford University for organising and supplying the venue, **Nick Antonio** for his superb effort in pulling the meeting together and all the speakers for freely giving their time and making the meeting such a success.

Peter Sacre MIOA

and some of the issues that arise from its practical use.

Noise limits have been proposed, together with penalties to be added to reflect the character of the noise if it is tonal. The tonality penalty is based on the Joint Nordic Method and for each 10 minute measurement period a 2 minute tonality assessment is made.

He then moved on to the practicalities of measuring a reliable background noise. It was recommended that monitoring should normally be performed for around two weeks whilst recognising that longer survey periods provide further information and that the noise level data should be correlated with wind speed and direction. In some areas, rain can considerably increase background noise levels as the rain run-off fills nearby streams.

Malcolm clearly illustrated some critical points with a large amount of field data and examined the influence of all the main noise sources in rural environments. This raised - if not fully answered - some fairly fundamental questions as to how to establish background noise levels.

Finally, we were informed that planning permissions were usually temporary and that after 25 years the wind farms have to be dismantled. In addition, if a turbine does not produce power for 6-9 months, depending upon the Planning Condition, then the offending unit must be removed. He finished the presentation with a lively question and answer session, involving the audience in further questions and interested discussion.

Paul Freeborn and Nick Antonio

Dealing with poor sound insulation 'out-flanking Baxter and Mills'

The Eastern Branch held a one day meeting in Ipswich on 13 March 2001, attended by about 60 interested members and non-members from all over the region and London.

David Ormandy, Warwick University and **Dani Fiumicelli**, Islington Borough Council, discussed using local authority powers under Section 80 of the *Environmental Protection Act 1990* to deal with poor sound insulation affecting residential premises.

The meeting was designed to be of interest particularly to Environmental Health professionals who, until the recent House of Lords judgements (the Baxter and Mills cases), had been using these powers on the basis that poor sound insulation could give rise to a 'statutory nuisance'.

As is well documented, their Lordships found that, contrary to what might be considered to be the 'common sense' view, noise from sounds of ordinary living cannot as a matter of law be found to be a statutory nuisance.

Ipswich Borough Council's solicitor, **Ian de Prez**, began the meeting with a brief outline of case law. **David Ormandy**, Principal Research Fellow at the University of Warwick Law School, then explained how and why the Housing Health and Safety Rating System (the HH&SRS) had been developed (for the DETR) and how this could be used to establish that poor sound insulation could be shown to be 'prejudicial to health'.

As he explained, the system was evidence based and the seriousness of a hazard could be rated. Noise was recognised as a potential hazard by the system. The HH&SRS requires that the likelihood of the hazard occurring is assessed; the severity of the possible outcomes is considered in order to obtain a numerical score. Weightings are given to different classes of harm (from moderate to extreme) and the risk of harm to health is then compared to what is seen as acceptable.

From this it was possible to show that poor sound insulation would be likely to lead to an unacceptable risk to health or, in legal terms, would be 'prejudicial to health'.

EASTERN BRANCH REPORTS

Dani Fiumicelli, Principal Environmental Health Officer for Islington Borough Council, gave a fascinating talk describing how (and why) Islington Borough Council deals with inadequate sound insulation. Islington typically investigates and takes action in about nine noise nuisance cases a month where sound insulation is found to be inadequate.

Dani explained that, although some local authorities still argue poor sound insulation can be a statutory nuisance, Islington prefers to use the 'prejudicial to health' argument.

He put forward a compelling case to demonstrate that noise disturbance resulting from poor sound insulation can be prejudicial to health. He outlined the acknowledged unpleasant effects of noise, using examples including work previously published in the *IoA Bulletin* (July/Aug 95) by Colin Grimwood of the BRE.

Dani compared these with the definition of health provided by the World Health Organisation: 'Health is a state of complete physical, mental and social well-being and

not merely the absence of disease or infirmity'.

The majority of problems in Islington arose from mid-to-late Victorian terraced houses which had been converted to flats during the 1970s and 1980s and were owned by Registered Social Landlords. Dani explained that, to begin with, many RSLs considered complainants were too fussy and were concerned that improvements would not be practicable. Nowadays, however, Islington BC always attempts to work in partnership with the person responsible for carrying out the upgrading, only using enforcement action where absolutely necessary.

Dani believes that this approach, combined with education relating to the seriousness of the problem, the fact that objective measurements are taken, and that often only habitable rooms are required to be treated (not bathrooms, hallways etc) has led to much wider acceptance that improving sound insulation achieves an important and necessary improvement in quality of life for the affected tenants.

Dani then looked to the future (including the HH&SFS mentioned above and the Human Rights Act) and concluded that there is an urgent need for new legislation to "... resolve the legal uncertainties and provide a clear and equitable framework for remedying inadequate sound insulation ...", a view which seemed to strike a chord with many attending the meeting.

Anyone wanting a free copy of the talks should e-mail clive.bentley@ipswich.gov.uk

Approved Document E

Members of the Eastern Branch welcomed **Dr Les Fothergill** from DETR to their 5 April 2001 meeting at Braintree District Council Offices in Essex. Dr Fothergill outlined proposed changes to the Building Regulations Approved Document E, a task repeated many times in recent weeks but nevertheless undertaken with thoroughness and enthusiasm.

That the presentation met with members' interest was borne out by the questioning, which lasted at least as long as the presentation! Some lively discussion and appropriate comments enabled observations to be noted by the speaker which may yet be incorporated into the finished document.

Colin Batchelor

Editor's Notes



Ian F Bennett BSc CEng MIOA
Editor

Following our foray into the exalted heights of orchestral music and the RFH, in this issue we are back to the rather more mundane aspects of environmental noise and consultancy. As a consultant myself, the variety of noise problems 'out there' is always fascinating, and the knowledge and experience of professional colleagues is a vast pool waiting to be tapped by the client public. Could I add a word of apology to one or two people (you know who you are) because we were rather short of space in this issue, and one or two items had to be held over. Nevertheless, offers of articles or features are welcome, and I thank all those who have helped me to 'promote' the *Bulletin* at various Institute meetings up and down the country.

Should you happen across any snippets of information about noise in the national or local press, just send them in. I usually manage to skim through the *Independent*, but that probably means I miss quite a lot of interest.

The Publications Committee is already starting to think about the *Bulletin* programme for 2002, so now is the time to make suggestions.

Could copy for the September/October issue be sent in by 27 July 2001? I know that seems early, but as it is the holiday season many of us will be seeking relaxation in a warmer climate (I might manage a weekend in Clacton-on-Sea).

Ian Bennett

Long-term noise monitoring

- just for the SEL of it?

The Measurement and Instrumentation Group organised a well-attended one-day meeting on 6 June 2001, at the Thistle Hotel, East Midlands Airport. Eight papers were presented on a variety of topics, half of which were directly related to aircraft noise.

The role of noise monitoring in airport noise control was discussed by **Jeff Charles** and **Peter Henson** (Bickerdike Allen Partners). This described the various uses to which noise monitors and other related information such as air traffic radar can be put.

A paper presented by **James Tingay** (Cirrus Research) on *Noise monitors in hazardous environments*, described how instruments can be designed to withstand the ravages of the urban jungle, especially vandalism. This appeared to strike a particular chord with those attending: lamp posts may not be solely for illumination as they can house microphones and measuring equipment! **Sam White** (CAA) presented a paper on



Validating the CA aircraft noise model with noise measurements on behalf of his two co-authors. This revealed that the AMCON model does not necessarily agree with the INM although both were created from the same guidance material. Then **Neil Robinson**, from East Midlands Airport, described the noise and aircraft

track monitoring system used there. His background knowledge made a useful introduction to the airside tour that followed lunch. East Midlands is unusual among UK airports because of the large number of cargo flights handled, with both DHL and UPS having cargo hubs sited there.

Martin Armstrong (Brüel and Kjær) then wound up the air transport connection with a paper he gave (at very short notice) about the noise management scheme used at London City Airport, and **Raymond Heng** (Sheffield Hallam University) outlined some of the noise implications of city centre regeneration. The final two papers were by **Ian Campbell** (Campbell Associates) who spoke about ways in which instruments can be controlled and interrogated remotely over the GSM phone system, and **Simon Bull** (Castle Group) with his *Noises of the unexpected*. The Group's AGM rounded off the meeting.



Airside activity at East Midlands Airport

NoiseMap 2000

WS/Atkins



Server Edition

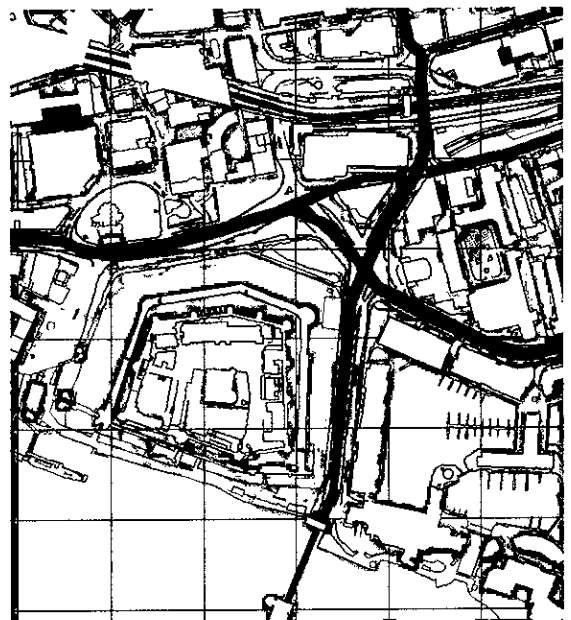
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Environmental noise from dredging

S J Clampton MIOA

One important aspect involved in launching a new ship is to ensure that there is sufficient depth of water to receive the vessel. In order to achieve this, dredgers are employed to remove silt and sand from the seabed of the launch area.

This article discusses aspects of environmental noise experienced at housing near a major slipway launch area as a result of dredging operations. An important part of the assessment centred on the fact that the dredger was to be operated in a slipway launch area which had not been used for the past ten years: local residents therefore had a perception of lower background noise levels than was previously the case.

Results of the noise assessment outlined include predictions of noise at the housing in advance of the commencement of dredging operations, details of the acoustic treatments employed to achieve the relevant Local Authority noise target and finally measurements of actual dredger levels at the nearby housing.

All sound pressure levels quoted are A-weighted.

Dredging requirements and typical noise levels

At the end of the construction of a large ship, there is no bigger spectacle than its traditional dynamic launch down a slipway into a body of water. The naming ceremony, the smash of the champagne bottle on the hull, the release of the restraining mechanism, the slow movement as the ship gathers pace down the slipway, the unravelling of restraining chains, the initial splash into the water, the resulting mini-tidal wave, the floating away of wooden supports and other flotsam, and the scurrying of tugs to line up the ship are all familiar images.

For smaller vessels such as frigates and submarines, different build strategies can be adopted. One such feature used at the shipyard at Barrow-in-Furness is the ability to build a vessel inside a large construction hall and, once complete, to lower it into the water using a ship lift with the vessel remaining horizontal.

The technique of launching vessels using a ship lift has been used at Barrow-in-Furness for the last ten years or so, reflecting the type and volume of vessel contracts over this period. Because of this, the traditional slipways were taken out of service. With the advent of new contracts for large ships, the slipways were reactivated including widening and strengthening of the slipway base, rebuilding cranes and rerouting of services etc. Also Walney Channel, the body of water to receive the launched vessels, had to be dredged.

In the heyday of slipway launches, maintenance dredging would be carried out regularly, both day and



Fig 1 General view of the dredger

night, using a bucket dredger to ensure sufficient draught in Walney Channel. This type of dredger has a series of excavator buckets on a rotating conveyor belt system, allowing the buckets to scoop up silt and sand from the sea bed, lift it to the surface, and deposit it into a waiting silt barge to be taken away. Typical overall sound pressure levels from a bucket dredger are shown in Table 1.

distance from dredger, m	sound pressure level, dB(A)
100	78
200	72
400	65

If these figures are extrapolated to the nearest housing some 280 metres away from the main dredging area, assuming attenuation due to distance only, a noise level of 69dB(A) would result. Although dredging was a common process in Walney Channel some ten years ago, and noise transmitted from the dredger could be heard at significant distances from the dredging area, complaints about noise were limited.

