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L'ASSOCIATION CANADIENNE D'ACOUSTIQUE
C.P. 1351, SUCCURSALE "F"
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EDITORIAL

This issue presents a report on a truly Canadian theme: on the difference between French and English people - regarding their voice spectra, that is. It seems fully appropriate that acousticians should be making a contribution to the language issue. We also publish a paper on a new room-acoustical measurement system based on sound intensity measurement. Also published is a report on aircraft noise levels in Toronto. I trust that aircraft like that illustrated on the cover don't use Toronto Island Airport every day.

In this issue are published full details of Acoustics Week in Canada 1993, to be held in Toronto. The organization of this year's meeting is progressing smoothly. The week will feature an opening reception, technical seminars on sound intensity measurement and on HVAC noise, an exhibition of instrumentation, software and materials, the symposium and, of course, a banquet. The organizers are expecting a huge turnout; prepare your abstracts, ladies and gentlemen.

In recent weeks I have received phone calls from people enquiring about such matters as how to join the CAA, how to have news published in this journal, how to apply for CAA prizes and the correct format for submitted papers. The answers to all these, and many other, questions are contained in every issue of Canadian Acoustics. I would suggest that, unless people have too much time on their hands or shares in Bell Canada, they look for this information in the journal instead of calling me. Feel free to call me if the information you seek is not there.

This issue sees the retirement of John O'Keefe as my assistant editor in charge of advertising. John is involved with organizing the annual meeting and feels he cannot cope with two CAA jobs. On behalf of all readers of Canadian Acoustics, may I thank you, John, for your hard work over the last years.

Ce numéro présente un rapport portant sur un thème vraiment canadien: la différence entre les francophones et les anglophones - plus précisément sur le spectre de leur voix. Il est intéressant de constater que les acousticiens peuvent contribuer à la problématique du langage. Nous publions aussi un papier portant sur un nouveau système de mesure en acoustique du bâtiment basé sur la mesure de l'intensité acoustique.. Un rapport sur les niveaux du bruit des avions à Toronto est aussi publié. Il est à espérer que les avions comme celle illustrée sur la page couverte n'utilisent pas l'aéroport de Toronto quotidiennement.

Dans ce numéro, vous trouverez tous les détails relatifs à la Semaine de l'Acoustique 1993 qui se tiendra à Toronto. L'organisation de ce congrès progresse bien. La semaine débutera avec une cérémonie d'ouverture, des séminaires techniques sur la mesure intensimétrique et sur le bruit HVAC, une exposition d'instruments, de logiciels et d'équipments, le symposium et le banquet, évidemment. Les organisateurs anticipent une forte participation; préparez vos résumés mesdames et messieurs.

Au cours des dernières semaines, j'ai reçu des appels téléphoniques de personnes qui demandaient des informations telles que la façon de devenir membre de l'ACA, comment faire publier des nouvelles dans le journal, comment poser sa candidature pour les prix et le format à respecter pour publier un article. Les réponses à ces nombreuses questions et bien d'autres, se trouvent dans chacune des publications de l'Acoustique Canadienne. À moins que les gens aient du temps à perdre ou des actions chez Bell Canada, je suggèrerais que chacun fasse l'effort de chercher ces informations dans le journal plûtot de me téléphoner. Sentez-vous à l'aise de me téléphoner si l'information que vous cherchez n'est pas disponible.

Ce numéro coïncide avec la " retraite " de John O'Keefe à titre de rédacteur adjoint à la publicité. John est impliqué dans l'organisation du congrès annuel et ne peut cumuler deux tâches à la fois. Au nom de tous les lecteurs de l'Acoustique Canadienne, je remercie John pour son bon travail des dernières années.

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Canadian Acoustics / Acoustique Canadienne 21(1) 3-8 (1993) **Research article / Article de recherche**

COMPARISON OF SPECTRAL AND VOICE QUALITY PARAMETERS OF VOICE TRAINED ANGLOPHONES AND FRANCOPHONES IN CONTINUOUS SPEECH

William Weiss
Department of Theatre
University of Ottawa
Ottawa, Ontario, Canada K1N 6N5.