It should be noted that the bucket dredger would also generate bursts of impulsive noise as the buckets clanked along the conveyor belt, which itself emitted intermittent squeals. If a noise assessment were to be carried out today to determine the likelihood of noise complaints due to such a dredger, then the presence of impulsive and tonal content would also need to be taken into account. For example, BS.4142 would add a 5dB penalty to the rating level[2].

With so many years having elapsed since the last dredging operation in Walney Channel, a major and prolonged dredge was required to remove the build-up of silt and sand. This was anticipated to take three months during the summer, with work continuing day and night depending on the tides. Noting that noise generated by the dredger could be a concern at nearby housing, it was proposed that a backhoe dredger, rather than a bucket dredger, should be used.

continued on page 23

AUTUMN CONFERENCE

Measurement and Assessment of Environmental Noise

(Instruments and Statutory Instruments)

Stratford-upon-Avon
14 – 15 November 2001

The Autumn Conference this year is being organised jointly by the Environmental Noise Group and the Measurement and Instrumentation Group.

The Conference will include a wide range of topics of interest to both groups and will inform participants of recent developments in environmental noise and vibration. There will be up-to-date information regarding: new and proposed revisions to British and European Standards, impacts of EU directives, including the proposed directive for the Assessment and Management of Environmental Noise, together with other national and international developments.

The conference will be of interest to a broad spectrum of people including consultants, environmental health officers, instrument manufacturers and suppliers; indeed anyone with who is interested in current thinking with regard to environmental noise and vibration measurement, assessment and control.

Topics will include:

- The new sound level meter standard, IEC 61672
- Effects of the current revision of BS6472 - Human response to vibration in buildings
- Noise mapping in the UK - policy and proposals from the recent formed Department of the Environment, Food and Rural Affairs
- Integration of noise mapping software with GIS and terrain data
- Monitoring and control of environmental noise from outdoor music festivals
- Pure tone noise from industrial sources
- Environmental noise assessment in New South Wales

Enter the above date in you diary now and look out for registration details in the next edition of the Acoustics Bulletin

Further information can be obtained from:

Tim Clarke (Environmental Noise Group) Bristol City Council,
Tel: 0117 922 2061 e-mail: tim_clarke@bristol-city.gov.uk
Or

Richard Tyler (Measurement and Instrumentation Group) AVI Ltd,
Tel: 01462 638600 e-mail: richard@avi.f2s.com

17th Residential Week-end Conference

Organised by the Electroacoustics Group of the Institute of Acoustics
In collaboration with ABTT, AES, APRS & ISCE

REPRODUCED SOUND 17

this year's theme

Measuring, Modelling or Muddling!

Stratford Victoria Hotel, Stratford-upon-Avon

16 - 18 November 2001

Technical Programme Committee Chairman: Robin Cross FIOA

Call for papers on topics relating to the following:

Room acoustics

Room modelling

Measurement

Intelligibility

Loudspeakers

Digital signal processing

Please send abstracts of not more than 200 words to the Institute of Acoustics office.
Final written papers for the proceedings must be received by 28 September 2001.

IOA Spring Conference 2002
and
EPSRC Theme Day on Acoustics

Past, Present and Future Acoustics

University of Salford
Greater Manchester

25 - 27 March 2002

The IOA Spring Conference 2002 will be unique in the sense that it will combine the goal of getting together the acoustic user and research communities to present and discuss current needs and developments in acoustics with the opportunity to influence the Engineering and Physical Science Research Council, via the EPSRC Theme Day, in their strategy for future research in acoustics. The theme of the conference is therefore to celebrate the achievements of past eminent UK acousticians, to showcase the current research innovations and applications in acoustics, and to speculate on the future direction of acoustics in the UK. It is hoped that through this conference and theme day, we will be able to establish the significance of acoustics as a subject, and show the influence of research in acoustics on industry and everyday life, and help to shape the future of acoustics in the UK and its multi-disciplinary links with other areas.

The conference will be organised with parallel sessions to cover all the major subject areas in acoustics. Both application and research presentations will be welcome. There will be keynote speeches to celebrate past achievements and structured sessions to highlight current research and applications. Workshops and discussion forums, with the participation of EPSRC, will be held to discuss the future of UK acoustics.

Please send an abstract of about 200 words by post,
fax or email to Institute of Acoustics ioa@ioa.org.uk
by 31 October 2001

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

The following were successful in the May 2001 examination

Institute of Naval Medicine

Carter, D A
McLorie, G E
Powell, J F
Sullivan, T E
Warren, T S E

Leeds

Dandy, M I
Leeham, P
Middleton, M S
Searson, K V

EEF Sheffield

Bellamy, W
Dobby, S M
Harvey, A
Heyes, L

INSTITUTE DIARY 2001

12 JUL

CCENV Advisory
Committee, *St Albans*

20 JUL

Library Working Group,
St Albans

23-24 JUL

**Bio-Sonar &
Bioacoustics
Symposium,
Underwater
Acoustics Group,
Loughborough**

7 AUG

Diploma Examiners
Meeting, *St Albans*

31 AUG

Diploma Examination
results

6 SEP

Bulletin Board of
Management,
Publications
Committee, *St Albans*

12 SEP

Meetings Committee, *St
Albans*

13 SEP

Distance Learning Sub
Committee, Education
Committee, *St Albans*

18 SEP

Research Committee,
Engineering Division
Committee, *St Albans*

20 SEP

Membership
Committee, *St Albans*

SEP

**IPPC Regulations,
Yorkshire &
Humberside Branch,
Doncaster**

4 OCT

Executive Committee,
St Albans

11 OCT

Medals & Awards,
Council, *St Albans*

25 OCT

Meetings Committee,
Publications
Committee, *St Albans*

26 OCT

CCENM Exam,
Accredited Centres

30 OCT

Professional
Development
Committee, *St Albans*

1 NOV

Distance Learning Sub-
Committee, Education
Committee, *St Albans*

6 NOV

Engineering Division
Committee, *St Albans*

8 NOV

Membership
Committee, *St Albans*

9 NOV

CCWPNA Exam,
Accredited Centres

14-15 NOV

**Autumn Conference,
Environmental Noise
& Measurement &
Instrumentation
Groups, Stratford-
upon-Avon**

16 NOV

CCMHAV Exam,
Accredited Centres

16-18 NOV

**Reproduced Sound
17, Electroacoustics
Group, Stratford-
upon-Avon**

22 NOV

Executive Committee,
St Albans

27 NOV

CCENV Advisory
Committee, *St Albans*

4 DEC

CCWPNA Advisory
Committee, *St Albans*

6 DEC

Medals & Awards,
Council, *St Albans*

11 DEC

CCMHAV Advisory
Committee, *St Albans*

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This design consists of a 360 deg excavator mounted on a barge, which scoops silt and sand from the seabed and deposits it into a silt barge alongside. It was anticipated that the dredger would be serviced by two silt barges working in rotation.

Typical overall sound pressure levels from the backhoe

distance from dredger, m	sound pressure level, dB(A)
100	68
200	62
400	55

dredger shown in Figure 1 are reproduced in Table 2.

The levels shown in Table 2 are some 10dB lower than those for an equivalent bucket dredger. Moreover, backhoe dredgers do not generate impulsive bucket clank nor intermittent conveyor belt squeal. By extrapolating the levels in Table 2 to the nearest housing 280 metres from the dredging area, an overall sound pressure level of 59dB(A) was calculated.

Environmental noise target

In the years since the last dredge, residents in the vicinity of the dredging area had become used to a lower background noise, with L_{A90} values around 44 to 46 dB at night, and 51 to 54 dB during the day. The decrease was largely the result of changes in shipyard operations away from the slipway areas because ship lift activities took place elsewhere in the shipyard.

Initial discussions with the Local Authority indicated that 24-hour working would not be permitted if the level was to be 59dB(A) at the nearest housing, as residents would not tolerate this level of noise particularly at night.

One solution would have been to use two dredgers during daytime hours only. Unfortunately this would have incurred costs considerably greater than the initial assessment, since the dredger mobilisation is contracted on a daily basis rather than operational time. Depth constraints limit dredging to eight hours per tide at this site.

Following further discussions with the Local Authority regarding noise levels, it was proposed that a limit of 54dB ($L_{Aeq,1hr}$) should apply at the nearest housing 280 metres away. This limit was based on the consideration that dredging would be limited to a three-month period, the 280 metre location being a worst case for subsequent noise predictions and calculations.

Proposed noise reduction treatments

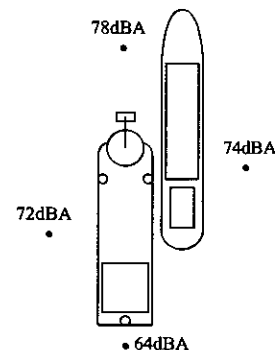
Using the details in Table 2, a minimum of 5dB reduction in overall A-weighted sound pressure levels from the dredger was required to achieve the Local Authority target.

In conjunction with the predictive work, further noise measurements were provided by the dredger owners[4]. These were in the form of overall sound pressure levels taken 25 metres from the Manu Pekka, the actual dredger chosen to perform the work, whilst

in operation. These are shown in Figure 2.

This figure indicates that the maximum overall sound pressure level was experienced ahead of the bow of the dredger, levels some 4 to 6 dB lower to either side (irrespective of which side the silt barge was tied up), and 14dB lower at the stern. It should be noted that the accommodation block on the aft section of the

Figure 2: Noise measurements with the Manu Pekka in operation [4]



dredger barge shielded the line of sight from the stern measurement location. A level of 78dB(A) at 25 metres implies an overall sound pressure level of 57dB(A) at 280m, a reduction of 2dB from calculations using the previous measurements in Table 2.

It was proposed that noise levels could be reduced at the nearby housing by at least another 4dB if the dredger barge could be oriented in the channel with the vessel facing away from the housing.

Unfortunately, this was not a practical permanent solution, since whatever its orientation, the dredger would always face some of the housing along the channel, and positioning it across the channel would cause an obstruction to shipping.

Moreover, when the vessel was anchored, the excavator would still rotate through an arc of at least 90 deg from the forward direction to drop debris into the waiting silt barge, with the noise emissions following the rotation of the excavator.

Following a visit to the dredger in Sweden before it was mobilised, it was estimated from further measurements taken around the vessel that a minimum of 5dB noise reduction could be achieved by applying acoustic treatments to the excavator, namely:

- Filling in holes in the diesel engine compartment walls with blanks and expanding sealant foam to improve containment of the engine noise;
- Fitting absorptive material in the diesel engine compartment to reduce the build-up of reverberant sound;
- Fitting an acoustic cowl over the engine air intake to reduce noise transmission through this opening and re-direct the noise away from nearby housing;
- Providing an enclosure over the existing diesel engine silencers and exhaust stacks.

These treatments were made ready during the transit of the dredger to Barrow-in-Furness. The

continued on page 24

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Environmental noise from dredging

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actual construction of the cowl (basically an acoustically-lined 90 deg bend) and enclosure consisted of fibre board lined with 100mm fibreglass quilt built on a timber frame. More robust and weatherproof materials could have been used, but since the dredger would only be in operation for three months in the summer, such action was not considered cost-effective.

Some of the proposed treatments are shown in *Figure 3*, and 'before and after' views appear in *Figure 4*.

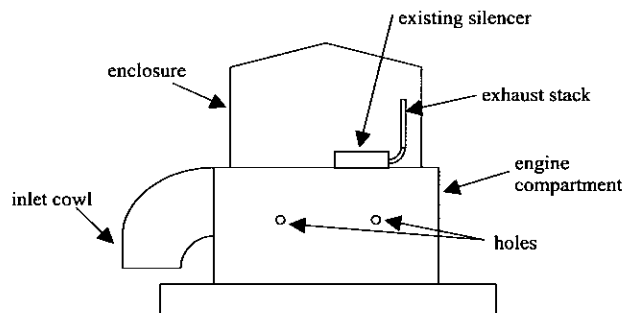


Figure 3: Proposed noise control treatments (rear view of excavator)

Results

Table 3 shows the average sound pressure levels on the Manu Pekka taken at the same locations before and after the acoustic treatments were applied (all readings were taken with the excavator running but

measurement location	alongside before treatment (Sweden)	alongside following treatment (Barrow-in-Furness)
around base of dredger	90	86
on top of dredger diesel engine compartment	93	89

not under load).

This table shows that a reduction of 4dB in the overall A-weighted sound pressure levels was achieved with the treatments outlined above.

Once dredger operations commenced, it was found that the enclosure was not a workable option because even with a louvred opening in the enclosure roof, hot exhaust gas from the exhaust stacks gave rise to an excessive build up of heat. The enclosure roof was therefore removed, but the walls were retained.

Table 4 shows a selection of overall sound pressure levels with the dredger in operation in the channel, measured in accordance with ISO 1996[5] and the levels that would have been experienced had the dredger been at the minimum 280 metres from the housing (allowing only for distance attenuation).

This shows that each of the overall sound pressure levels extrapolated to 280 metres from the dredger achieved the Local Authority's $L_{Aeq,1hr}$ target of 54dB. It should be noted that a wall partially blocked the line of sight from the dredger to the measurement location on Barrow Island, so the levels extrapolated from this

location are lower than those extrapolated from the Walney Island measurements. It is believed that levels on Barrow Island in the absence of the wall would have been broadly similar to those at the Walney Island location.

Although it was demonstrated that the Local Authority's target level would be achieved, a few complaints about noise were received, but were not considered justified in the context of BS.4142.

Dredging was completed one month ahead of schedule, mainly because of favourable weather, but also because it was possible to service the dredger with three silt barges rather than the two envisaged.

Conclusions

This article demonstrates that with forethought and relatively little expenditure, compliance with a realistic noise limit can be achieved even in unusual circumstances.

Table 4 Measured and extrapolated levels at nearby housing				
measurement time and location	measured LAeq and duration	distance from dredger	wind direction and speed	calculated LpA at 280m
14 June 23:00 - 00:00 Walney Island	47dB60 minutes	570m	W, 4ms-1	53dB
15 June 01:00 - 02:00 Walney Island	47dB60 minutes	570m	W, 4ms-1	53dB
16 June 00:00 - 01:00 Walney Island	49dB50 minutes	520m	SW, 3ms-1	54dB
16 June 02:00 - 03:00 Walney Island	45dB45 minutes	520m	SW, 3ms-1	50dB
15 June 00:00 - 01:00 Barrow Island	46dB60 minutes	425m	W, 4ms-1	50dB
15 June 02:00 - 03:00 Barrow Island	45dB15 minutes	425m	W, 4ms-1	49dB
15 June 23:00 - 00:00 Barrow Island	44dB60 minutes	435m	SW, 3ms-1	48dB
16 June 01:00 - 02:00 Barrow Island	44dB55 minutes	435m	SW, 3ms-1	48dB

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1. Technical Report AT 4529/1 Rev 0, Acoustic Technology Ltd 1999.
2. BS 4142:1997 Method for rating industrial noise affecting mixed residential and industrial areas.
3. Technical Report 20052M01 JVG, Westminster Dredging Co Ltd 1996.
4. Manu Pekka General Arrangement, Westminster Dredging Co Ltd 1996.
5. ISO.1996: 1982 Description and measurement of environmental noise.



Fig 4(a) top - air intake before treatment and below after treatment

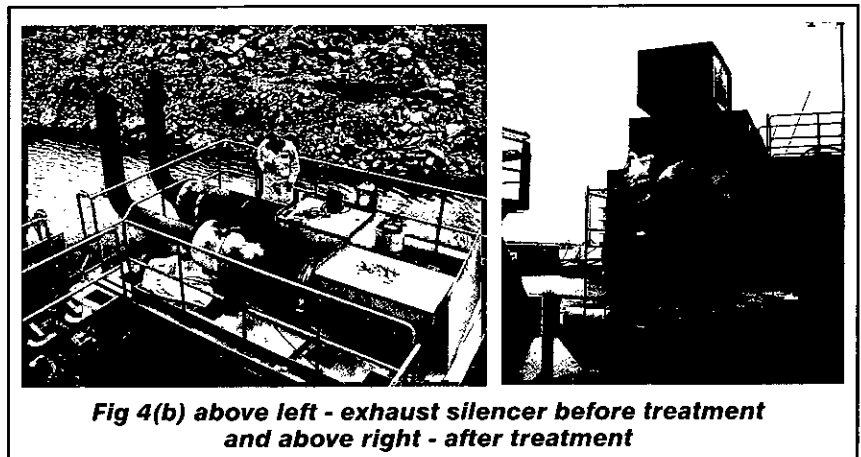


Fig 4(b) above left - exhaust silencer before treatment and above right - after treatment

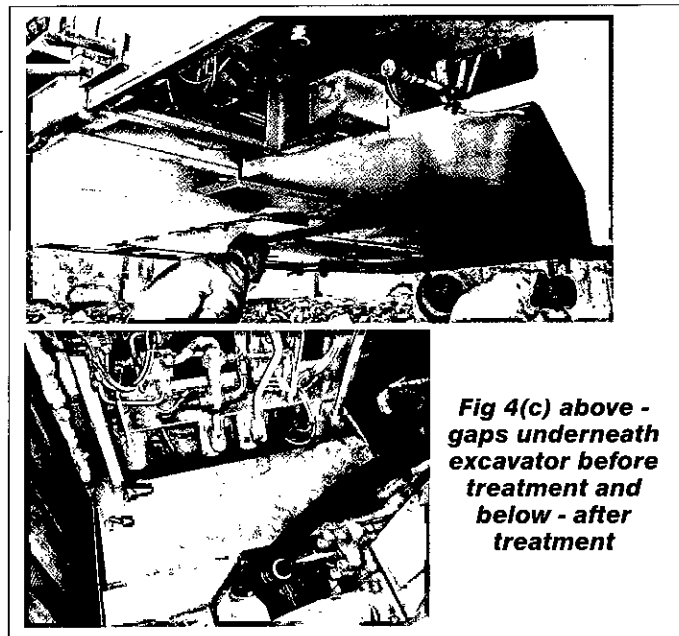


Fig 4(c) above - gaps underneath excavator before treatment and below - after treatment

ACKNOWLEDGEMENT

The author gratefully acknowledges the permission of Westminster Dredging Co Ltd to use as an example the Manu Pekka backhoe dredger in this article.

Simon Clampton MIOA is with BAE Systems, Barrow-in-Furness, Cumbria, UK.

Measuring and assessing the sound you intend - not everything else instead

Richard A Collman MIOA

In order to make sound measurement more accessible, a great deal of very useful work has been undertaken towards simplifying the expression of sound levels, first by transforming frequency content to a single number, in terms of dB(A). Even though it is also misapplied on occasions, the use of this single figure 'A' weighted sound level has provided many benefits and acted as a platform for further simplification.

The subsequent development of statistical parameters such as L_{Aeq} , L_{A90} and L_{Amax} , integrating variation with time into the single figure value, further assisted with the measurement and assessment of acoustic environments. Indeed this approach underpins many standards, guidance documents and even legislation such as BS.4142:1997, PPG24 and the Noise at Work Regulations.

This concept is now being extended still further with parameters such as L_{den} , which is specifically intended to provide a single number that encompasses the variations of sound in frequency, magnitude and time at a particular location for a longer period of time such as an entire year.

Long-term averaging is appropriate for many assessments of 'environmental noise' and noise sources that are relatively stable or change gradually such as road traffic noise. However, the approach is not suitable for other noise sources, such as those that produce significant variations of sound level over short periods of time, particularly when such changes are themselves subject to considerable variation.

One of the greatest difficulties faced by many practising acousticians is that of obtaining reliable sound level measurements under site conditions rather than in a laboratory. Although this paper does not provide a magic solution for all situations, it has been found that the technique it presents overcomes some of the difficulties for a variety of different sound level measurement requirements.

The author and other colleagues have successfully used the technique for many varied projects and different applications for several years. Throughout this time the methodology has consistently provided high quality, reliable data that has facilitated subsequent analysis of the data, whilst minimising the overall costs of measurement and analysis.

Existing measurement and analysis techniques

There are certain principles involved in the measurement and analysis of sound levels when using long-term statistical parameters. Broadly, these can be summarised as follows:

□ Measure the sound level

Identify suitable measurement locations such that the required sound level can be measured and quantified and extraneous noises will be minimised. If possible, any extraneous noises should also be quantifiable.

Measure the sound level for the required period of time using consistent averaging periods, unless there is a valid reason for not doing so, such as changing from day to night at 23:00h for an assessment in accordance with BS.4142:1997.

If extraneous noises affect the measurement either re-start the measurement, or use a 'pause' function, whilst ensuring that the extraneous noise is excluded before it affects the measured parameter.

One possibility is to make a concurrent tape recording of the sound so that more detailed analyses can be undertaken later, particularly if extraneous noises affect the 'on site' parameters measured. Whether measurements are paused or not, it is necessary to ensure that the statistical parameters reflect a combination of the intended source noise and other ambient noise levels.

A log should also be made recording details of any acoustically significant events that may affect the subsequent analysis, together with the times of such events, so that the parameters affected by each event can be identified.

□ Analyse the data

Record the statistical parameters for the various time periods. Compare the statistical parameters and the timed notes and try to quantify the various compromising effects of extraneous noise so that different statistical parameters can be compared reliably to achieve an appropriate assessment.

Report on the findings of the analysis, including an estimate of any uncertainties such as those due to extraneous noise sources.

An alternative measurement technique

So far we have seen that for a reliable assessment of long-term statistical parameters, it is critical to ensure that the effects of extraneous noise sources are minimised and also quantified. However, even where it is possible to undertake such an assessment, there are many situations where it is not appropriate to consider only one or two parameters that condense many subtleties of time and frequency into a single number. This is because information is lost when all of the variation with time is coalesced into a single, average value.

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The reliability of the measurement and analysis techniques outlined above is usually affected significantly by extraneous noise sources, such as passers-by asking what you are doing, police helicopters, dogs barking, or any of the many other noise sources that always seem to appear as soon as a sound level meter is switched on.

A further complication arises when assessing noise sources with different acoustic characteristics. For example, an assessment of the impact of the noise associated with deliveries to a factory on residents living beside a reasonably busy road should include at least two comparisons. The delivery vehicle noise can be compared with the existing road traffic noise, but the noise from unloading activities has very different characteristics.

The problem with the use of a long-term statistical average over five minute or one hour measurement periods is that the averaging process destroys most of the information about different acoustic characteristics of the noise sources. Such long-term averages are almost always affected by several different noise sources, making it even more difficult to quantify the significance of any specific noise-producing activity.

□ Principle of the method

The principle is very straightforward. Instead of just taking an average value over the measurement period, it is better to monitor the changes in sound level throughout the period and use this information for any assessment of the noise. It is then possible to be more specific and accurate about the effects of the noise

source under consideration and other extraneous noise sources.


With suitable instrumentation, there is relatively little additional work involved in obtaining this information. From the author's experience, it is likely that the overall time for measurement and analysis will not be significantly different. Indeed, with the improved quality of the data, the reduction in analysis time may well outweigh the slight additional time required to capture the data prior to analysis. The analysis will also be far more specific than is possible with only long term average data, allowing a more reliable analysis and providing better information that may well permit other cost savings.