ABSTRACT

Continuous speech of 23 subjects was recorded. The group was composed of Voice Trained (n=11) and Untrained (n=12) Male and Female Anglophone subjects. The objective of the investigation was to find out how are *spectral levels* and *voice quality* compared to an equivalent group of Francophones that were the object of a previous study. Long term spectral analysis was applied to all recorded samples and *Spectral Levels* were determined for regions of $F0$, $F1$, <1000Hz (B_{1K}), >1000Hz (A_{1K}); and the following ratios were computed: 1. $\theta = F1 - F0$, 2. α_{AB}= >1000Hz - <1000Hz. Analyses of variance were carried out in order to ascertain differences between Trained and Untrained subjects and between the linguistic groups. Results show: 1. α_{AB} greater for Trained Anglophones than for Untrained Anglophones. 2. α_{AB} not greater for Trained Francophones than for Untrained Francophones. 3. α_{AB} greater for Trained Anglophones than for Trained Francophones. 4. α_{AB} the same for Untrained Anglophones and Untrained Francophones. 5. Trained Anglophones have higher Spectral Levels than Untrained Anglophones. 6. Trained Francophones have smaller Spectral Levels than Untrained Francophones. 7. Trained Anglophones have significantly higher Spectral Levels than Trained Francophones in the higher frequencies. 8. Untrained Francophones have significantly higher Spectral Levels than Untrained Anglophones in the lower frequencies. 9. There were no significant differences for θ. Key Words: Spectral analysis- L.T.A.S.- Voice Quality - Voice Training - Anglophones - Francophones.

SOMMAIRE

La parole continue de 23 sujets a été enrégistrée. Le groupe était composé de sujets anglophone masculins et féminins avec formation (n=11) et sans formation (n=12). Le but de l'étude était de comparer leurs *hauteurs spectraux* et leurs *timbres vocaliques* avec un groupe semblable de francophones qui avaient fait l'objet d'une recherche antérieure. Le spectre moyenné à long terme a été calculé pour tous les échantillons et des *hauteurs spectraux* ont été détérminés pour les zones $F0$, $F1$, <1000Hz (B_{1k}), >1000Hz (A_{1k}); ainsi que les proportions suivantes: 1. $\theta = F1 - F0$, 2. α_{AB}= >1000Hz - <1000Hz. Des analyses de variance ont été réalisées pour vérifier des différences entre sujets avec et sans formation ainsi qu'entre les deux groupes linguistiques. Résultats: 1. α_{AB} plus grand pour anglophones avec formation que pour anglophones sans formation. 2. α_{AB} n'est pas plus grand pour francophones avec formation que pour francophones sans formation. 3. α_{AB} plus grand pour anglophones avec formation que pour francophones avec formation. 4. α_{AB} semblable pour anglophones et francophones sans formation. 5. Anglophones avec formation ont des niveaux spectraux plus élevés que les anglophones sans formation. 6. Francophones sans formation ont des niveaux spectraux plus élevés que les francophones avec formation. 7. Anglophones avec formation ont des niveaux spectraux plus élevés que francophones avec formation d'une façon significative dans les fréquences aigües. 8. Francophones sans formation ont des niveaux spectraux plus élevés que anglophones sans formation d'une façon significative dans les fréquences basses. 9. Il n'y avait pas des différences significatives pour θ. Mots clés: analyse spectrale - s.m.l.t. - timbre vocalique - formation vocale - anglophones - francophones.

1. INTRODUCTION

Long Term Average Spectra as an acoustic measure of voice quality has been used in order to ascertain progress in voice therapy (Frokjaer-Jensen and Prytz, 1976) and voice training (Wedin *et al.* 1978), to distinguish trained from untrained singers (Sundberg and Gauffin, 1978) and across language groups (Zalewski and Majewski, 1971, Banuls-Terol, 1971, Tarnóczy and Fant, 1964, Boysson-Bardies *et al.* 1984, Harmegnies and Landercy, 1985, Esling, 1983). Given the very wide intra-speakers' variations (Tarnoczy, 1956, Bordone-Sacerdote and Sacerdote, 1969, Doddington, 1985, Harmegnies and Landercy, 1985) spectra at conversational levels have not been used widely in differentiating language-groups.