In order to monitor how the sound level changes over time, the only significant change is to use the sound level meter to log consecutive short duration L_{eq} values and then download them for subsequent analysis.

For most applications, a convenient averaging time for short duration measurements is one second. This is short enough to provide several samples for most events, such as vehicles passing, conversation, dogs barking, or intermittent plant operations, but does not result in unmanageable quantities of data. It also has the advantage that the maximum or minimum value during a specific measurement period is also the L_{max} or L_{min} value. For very short duration events a shorter period such as 0.1 seconds may be appropriate.

Most applications involving statistical parameters are concerned with the overall noise level, rather than with more detail such as octave band frequency analyses for noise control purposes.

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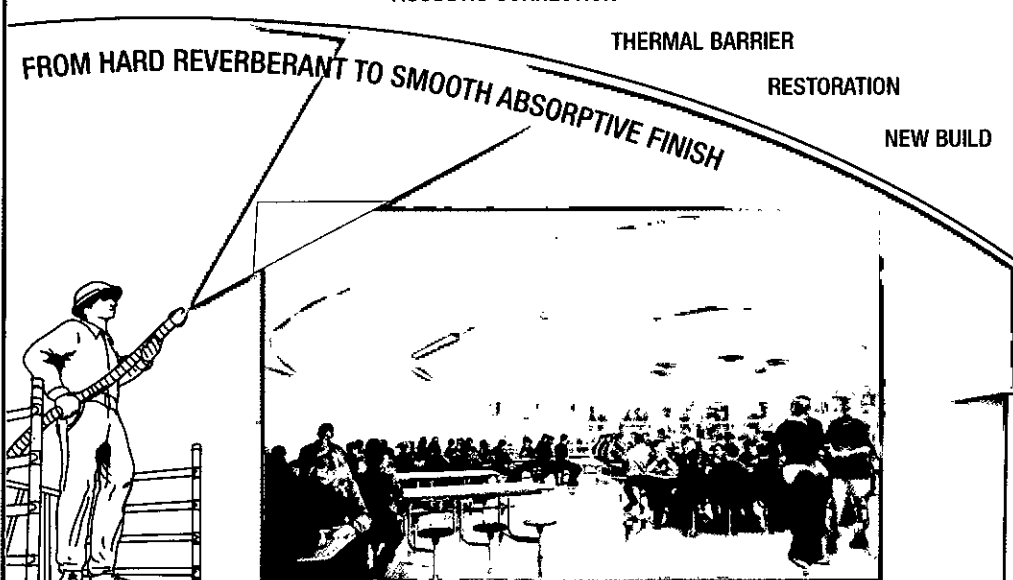
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continued from page 27

Where only the overall level is of interest, it is only necessary to log the 1-second L_{Aeq} values. Even where additional octave band or similar more detailed information is required, it is generally possible to measure spectral data relatively quickly and then investigate any time-dependent characteristics separately, thus providing the required information without excessive quantities of data.

A good estimate of a longer-term L_{A90} (and some other statistical parameters) can be obtained from the 90th percentile of the consecutive 1-second L_{Aeq} values ranked in descending order.

From the author's experience, if the sound level meter also logs 1-second L_{A90} values (even though these are fairly meaningless in isolation), the 90th percentile of the 1-second L_{Aeq} and the 90th percentile of the 1-second L_{A90} values will bracket the longer term L_{A90} value obtained from the meter by conventional means. Under most conditions the two values are consistent to within a few tenths of a decibel for periods of five minutes or more.

Two examples of a more detailed look at the variation of sound level with time

Although this technique has been used for a wide variety of projects, the following two examples provide an indication of the power and flexibility of the approach.

Assessing railway noise as part of the ambient sound level

One project involved the assessment of the ambient noise level, and particularly the contribution from railway noise, around a proposed residential development site. The site was adjacent to a railway line, a few miles from Heathrow airport, and was subject to road traffic noise. In addition, an enthusiastic guard dog complete with rattling chain protected the neighbouring commercial site.

With the variety of different noise sources with different propagation characteristics and time frames, no long-term statistical parameter could

Table 1: Example of log showing acoustically significant events for railway noise assessment

start time	duration	source*	details
07:15:10			gate opening
07:15:35	19s		dog barking 8m away
07:16:02			dog moving: chain noise
07:16:13		B	
07:16:23	17s	B	
07:16:37	43s	A	
07:17:10		T	
07:17:22			barking and car noise
07:17:52		T	
07:25:56			pigeon
07:28:13			speech / impulsive sound at adjacent premises
07:30:15	15s		roller shutter door at adjacent premises
07:34:16			distant traffic

*Key: T: train noise; A: aircraft noise; B: dog(s) barking

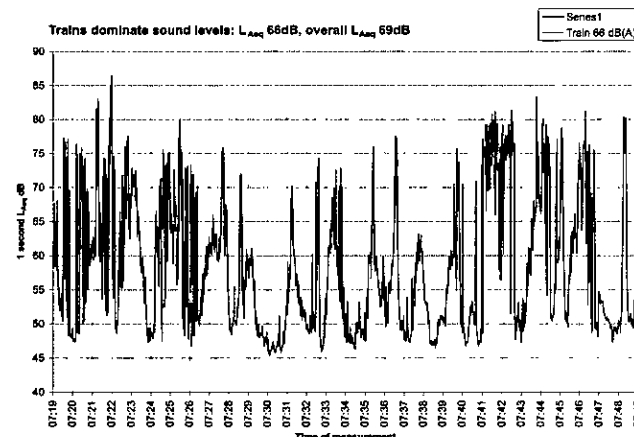
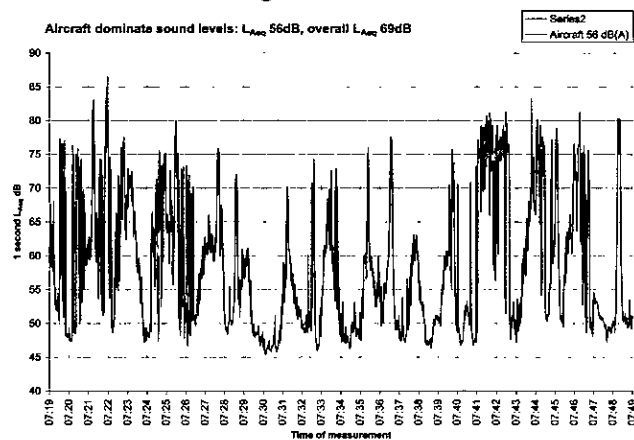
provide suitable information about the relative significance of the different noise sources.

This information was essential for any modelling of acoustic propagation around the proposed residential development, particularly with the proposed acoustic barrier shielding the railway line, but a lack of any screening benefit for aircraft noise. In addition, the noise from the guard dog had to be excluded from the assessment because the presence or absence of a dog is not a significant planning issue.

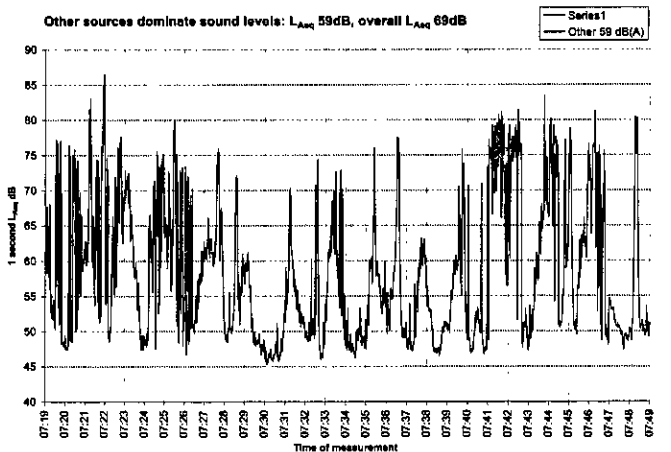
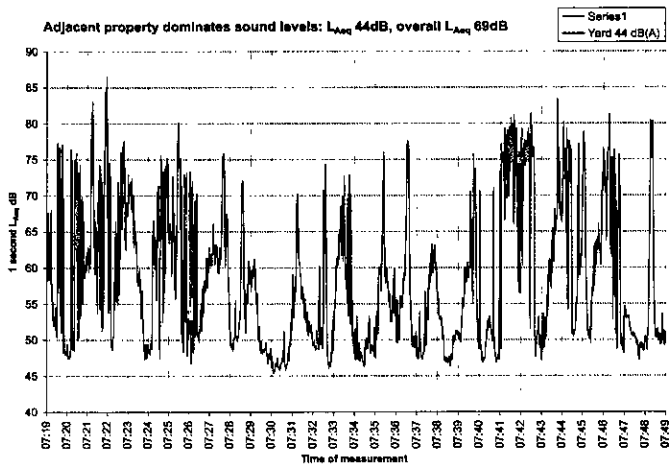
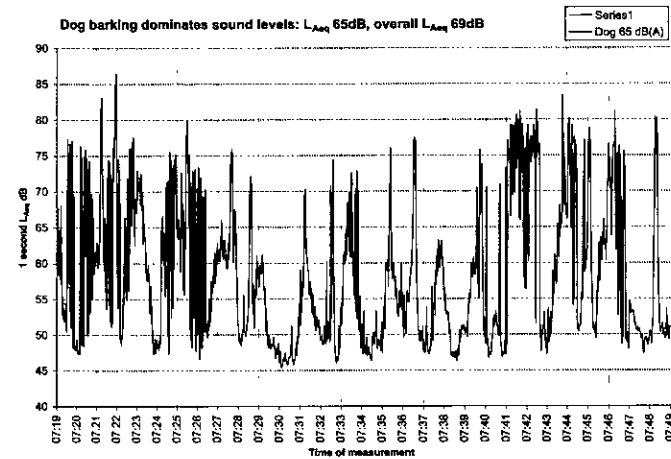
Using consecutive 1-second L_{Aeq} values together with a synchronised log of events, it was a straightforward task to determine contributions from the different noise sources. The example graphs in Figures 1 to 5, together with the event log, show this analysis. The black line on each graph identifies the time when that particular source was dominant, times when other sources were dominant being shown in blue. A single graph with the different noise sources shown in different colours makes visual comparisons even more straightforward.

Figures 1 to 5 show that the long-term L_{Aeq} of 69dB was affected by the neighbouring dog almost as much as by train noise. A reduction of 10dB in the train noise level would mean that the aircraft noise would continue to be dominant, and other sources such as road traffic noise would become the most significant at this location. None of this could be determined solely from long-term statistical data.

Figures 1 and 2



Figures 3-5



Assessing the effect of delivery vehicle noise

This project involved assessment of the acoustic impact on neighbouring residents of early morning deliveries. A few months before the author's involvement, a separate survey had been undertaken based only on long term statistical parameters. Some of the data from the earlier report is shown in Table 2.

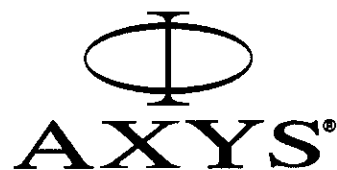
Based on the variation in L_{Aeq} and L_{A90} , the surprising conclusion was that deliveries were not acoustically significant because 'deliveries did not significantly alter L_{Aeq} or L_{A90} values'. However, the opposite conclusion could be drawn from the L_{AMax} value of 82.3dB(A) from 06:57. This contradiction illustrates the problems that can arise when using only long term statistical data.

The author subsequently recorded series of
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Table 2: Example of delivery noise log based solely on long term averaging

time	L _{Aeq}	L _{AMin}	L _{AMax}	L _{A90}	notes
04:54	44.2	37.3	62.1	39.1	
05:07	45.8	37.6	62.6	39.6	roller shutter door opened, trolley wheeled outside
05:19	44.9	39.5	58.4	41.1	
06:03	48.8	41.9	67.4	44.1	3+ cars from cul-de-sac
06:14	48.1	42.9	65.4	44.1	2 cars from cul-de-sac
06:24	48.0	42.8	65.1	44.1	
06:57	56.1	44.2	82.3	45.6	Gate open, 2 deliveries, 2 cars on side road
07:09	52.9	44.8	70.7	46.1	1 delivery vehicle out
07:20	54.0	45.1	74.1	46.6	2 cars from cul-de-sac, van on side road

consecutive 1-second L_{Aeq} values, together with synchronised logs of events at different locations both during deliveries and at other times. Figure 6 shows some of the information obtained, and it is summarised in Table 3.

Based on the more detailed information, it can be seen that at the residential cul-de-sac, the underlying background noise level varied between 43dB(A) and 49dB(A) at this time of the day. Vehicles on the ring road or side road produced typical levels between 50dB(A) and 55dB(A), whereas delivery vehicles produced typical levels between 47dB(A) and 51dB(A). The delivery vehicles produced a maximum level of 59dB(A).

Figure 6

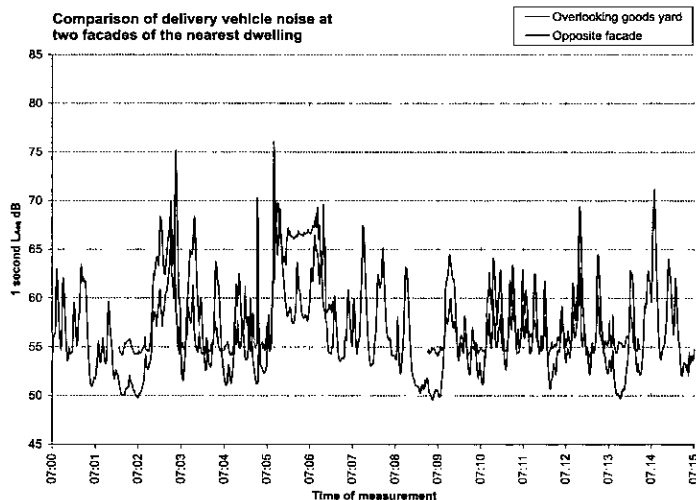


Table 3: Comparison of noise levels, dB, based on consecutive 1-second L_{Aeq} graphical analysis

noise source	facing ring road	from ring road	cul-de-sac
underlying background noise	50+	45-50	43-49
vehicles on ring road	65-75 (max 90)	60-70 (max 75)	50-54
vehicles on side road			55
delivery vehicles			47-51 (max 59)

Comparison of the two techniques

Similarities and differences

Although the two techniques of long term averaging and consecutive short duration logging appear similar, there are some very distinct differences arising from the very different philosophies behind the two methods. Both involve measuring the sound level for periods of time such as five or ten minutes to one hour or longer.

Conventional long term averaging aims to gather a few values that provide an overview of the acoustic environment, but which are often affected significantly by extraneous noise sources. All noises are aggregated into single figure values for each averaging period, making assessments of different noise sources difficult and unreliable.

Consecutive logging aims to show how the noise level varies over time, in a way that allows individual events to be easily identified and quantifiable. This provides a much clearer understanding of the factors affecting the acoustic environment, facilitating better analysis of alternative attenuation schemes. However, consecutive logging also enables single figure long-term average values to be derived easily, where these are required for comparison with other data.

Suitable instrumentation

By today's standards, the consecutive logging technique does not require particularly sophisticated instrumentation, and a large proportion of the integrating sound level meters that provide long term statistical data also have the necessary logging and downloading capabilities.

The following suppliers of acoustic instrumentation, listed in alphabetical order, are understood to produce suitable instrumentation: AcSoft; Bruel & Kjaer; Casella CEL; Castle Group; Cirrus Research; Norsonic.

Conclusion

Although conventional single-figure parameters have a wide range of uses for the assessment and comparison of sound, there are many situations where more detailed information is required. A single figure dB(A) value combined with a visual (graphical) analysis of the variation with time provides a powerful technique for identifying and quantifying what is actually happening, whereas the information provided by long term statistical parameters only tends to be more obscure.

Any additional measurement time is likely to be offset by savings in analysis time. The result is more specific data and a more reliable analysis, providing a better understanding of what the numbers actually mean to the listener. The technique may be thought of as a hybrid of older methods of plotting sound pressure level, and newer methods of averaging, but combined using modern instrumentation.

Richard A Collman MIOA is with Acoustical Control Engineers Ltd and Belair Research Ltd.



Figure 1: rear view of conventional kart

Controlling noise from karting

Mel Kenyon MIOA

This project should be of interest to many involved in Environmental Noise. This single job encompassed many of the issues commonly encountered in environmental noise problems - negotiations with local authorities, site noise measurements, misuse of BS.4142, noise control design, threats of legal action, more noise control design - and the internet saving the day.

In June 1997, we were instructed to advise a leisure company wishing to install outdoor karting tracks at three sites in separate local authority areas. At all three the respective local authorities had voiced concern about the likely noise impact.

For those who have never seen this type of kart track, they are short circuits, generally equipped with six single-seater and two twin-seater karts. A driver's 'turn' lasts less than ten minutes, and the drivers are generally inexperienced early teenagers and parents. This type of operation is known to the trade as 'rental' and can be seen at many funfairs and seaside attractions.

Figure 1 is a rear view of a kart, showing the four-stroke air-cooled petrol engine. Naturally, this is the main noise source: it is the same type of engine used in petrol lawn mowers. Apparently go-karts (as they used to be called) were invented by a mower manufacturer following the late cancellation of an order for several hundred petrol mowers.

At all three sites the local authorities wished to use BS.4142 to assess the kart noise, and the rated noise level from the track had to be no more than 5dB above the background noise at the nearest housing. As is often the case, the respective local authority officers considered that the noise was tonal, so the tonal penalty meant the kart noise level had to be the same as the background level.

At first sight *Method for Rating for Industrial Noise Affecting Mixed Residential and Industrial Areas* is not applicable to the circumstances of karts at the seaside, but it was clear that the only route to obtaining planning consent without an appeal would be to demonstrate compliance with the local authorities' BS.4142 criterion. Equally there is a legal precedent

for using BS.4142 to assess kart noise (Tetley & Others v Chitty & Others All ER 1986 663).

The first of the three sites was remote from major noise sources and subject to very low daytime background noise levels, with housing very close-by: predicted noise levels from the karting track were some 30dB higher than the background.

As it was also an Area of Outstanding Natural Beauty, even if the local authority was prepared to grant consent for a track, it was unlikely that large earth mounds to reduce noise levels would be permitted. Plans for this track were therefore shelved.

At the second site the local authority initially wanted to use the background noise in early March as the baseline (31dB L_{A90}), but this was a time when the camp and most of the resort were closed. Measurements when the holiday camp was actually open in April revealed that the relevant background level was 40dB L_{A90} .

Background noise measurements at the third site produced the same figure: in fact the predicted rating noise levels at the second and third sites were 20dB in excess of the background at the nearest housing, so the rating noise levels needed to drop by at least 15dB in order for planning consent to be granted.

The local authorities suggested that electric karts should be used, but the response of the developer was that the only electric rental karts were produced for toddlers, and their 3mph top speed was unlikely to find favour with teenagers or their parents. Accordingly, other methods of noise control would have to be considered.

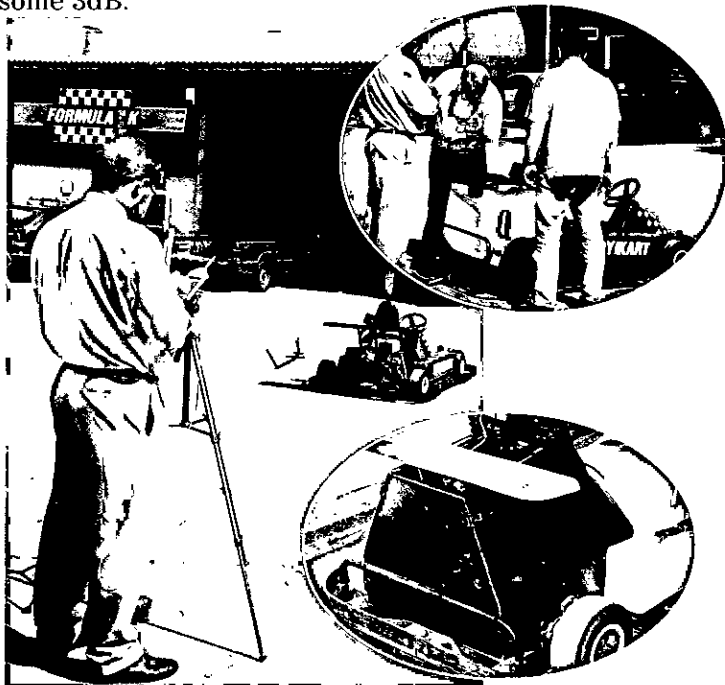
It is no mean feat for a barrier to reduce A-weighted noise levels by 15dB: a fairly high barrier (say more than 6m) would normally be required. If an earth mound were employed, the land take would be at least 12m (assuming 45 deg slopes). If a fence were used, the cost of the necessary strengthening would be very great because of the wind loading on a 6m high 'sail' situated near the sea shore. It was therefore decided to investigate 'silencing' the karts in order to eliminate the barrier or at least reduce its height.

continued on page 32

Controlling noise from karting

continued from page 31

Figures 2 and 3 show the development of the hush-kits at the kart manufacturer's premises, where heavy-duty ceiling tiles and 'gaffer' tape were used for the prototype. We contacted the engine manufacturer (Honda) in Japan and obtained a more effective silencer from their American agents. After testing, the combination of a larger silencer located closer to the ground and a partial enclosure reduced noise levels by some 3dB.



Hush-kit development: figure 2 main picture - noise measurements; figure 3 inset top - prototype engine enclosure; figure 4 inset bottom - production enclosure

Figure 4 shows the production hush-kit enclosure made from steel lined with damping compound to prevent drumming, and further lined with dense absorbent (flameproof) material. It can be seen that the enclosure is open at the top, which is not ideal for noise reduction.

One of the prototype enclosures had a 'top', but petrol is fed to the engine by gravity, and the tank has to sit on top of the engine (at the top of the enclosure). The heat built up in the covered enclosure was enough to boil the petrol in the tank, which was not felt to be a good idea! The top and bottom of the enclosure therefore had to be left open to provide enough cooling air for the engine.

The production hush-kits were demonstrated to the two local authorities and both accepted that noise levels were lower and the noise was no longer tonal. This meant there was an 8dB reduction in the rating level (3dB of level reduction, and 5dB by eliminating the tonal characteristics). Mounds only 4m high were then designed so that the resultant levels were a further 9dB lower, thus giving the necessary 15dB reduction in rating level.

A one-year temporary planning consent was duly granted for the third site and the karting track was

built, despite vocal opposition from local residents before construction. It is understood that there have been no subsequent noise complaints and full planning consent was subsequently granted.

However, matters back at the second site became more complicated.

There, another holiday camp was immediately adjacent to the operator's site and was much closer than the housing. In discussions, the local authority had indicated that if the 4m barrier were continued around the track so as to screen both the housing and the holiday camp, they would recommend approval of the application. Unfortunately the track was constructed before planning consent was granted, and the perimeter mound was only built 2.75m high.

Complaints ensued from the adjacent holiday camp, and the local authority then took the view that its BS.4142 criterion should also apply to temporary residents at the holiday camp. This meant that the rating level at the holiday camp should be no more than 5dB above background. From site measurements, noise levels now had to be reduced by a further 17dB, notwithstanding the hush-kits fitted to the karts, and the existence of a 2.75m high mound.

There appeared to be five main avenues of attack to try and gain planning consent.