An acoustic measure of voice quality was proposed by Frokjaer-Jensen and Prytz (1976) as the ratio α = intensity above 1kHz/ intensity below 1kHz. In that study patients with a history of unilateral laryngeal paralysis, after undergoing voice therapy increased the energy in the harmonics above 1000Hz. Wedin *et al.*, (1978) seemed to confirm the usefulness of this measure in normal speech with a group of professional singing teachers who had undergone one week of intense voice training. Their normal speech voice contained a significant increase of energy in the spectra above 1000Hz. The higher intensity in the upper spectra seems to be associated with a "clearer" speaking voice (Kiukaanniemi *et al.*, 1982). Sundberg and Gauffin, 1978 suggested, on the other hand, that in singing, judging the higher spectra as a measure of good quality is misleading because it could be obtained with an increased vocal effort ("pressed" phonation) which is not characteristic of trained male singers. They proposed that a measure of good quality is θ, a higher increase of energy in the $F0$ area relative to the $F1$ area, which is a characteristic of trained subjects ("flow" phonation). In a recent study (Weiss, 1991), which was also the first part of the present investigation, both of these voice quality measures showed no significant differences between voice trained and untrained Francophone subjects. It was concluded that possibly the voice quality measurement α is linguistically related, given that those studies were conducted with English, Danish Swedish and Finnish speakers, and were, perhaps, not appropriate for French, whereas the other voice quality measurement, θ might be adequate for singing but not for speech.

Some authors have expressed the need to give special consideration to normative acoustical data of voice trained speakers (Peppard *et al.*, 1988). If acoustical measurements of desired voice quality parameters as represented by voice trained speakers are different across languages, it would be important to compare the relevant acoustical targets of both trained and untrained speakers of different language groups. These normative parameters could be of interest in the fields of voice training, speaker's recognition and synthetic speech. In this study the above mentioned four frequency intervals LTAS's ($F0$, $F1$, <1000Hz (B_{1K}), >1000Hz (A_{1K})) and the ratios: 1. $\theta=F1-F0$, 2. α_{AB}= >1000Hz - <1000Hz, were used to compare continuous read speech, between **voice trained** and **untrained** subjects of Canadian English and French, both within and across languages. The data for the French speaking group, which was extracted at the same time as the English speaking group, was used again from the previous paper (Weiss, 1991).

2. SUBJECTS

The experiment for both groups was carried out at the same time and under the same conditions. The group of 23 Anglophone subjects was composed of Voice Trained (n=11) and Untrained subjects (n=12). The group of 23 Francophone subjects was composed of Voice Trained (n=12) and Untrained subjects (n=11). All subjects were given a detailed audiogram and those with abnormal hearing were screened out. Those with mother tongues other than Canadian English (Anglophones) or Canadian French (Francophones) were also excluded. An experienced voice trainer listened to the subjects in order to preclude any voice abnormalities. There were 10 male and 13 female Anglophones, and 12 male and 11 female Francophones. The average age of the Anglophone group was 36.83 years and that of the Francophone group 29.16 years. The average years of training of trained Anglophones group was 6.59 years, and that of trained Francophones 4.96 years. The trained subjects were either members of a well known choir or professional actors and radio announcers. The subjects donated their time without pay. The problem pertaining to the fact that different types of voice training for singers and speakers were involved in this experiment was considered. Given the large array of voice training methods given to singers and speakers, and the fact that speakers get training of the sort given to singers, it is impossible to control the pedagogical input in such a large group. It was deemed that the selection of trained subjects for investigations of the normative type is probably quite adequate when based on their careers or artistic activities.

3. MATERIALS

The English and French texts, of phonetically balanced contents lasting approximately one minute of reading time, was edited from existing literary materials. Given the length of the reading materials and the minor importance of their contents (Benson and Hirsh, 1953) they will not be reported.

4. PROCEDURE

The subjects were recorded while reading the same one minute text. The subjects were given a few minutes to become acquainted with the text, but beyond that they were not given instruction or practice. All the recordings, and the audiometric screening, were conducted in a soundproof cabin (I.A.C.). During the recording the distance from the microphone was one foot. A 1000Hz tone was recorded on the tapes for calibration purposes. The microphone was a Sennheiser MD441-U (filtration switch on 'M'), the tape recorder a full track Revox 77A (tape speed 15 ips), and the tapes Ampex 406.

5. ANALYSES

The recorded samples were analyzed with an Ono Sokki CF300 spectral analyzer for Long Term Average Spectra at 1/3 octave intervals, 16-kHz range, for 128 spectra used to compute the long term average, during one minute. The data were transferred and digitized in an IBM micro-computer through a software package designed for the project and then transferred to the mainframe (Amdhal) computer where Spectral levels were determined.