1. Radically redesign the karts so that the petrol tank could be located away from the engine, permitting a covered enclosure. This may have reduced levels by a further 5dB.
2. Convince the local authority that the relevant background level was higher than 40dB L_{A90} by means of further background measurements.
3. Artificially increase the background noise level, for example by building a water feature with a 'noisy' fountain adjacent to the boundary, which would be turned off after 11pm, or possibly by providing sound masking via a loudspeaker system.
4. Try to convince the local authority that an increase of 10dB above background should be acceptable to the temporary residents of a holiday camp.
5. Increase the perimeter barrier by a further 2m to 4.75m overall, which should reduce noise levels by a further 4.5dB.

Satisfying the local authority by some combination of the above may have been achievable but seemed unlikely. The local authority threatened to serve an enforcement notice, requiring removal of the track: had they done so, the developers would have been in a very difficult position.

We began looking for manufacturers of quieter karts and conducted an internet search using the search term *go-kart manufacturer*. An alternative manufacturer was found, although they used exactly the same petrol engines but in an open 'space frame'

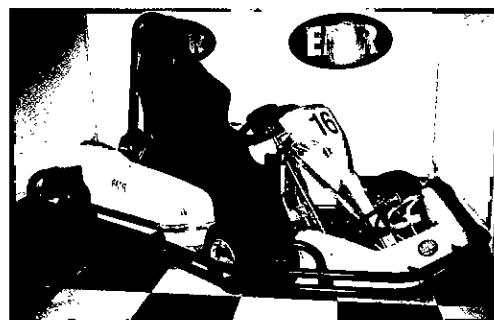


Figure 5: EMR electric 'rental' kart

body, so they were likely to be even noisier. The search also revealed two manufacturers of electric karts who were currently developing adult rental versions.

Figure 5 shows a kart made by EMR, which was able to provide a demonstration of its products. Figure 6 shows comparative noise levels of the petrol and electric karts, and for karts circulating on the track the electric version has a 16dB advantage over the petrol.

Incidentally, it can be seen that when both the

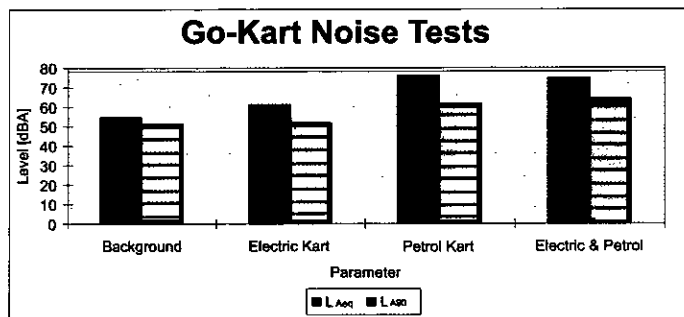


Figure 6

electric and petrol karts were on the track the L_{Aeq} was lower, but the L_{A90} higher than for the petrol kart alone. This was because the drivers had to proceed more considerately with another kart on the track.

In discussion with the electric kart manufacturer, it emerged that the karts could be made even quieter. Although the demonstration model was fitted with a metal drive chain, rubber drive belts could be fitted as an alternative. The manufacturers routinely fitted the chain drive, because its noise provided a greater sensation of speed and acceleration for drivers.

The local authority was informed of the test results, but needed to witness the electric karts itself before it could agree that the noise impact would be acceptable. Accordingly, a demonstration of the chain and belt drive versions was arranged. Unfortunately the weather on the day of the tests was not suitable for making measurements. However, the kart with the rubber belt drive was so quiet that the local authority agreed planning consent would be granted for these karts without the need for further tests.

The site operators relocated the petrol karts to their other sites, and equipped this location with belt drive electric karts. The capital cost of the electric units is higher than petrol, but the running costs are lower, meaning that in the longer term it should be cheaper to run electric karts. They are so much quieter that it may even be possible to use them at the first site which was originally ruled out on noise grounds.

The only drawback with the rubber drive belts is the lack of noise feedback: driver noise levels do not rise significantly with speed or acceleration, and the sensation of speed (and thus driving enjoyment) is reduced. The electric kart manufacturers are currently investigating installation of loudspeakers in the seat backs, arranged so that the volume would be directly related to the position of the accelerator pedal.

If the speakers are located in the region of the driver's kidneys, environmental noise levels should not be increased. This would prove that 'one man's meat is another man's poison' or more accurately 'one man's noise is another man's speed sensation'.

Mel Kenyon MIOA is with Martec, Skelmersdale, Lancs.



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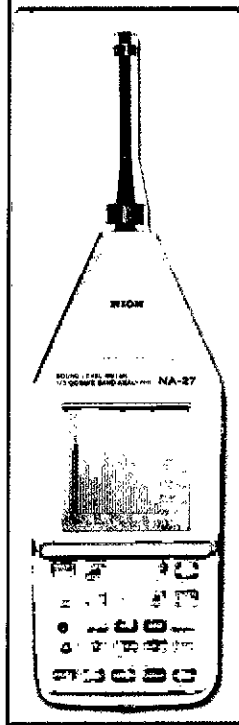
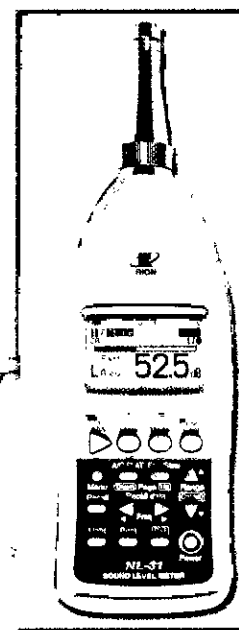
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23 April 2001

Aircraft noise

Mr Todd: To ask the Secretary of State for the Environment, Transport and the Regions when he will publish the response he has received to his consultation on the control of noise from civil aircraft; and if he will make a statement.

Mr Robert Ainsworth: My Department received some 590 responses to this detailed consultation. They are currently being studied. We shall announce our conclusions in due course. Copies of the individual responses will be made available for inspection, by arrangement, at the Department's offices, except where consent to disclosure has been explicitly withheld.

25 April 2001

Noise pollution

Mr Green: To ask the Secretary of State for the Environment, Transport and the Regions what steps have been taken since May 1997 to equip local authorities with greater powers to regulate noise pollution.

Mr Hill (holding answer 23 April 2001): The provisions in the Noise Act 1996 relating to the new night noise offence and associated powers of seizure came into force on 23 July 1997. We have issued a consultation paper, following a review of the Noise Act, setting out further options for local authorities to use in tackling noise nuisance. The closing date for comments was 31 March. I will announce the

FROM HANSARD**Written answers**

**Extracts are provided by
Rupert
Taylor FIOA**

outcome of the consultation to the House. Copies of the report and consultation paper are available in the House Library.

2 May 2001

Aircraft noise

Dr Tonge: To ask the Secretary of State for the Environment, Transport and the Regions what measurements his Department takes of the impact of aircraft noise on residents in south-east England during the (a) day and (b) night.

Mr Robert Ainsworth: My Department publishes annual daytime noise contours for Heathrow, Gatwick and Stansted airports. These contours cover the 16 hour day from 07:00 to 23:00 BST, averaged for

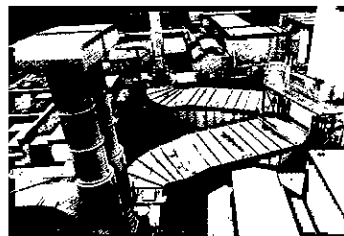
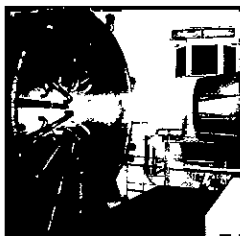
the relatively busy period 16 June to 15 September. The contours for 2000 are about to be published by the CAA on the Department's behalf; and the explanatory booklets, including small-scale versions of the contours, will be placed on the DETR website shortly.

All take-offs are monitored for compliance with the departure noise limits. The new daytime and night-time limits announced by my hon. Friend on 18 December 2000, Official Report, columns 11-12W, have come into effect. Readings from these and other noise monitors (covering both arrivals and departures) are used, along with radar data on the dispersion of aircraft tracks, to validate the model used to generate the contours. Other



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BSI NEWS

measurements are taken, and contours produced from time to time, for various studies on behalf of the Department and of the airports.

We do not routinely publish contours for aircraft noise at night at these airports, as research has suggested that, because of the uneven and distinct patterns of operation, these would not be sufficiently well correlated with sleep disturbance and annoyance. However, operations at night are subject to the restrictions, including movement limits and noise quotas made, after consultation, by Notice under s.78 of the *Civil Aviation Act 1982*; and are monitored and reported by the airports accordingly.

Elsewhere in the South East, noise measurement and contouring are the responsibility of the individual airports. However, noise measurements collated from other airports will help inform the current *South East and East Regional Airports Study (SERAS)*.

8 May 2001

Aircraft noise

Mr Andy King: To ask the Secretary of State for the Environment, Transport and the Regions what plans he has to carry out a new study to update the *Aircraft Noise Index Study of 1985*.

Mr Robert Ainsworth: My Department is to carry out a major study to reassess attitudes to aircraft noise. This new study underlines the Government's commitment to underpin our policy on aircraft noise by substantial research that commands the widest possible confidence.

Our current understanding of the relationship between annoyance and aircraft noise over 24 hours is based primarily on research that was carried out in the 1980s, in particular the *Aircraft Noise Index Study* published in 1985. That was based on the largest survey yet carried out of public attitudes to aircraft noise and eventually led the Government of the day to adopt the L_{eq} (equivalent continuous noise) index for daytime noise contours.

The conclusions have been broadly confirmed by other studies here and abroad, and we have no reason to doubt their validity. But in the light of our commitment to develop a new air transport policy, of changes to traffic patterns since then, and the general

reduction in noise levels of individual aircraft, it is now timely to commission a fresh study.

We want the aviation industry to meet the external costs it imposes. This new study will give us more information on the value people give to relief from noise, and to focus our policies from a broader range of evidence.

In deciding to commission this further research, I have considered the findings

BS EN Publications

BS EN 352:2001 Hearing protectors - Safety requirements and testing

BS EN 352-4:2001 Level-dependent ear-muffs

No current standard is superseded.

BS EN 60268:2001 Sound system equipment

BS EN 60268-3:2001 Amplifiers
Supersedes BS 6840-3:1992.

British Standard implementations

BS ISO 6954:2001 Mechanical vibration - Guidelines for the measurement, reporting and evaluation of vibration with regard to habitability on passenger and merchant ships
Supersedes BS 6634:1985.

British Standards reviewed and confirmed

BS 5775:1993 Specification for quantities, units and symbols

BS 5775-7:1993 Acoustics

of three recent Government-sponsored studies on sleep disturbance, and the advice of independent experts. I am grateful to those who sat on the steering and technical working groups for their help in shaping those studies.

I have concluded that a new full-scale objective sleep study would be unlikely to add significantly to our understanding; and that the way forward is through concentrating instead on further research into subjective responses to annoyance by night and by day.

I am placing copies of the three reports (*Adverse Effects of Night-time Aircraft Noise*; *Aircraft Noise and Sleep UK Trial Methodology Study*; and *Perceptions of Aircraft Noise Sleep and Health*) in the House Library. These have been published by the former Department of Operational Research and Analysis (DORA) of National Air Traffic Services Ltd, and by the Institute of Sound and Vibration Research Consultancy

Services and Department of Social Statistics at the University of Southampton, respectively. Further information on Government sponsored research

into aircraft noise and sleep will be available shortly on the Aviation section of my Department's website. Invitations to tender for the new study will be issued shortly. We shall ensure that both environmental and aviation interests can contribute to the oversight of the project. It will last three years, with pilot results planned to be available next year to feed into our White Paper on air transport.

British Standards withdrawn

BS 6634:1985 Guide for overall evaluation of vibration in merchant ships
Superseded by BS ISO 6954:2001.

BS 6840-3:1992 Methods for specifying and measuring the characteristics of sound system amplifiers
Superseded by BS EN 60268-3:2001.

Draft British Standards for public comment

01/561184 DC BS ISO 1996-4

Acoustics - Description, measurement and assessment of environmental noise - Part 1: Basic quantities and assessment procedures (will supersede BS 7445: Parts 1, 2 and 3: 1991).

CEN European Standards

EN 352 Hearing protectors - Safety requirements and standards

EN 352-4:2001 Level-dependent ear-muffs:
Implemented as BS EN 352-4:2001.

IOA COURSES

Exposure to hand-arm vibration

Courses for the new *IOA Certificate in the Management of Occupational Exposure to Hand-Arm Vibration* ran for the first time at three accredited centres during April. They attracted participants from industry, local and national government and the consultancy sector. The courses coincided with a period during which the relevant legislative climate is changing rapidly: the European Parliament is currently considering a draft directive on workplace vibration exposure which was agreed by European Social Affairs ministers in November 2000. As implied by the title, this Certificate takes a broader view of the issues involved in managing the risks, compared with other IOA certificates which concentrate on measurement and dose assessment.

Broader view

As a result, the course is expected to appeal to health and safety professionals and a wide range of managers who have duties under health and safety legislation. Some centres report that they already have bookings for their next course in November 2001.

Full results from the April examinations will appear in the next *Acoustics Bulletin*. Individuals wishing to attend a course, or organisations seeking accreditation to run the course, should contact the IOA office for further information.

'This new study will give us more information on the value people give to relief from noise'

Engineering Council will be no more

Science Minister Lord Sainsbury has announced the creation of the **Engineering and Technology Board (ETB)**. In supporting the engineering and technology sector, the Board will subsume the Engineering Council's work.

This is the first initiative introduced in response to the Hawley Group's findings. That group was set up with government backing in 1999 to set the Engineering Council's course for the 21st century economy.

Lord Sainsbury said that if engineering and technology were to make their full contribution to the economy, a number of changes must be made. All young engineers must have the chance to gain managerial and entrepreneurial skills,

and engineers of all kinds must have the opportunity to keep their skills up-to-date in a rapidly changing world.

The new Board should be up and running by October 2001. Currently a shadow board chaired by Dr Hawley has been established, to oversee six working groups looking at:

- Construction and governance of the new Board;
- Business and industry needs;
- Communication;
- Attracting greater memberships of institutions and registration; and
- Education, training and continuing professional development.

Commenting that this 'was not a simple name change', Dr Hawley said that the new Engineering and Technology Board would be a totally different organisation from the existing Engineering Council. ETB would be different in structure, purpose, image, and ability to influence, and was about working on behalf of - and for the benefit of - the wider engineering and technology community.

SOUTH BANK UNIVERSITY

Three year project on classroom acoustics

Bridget Shield has been awarded an EPSRC grant under the Equal programme for a three year project: *Acoustic design guidelines and teacher strategies for optimising learning conditions in classrooms for hearing and hearing impaired children*.

The project will be carried out with Julie Dockrell, Professor of Psychology and Special Needs at the Institute of Education, and will be multidisciplinary, involving acoustics, psychology and audiology.

Arup Acoustics, AMS Acoustics, the Voice Care Network and David Canning of City University will collaborate on the project, which commences in October 2001.

This initiative follows a two-year project funded by the Department of Health and DETR on: *The effects of noise on the attainments and cognitive performance of primary school children*, now nearing completion.

The current project has involved the design of measurement protocols for internal and external noise surveys of schools, detailed noise surveys of occupied and unoccupied classrooms, and external noise surveys of 140 London primary schools.

Children's and teachers' perceptions of noise have been obtained by questionnaire surveys involving over 2000 primary school children and 50 teachers; and the effects of noise on children's performance have been investigated through experimental testing of children in controlled noise environments. The final report on this project will be available in the autumn.

EU DIRECTIVES

Physical Agents Directive

The **Social Questions Working Group** of the EU is considering a proposal for a Council Directive on the exposure of workers to the risks from physical agents. The text is summarised below.

Vibration

The European Commission's (EC's) revised proposal for a *Physical Agents Directive* was published in the *Official Journal of the European Communities* in August 1994 following the European Parliament's first reading. No progress was made and the original implementation date, 31 December 1995, was not achieved.

The German Presidency put forward a revised proposal limiting the scope of the Directive to vibration (hand-arm and whole body) in order to make progress.

The proposal identified an action level of exposure at which specified actions must be taken, and an exposure limit value which must not be exceeded. Action includes assessing workers' exposure, reducing the risks, informing workers, and providing health surveillance.

Political agreement was reached on the proposal at the **Employment and Social Affairs Council** on 28 November 2000.

Key features are:

- Exposure action value and limit value for hand-arm vibration will be 2.5m/s^2 and 5.0m/s^2 respectively;
- Exposure action value and limit value for whole-body vibration will be 0.6m/s^2 and 1.15m/s^2 respectively;
- There will be a transitional period of six years for existing equipment, after which the limit values will apply;
- 'Existing equipment' includes equipment provided for up to three years

after the date of implementation;

- The transitional period for existing agricultural equipment will be nine years. The Council will reach a common position on the text once the relevant International Standard (ISO 5349) is adopted. The European Parliament (EP) will consider the proposal in the second half of 2001. If the EP agrees the proposal, adoption of the Directive may occur by the end of 2001, and UK Regulations would have to be introduced within three years.

Noise Directive

The Swedish Presidency has introduced a proposal for a *Noise Directive* which would repeal the existing 1986 Noise Directive (86/188/EEC), implemented in the UK by the *Noise at Work Regulations 1989*.

The main changes are:

- The action values of 90dB(A) and 85dB(A) are reduced to a limit value of 85dB(A) and an action value of 80dB(A);
- There is a lower action value of 112Pa for impulse noise (but 200Pa remains as a limit value);
- Health surveillance is required at 80dB(A) and 112Pa;
- Hearing protection must be worn above 85dB(A) and 200Pa;
- Noise in sleeping quarters must be reduced to 60dB(A);
- There is no derogation provision from the hearing protection requirements, and no exceptions for sea and air transport. The Noise Directive is still in the negotiating stage in the Social Questions Working Group of the EU, and the above proposal may change as negotiations progress.

Keith Broughton MIOA, HSE

(keith.broughton@hse.gsi.gov.uk)

New manager for ISVR

ISVR Consultancy Services has a new Manager, in Stuart Dyne CEng MIOA, who has been with ISVR since 1985 and is also Examiner for the Measurement module of the IOA Diploma. Stuart will be incorporating the existing shock analysis laboratory into the activities of ISVR Consultancy Services.

The organisation is able to call on the expertise of the ISVR academic and research staff as well as its full-time consulting engineers in fields including acoustics, noise and vibration, speech intelligibility, hearing and audio communication, industrial and environmental noise and vibration, transportation impact, and computational analysis using SEA and FEA.

Tyco acquires Spector Luminex

Tyco Fire and Security Services has acquired **Spector Luminex Ltd**, a private safety communications company, which will be integrated into Security's Wormald Ansul (UK) Engineering Services group.

Spector Luminex, with reported revenues of £6 million in 2000, is a leader in voice alarm, public address and intercom systems. The company specialises in hazardous area products, particularly for clients in the oil and gas, petrochemical and marine industries. Spector Luminex and Tyco Fire and Security already have similar customer bases, offering products which complement each other in many areas. The acquisition brings additional UK coverage and will allow an increase in the scope of products and services supplied to customers.

Commenting on the sale, Spector Luminex general manager, John Widdowson, said that the company would bring additional engineering expertise to Tyco Fire and Security. Its long-term maintenance contracts and framework agreements offered a platform for organic growth through a common distribution channel. Wormald Ansul (UK), with annual revenues exceeding £200 million, employs 2190 people around the UK. It is owned by Tyco International Ltd, the world's largest manufacturer and installer of fire and safety systems, and the biggest provider of electronic security services in the US and UK. Other supply ranges include disposable medical products, packaging materials, flow control products, electrical and electronic components and underwater telecommunications systems. Tyco operates in more than 100 countries and employs over 200,000 people.

Further details from Gail Hunter, tel: 0161 455 4588



IAC builds airbag test facility

Automotive test facility specialist **IAC** has constructed a new airbag test facility for Jaguar Cars at its Whitley Engineering Centre in the West Midlands, UK.

Situated inside a building devoted to component testing, the new facility contains the very loud noise levels generated when airbags are fired [up to 140dB(A)] reducing the risk of hearing damage to employees nearby. It also creates a dedicated space in which Jaguar can safely and accurately record on film the behaviour and performance of new airbag systems.

The test facility was built by IAC using a system of modular acoustic panels to provide a structure measuring 14 metres x 11 metres x 5 metres high. Test operations

are directed by Jaguar personnel from a control room running the full length of the test room and the interconnecting wall incorporates several large acoustic windows through which the airbag test apparatus can be viewed at all times. A 3 x 3 metre sliding acoustic door provides access to the test room (for equipment and personnel) and reverberation within the room is further reduced by sound-absorptive panels on internal walls. IAC's contract also covered the provision of access walkways and ventilation silencers.

Further details from Graham Dale tel: +44 (0)1962 873024
e-mail: grahamd@iaci.co.uk www.iaci.co.uk

Exposure to high frequency sound

HSE publishes research into effects on hearing

HSE has just published a new Contract Research Report, 'Damage to human hearing by airborne sound at very high frequency of ultrasonic frequency' by Ben Lawton from ISVR.

This extensive review examines the audiological, occupational hygiene and industrial safety literature on the subject. Also, the auditory effects of audible sound in the very high frequency range (10-20 kHz) and also in the inaudible ultrasonic range (greater than 20 kHz, generally thought to be the upper frequency limit of young normal hearing).

Exposure limits have been proposed, with the intent of avoiding any subjective and auditory effects in all exposed individuals.

The evolution of these internationally recognised Damage risk Criteria and maximum Permitted levels has been critically examined. Conclusions and recommendations are offered in respect of hearing damage and adverse subjective effects caused by sounds outside the customary frequency range for occupational noise exposure assessments.

Contract Research Report CRR 343/2001 is available, price £15, from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA, tel: 01787 881165.

The report will also be available shortly on the HSE website at: www.hse.gov.uk

Quality launch for dB Attenuation

New noise control company **dB Attenuation Ltd**, which operates from its Colchester office in Feering, Essex, offers services to industry covering the conception, design, manufacture and installation of noise control systems. The company is a specialist supplier to the electrical distribution industry, experienced in working with regional electricity companies and national providers across the UK.

Other areas covered include heavy and light industry, entertainment, retail and catering services.

Highlighting the company's commitment to customers, the launch announcement

was timed to coincide with the award of ISO.9001:2000 certification.

The company says its commitment to service is demonstrated by its state of the art noise monitoring systems, Autocad facilities, experience with bespoke design, and not least the certification to ISO.9001. Only 3% of UK businesses hold such an award, so dB Attenuation considers itself at the forefront of quality service and customer care.

Further information from Danny Blacklock or Eric Brennan, tel: 01376 572787 fax: 01376 572788 e-mail: info@dbattenuation.co.uk



Danny Blacklock of dB Attenuation Ltd (right) accepts the ISO.9001:2000 certificate from Eddie Soar of QMS International

Monoglas **Howling success**

What do you do when the rain crashes down on the roof of your greyhound kennels, making so much noise that it upsets your dogs? When the dogs get upset, so do the neighbours! This was the problem at Tompsett Farm, Kent until **Monoglass Spray-on** was applied.

Suitable as an acoustical treatment where high levels of sound absorption are required, this is another weapon in the armoury needed to meet the proposed Approved Document Part E of the Building Regulations. Its noise reduction coefficients are claimed to be greater than any other spray-on material to control noise in our living and working environments.

Monoglass Spray-on, say the manufacturers, has become the leading spray-applied glass fibre insulation world-wide. Made from 25% recycled glass, it is non-toxic, odourless and standard white for higher light reflectance, although other colours can be accommodated.

A non-combustible product, it eliminates many concerns and disadvantages associated with combustible cellular plastic or cellulose insulation materials. It allows for flexibility and freedom of design, providing options previously unavailable to the acoustic engineer and architect.

Inorganic glass fibre is combined with binders for a one-pass spray application

to any surface. It bonds to concrete, wood, steel, gypsum, rigid fibreglass and plastic insulation. The material becomes part of the building structure, resisting heat passage, air leakage, condensation and moisture migration. The pneumatic application method creates a homogeneous, carpet-like texture which can be adapted to meet various surface finish requirements.

In addition to its acoustic properties, Monoglass Spray-on has high thermal values which can be achieved without expensive mechanical support or multi-layer applications. Economical, clean and fast installation reduces costs and makes retrofitting a viable option.

For more details phone Graham Weeks on 01344 882314

LMS International **Pimento portability**

A new multichannel noise and vibration analyser, described as a professional laboratory system in a portable package, has been introduced by **LMS International**.

This has between 8 and 24 channels with 24-bit ADC, over 20kHz bandwidth on all channels in real time (or 1 million samples per second in sustained data throughput), a built-in tachometer, and a 24-bit DAC for structural stimulation. Its footprint is similar to that of a laptop computer, it weighs less than 5kg, and can be operated from AC or DC supplies, or its own internal battery.

LMS *Pimento* applications include general-purpose data acquisition, digital signal processing, and also specialised modules covering acoustics, structural testing and rotating machinery analysis. It can perform measurement sequencing, data processing and reporting

automatically under the control of a command processor which is programmable by the user. The CANbus Controller Area Network standard installed in most modern vehicles is supported, so noise and vibration data can be tracked against parameters such as oil pressure or temperature as well as speed. Power consumption is only 1.25W per channel, and to eliminate cooling fan noise, none is fitted: instead, the instrument is cooled by finning and heat pipes. The unit is modular in concept, and calibration is digital. LMS says that the basic 8-channel model is about the same price as a traditional analyser, and extra analysis modules and channels can be added as required.

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SOUND & VIBRATION

ANV Measurement Systems

New ground vibration logging system

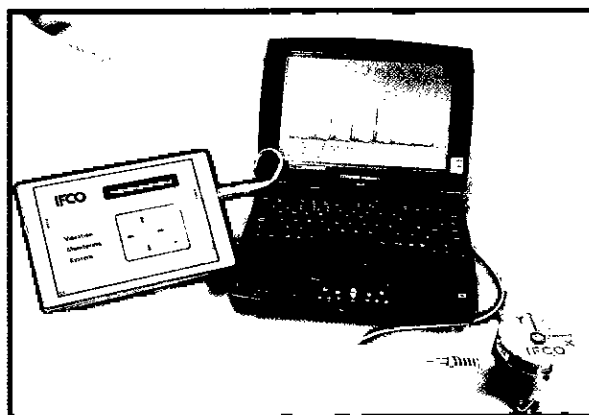
The IFCO vibration monitoring (VM) system is now being distributed by **ANV Measurement Systems**, UK distributor for Rion sound and vibration instruments.

As with the Rion range, the IFCO VM system is simple and practical to use, continuously logging peak particle velocity (PPV) in three dimensions. The system, which can be purchased or rented, consists of the data-logging device and a three-dimensional geophone set.

The PPVs for each channel are stored, together with the measurement time from the system's real-time clock. The dominant frequency of the maximum PPV for each measurement period is also recorded.

The measurement period is programmable from 1 to 999 seconds and the system will store up to 12600 sets of results. This equates to 8.5 days of 1-minute results or more than four weeks for measurement periods of 10 minutes (or more).

The system will run for approximately four



weeks on a set of three alkaline 'D' cells. The instrument is supplied with easy-to-use download software which supports Windows 95 upwards. This shows the results graphically from all three directions logged against the real time clock, enabling a very quick judgement to be made upon whether criteria have been exceeded and, if so, at what time it occurred. The results can be easily imported into spreadsheets for further analysis.

The system can also trigger an (optional) alarm.

Further details contact: Bob Lorenzetto, Les Jephson or Mike Breslin, tel: 01908 642846 fax: 01908 642814. e-mail: info@noise-and-vibration.co.uk.

Windmill Software

Reads and controls laboratory instruments

A versatile new instrument driver from **Windmill Software** handles almost all equipment that can be connected to the COM port of a PC. Bundled with Windmill's full-featured data logging, charting and control applications, the package makes it easy to computerise laboratory measurements.

Furthermore, users can send data to other Windows programs like Excel spreadsheets or LIMS applications. Free technical support for life is available and customers can take advantage of a 'try before you buy' offer.

Running under Windows 95, 98, NT, 2000 or ME the driver - called *ComIML* - can handle instruments communicating over RS-232, RS-485, RS-422 or Modbus. These may send ASCII or binary data. This flexibility ensures the majority of serial instruments are supported, including gas analysers, pH transmitters, titrators, particle analysers, sound level meters, conductivity meters, laboratory scales, GPS and sonar. Users have the freedom to interface devices from many different manufacturers, such as A&D, Ashtec,

Brüel & Kjær, Ecom, Funaro, Mettler Toledo, Motorola, Molyteck, Omron, Parallax, Sartorius, Siemens and Telegan.

To enable engineers and scientists investigate their ability to 'talk to' their instrument before buying the Windmill package, the set-up part of the system is freely available. Users can download this program from the company's web site, enter their instrument settings, and confirm they can receive data.

The program also provides many trouble-shooting facilities, helping pinpoint problems with the COM port connection.

The Windmill package, consisting of a complete suite of data acquisition, logging, charting and control applications, costs £145. No programming is required. If needs grow, a range of optional extras is available. These include drivers to interface GPIB (general purpose interface bus), USB (universal serial bus), and Ethernet devices; Visual Basic programming tools; alarm alerts by telephone; and process mimic generators.

For more details: visit <http://www.windmillsoft.com/comiml.html> or contact: Graham Collins on +44 161 833 2782, fax +44 161 833 2190.

Cirrus Research

DoseBadge - wireless noise dosimeter

Most traditional noise dosimeters have a microphone attached to a cable which can cause problems when the wearer is involved in activities requiring movement or operation near machinery.

In the style of a radiation badge - more than a traditional noise meter - it is lightweight (50g), has no microphone cable, and is simple to use. The badge is controlled, calibrated and downloaded using the reader unit via an infra-red link, and can be recharged after use.



doseBadge downloaded with infra-red link

The *doseBadge* allows the operator to comply fully with requirements of the *Noise at Work Regulations*, measuring both dB(A) L_{eq} and $L_{EP,d}$ as well as dB(C) peak exceedance and percent dose.

Supplied as a complete measurement system, it includes Windows software and all the accessories needed. Typical kits include 2, 5 or 10 badges, along with charging units.

Further details from: James Tingay, Cirrus Research plc tel: 01723 891655 fax: 01723 891742

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A 'lughole mechanic' remembers

Ian Acton FIOA recalls efforts to establish the links between noise and industrial deafness

I have just retired, having spent thirty nine years - to the day - involved with noise and industrial deafness. Your editor, being some years my junior, has flatteringly suggested that I recount some of my earlier experiences.

The first meter I used was an early Dawe model with separate octave filter set connected by cables. Although described as 'portable' in the sales literature, these weighed about fifteen and twenty five pounds respectively. I pushed them around on a tea trolley. Octave band analysis was customary, if not compulsory, at that time. There was a feeling that resorting to single figure dB(A) readings was like throwing the baby out with the bathwater. Noise measurements were, of necessity, made at fixed points, but still took some time.

Early readings

Integrating meters were unheard of, and the height of sophistication was to assess personal noise exposure by averaging readings from several points. Anyone who climbed stairs during the course of their work was conveniently ignored.

I calculated that, with careful calibration, I could repeat field measurements to within a standard deviation of 2dB except at low frequencies. Has much really changed since?

Our statistician put things into perspective by producing a perfect correlation between the sales of motor scooters in Cambridge and illegitimate births in Oxford. Or was it the other way round? Notwithstanding, the M25 motorway did not exist, and the best route was through Maidenhead.

I was a founder member of the Society of Acoustic Technology, which became the British Acoustical Society and then, in due course, the present Institute. I applied for membership of the new Institute, and was surprised to be offered Fellowship. I still think they wanted the extra subscription income. I worked alone for the first three years until my grant ran out. My late professor then took me to one side and suggested there was 'no future in this noise business'. I disagreed. As employment protection legislation was non-existent, I soon found myself unemployed and of no fixed abode, to boot. With nothing else to do, I got married.

Many years later I was being cross-

examined in Court in the same city by a Queen's Counsel who asked whether I knew there has been a whole department in the medical school devoted to the study of noise and deafness. I had the pleasure of replying: "Yes, it was me!".

The first wearable earmuffs had cushions filled with glycerine. I was asked to take a set to Scotland. The reduced pressure in the aircraft cabin had a devastating effect on the integrity of the cushions, and glycerine leaked into my overnight baggage. How do you explain that sticky mess when you get home?

Early forays into measuring the impulse noise produced by high-voltage air-blast circuit-breakers involved standing bricks or concrete blocks on end, and calculating the pressure necessary to blow them over. The results proved remarkably accurate when confirmed by dedicated instrumentation many years later. Or was it simply luck?



The first wearable earmuffs had cushions filled with glycerine

The risk of electrocution was always forefront in the mind, but we were reassured by the knowledge that hearing the bang meant we were all right. That was, at least until the next time.

Measuring weapon noise involved triggering an oscilloscope by the signal from a second microphone placed ahead of the measuring microphone on the basis that sound travels about one foot in one millisecond. The trace was meant to be captured by a Polaroid camera.

The whole process was rather hit-and-miss, and a lot of ammunition and film were wasted. This didn't matter too much with small arms, but the Range Sergeant could get a little agitated when asked if he minded firing another rocket launcher because we missed the last one. These measurements have also proved reassuringly accurate with the passage of time.

The Wilson Committee report, the booklet *Noise and the Worker*, and numerous Annual Reports of H M Chief Inspector of Factories all came and went without anyone in high places really noticing that people were going deaf.

The Departmental Committee on Compensation for Industrial Deafness reported: "Boilermaker's deafness does not however prevent a man from continuing his trade and it cannot therefore give rise to claims for compensation on the ground of incapacity".

One prominent industrial medical officer suggested that if a person objected to noise, he should find another job, whilst another wrote that: "Deafness was perhaps an excuse to avoid Union meetings or going to church". Lack of interest meant lack of money.

I resorted to involvement in community noise complaint cases to make ends meet. The local British Legion held a regular Saturday night knees-up accompanied by accordion and drums. Its building could best be described as an acoustic sieve, so we listed the tunes played during the evening - *White Cliffs of Dover*, *Edelweiss*, and so on. How could the Court possibly have convicted on the basis of evidence like that?

In another case, the night appointed for noise measurements outside a seafront discotheque coincided with gales and the high tide. I honestly could not measure anything above the background noise.

A landmark ruling

Mr Frank Richard Berry changed everything when, on 6 December 1971, he successfully sued his employer for causing his industrial deafness. This was the first of the epic High Court industrial deafness cases, and the only one I missed.

Yet again, Common Law was ahead of the government. The *Code of Practice for reducing the exposure of employed persons to noise* followed on 17 April 1972. With a title like that, it soon became better known as the 'Yellow Peril'. First editions can be identified by a printing error on page 24. And the rest is history.

Finally, the title 'lughole mechanic' was bestowed by Brian Clarkson, President of the Institute from 1980 to 1982. Please note that it should be said with a Yorkshire accent.

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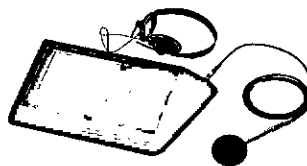
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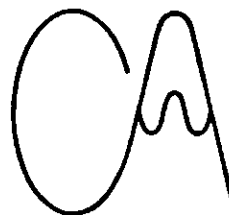
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