Long Term Average Spectra were computed for the following intervals:

***F*0e**: Log energy at interval 80-160Hz for men, 160-250 Hz for women
***F*1e**: Log energy at interval 315-600Hz
B_{1K}: Log energy below 1kHz (80-800Hz)
A_{1K}: Log energy above 1kHz (1000-5000Hz)
θ_{F1F0}: ***F*1e** minus ***F*0e**
$\alpha_{AB}= A_{1K}$ minus B_{1K}

These intervals were chosen in order to calculate the ratios θ_{F1F0} and α_{AB} which were the voice quality acoustical parameters reported in previous investigations and tested in the present study. Given that the recording and the analyses conditions were identical for all subjects, and that the interest lied in the relative energy levels, the computed intervals served to compare spectral levels and it was not necessary to SPL normalize them. The log energy measures also allowed for a simple subtraction for the calculation of the ratios. SAS (SAS Institute Inc.) analyses of variance (t-tests) were computed in order to ascertain differences between the Voice Trained and the Untrained, as well as between Anglophones and Francophones.

6. RESULTS AND DISCUSSION

Unlike Francophones (Table 2, Fig. 2) the Anglophone data (Table 1, Fig. 1) confirms previous findings (Wedin *et al.* 1978) that voice training provides significantly more spectral energy in the higher frequencies relative to the lower frequencies (α_{AB}: $p<.004$; the smaller log difference indicates more relative energy in the higher spectra). However, the spectral levels of the trained Anglophone subjects are higher in all intervals (i.e. have smaller negative numbers) and significantly at A_{1k} ($p<.02$). That is, Trained Anglophones speak louder that their Untrained counterparts, and those higher vocal levels produce more energy in the higher frequencies.

Unlike Anglophones, Untrained Francophones have higher spectral levels than the Voice Trained yet α is not significantly different.

θ was not significantly different for either language group.Trained Anglophones (Table 3, Fig.3) have significantly higher spectral levels in the higher frequencies (A_{1K} ($p<.05$)) than Trained Francophones and there are significant differences for α_{AB} ($p<.002$). This confirms that voice training increases the energy in the higher frequencies for English speaking subjects as it did for Swedish speaking subjects (Wedin et al. 1978). Untrained Francophones (Table 4, Fig.4), on the other hand, have higher vocal levels than Untrained Anglophones mainly in the lower frequencies (F0e: $p<.03$; B_{1K}: $p<.03$) but there are no significant differences for α_{AB}.

Voice training increases or decreases vocal levels differentially, depending on the language group. These spectral differences are probably linked to language dependent articulatory settings (Laver, 1980). However there were no significant spectral level differences in the higher frequencies between the untrained Anglophones and Francophones. Trained Anglophones, on the other hand, have higher energy in the upper spectra than untrained Anglophones and trained Francophones. Clearly, voice training produced a language specific acoustical target that was not operant in French.

There are no clear perceptual evaluations of acoustical determinants of voice quality. One can only infer tentatively some possibilities from these results. The tables show that the spectral levels of voice trained Anglophones were higher than those of their untrained counterparts. It is well known that higher vocal levels produce a shift of energy towards the higher spectra (Van Summers *et al.* 1988; Stanton, 1988) thereby producing more 'sonority' (Wedin *et al.*,1978) and perhaps more 'tension' (Laver, 1980). Trained Francophones have on average lower spectral levels than their untrained counterparts, indicating perhaps that for Francophones the vocal target is one of relaxation. This is found in Table 3 where vocal levels for trained Anglophones and Francophones is similar except in the higher frequencies, whereas in Table 4 untrained Francophones show significantly higher levels in the frequencies below 1000Hz (B1K) where most of the vocal energy resides. The settings for English and French are different in lip, jaw and tongue tip positioning creating a 'laxer' English and a 'tenser' French (Laver, 1980), the adjustments resulting from voice training seem to equalize vocal levels but accentuate the difference in the higher frequencies that result from the settings.

A comparison by gender did confirm the result of the combined groups and was not reported in order not to unduly burden this paper.

The fact that α_{AB} distinguished the trained Anglophones from all the other groups, but that it did not distinguish the untrained Anglophones from the untrained Francophones made it clearly a linguistic *voice training* parameter, an acoustic measure that characterises good English voices. It is noteworthy that a similar measure for French was not found, and that the English target should not be applied to French speech.

7. SUMMARY

1. α_{AB} greater for Trained Anglophones than for Untrained Anglophones. 2. α_{AB} not greater for Trained Francophones than for Untrained Francophones. 3. α_{AB} greater for Trained Anglophones than for Trained Francophones. 4. α_{AB} the same for Untrained Anglophones and Untrained Francophones. 5. Trained Anglophones have higher Spectral Levels than Untrained Anglophones. 6. Trained Francophones have smaller Spectral Levels than Untrained Francophones. 7. Trained Anglophones have significantly higher Spectral Levels than Trained Francophones in the higher frequencies. 8. Untrained Francophones have significantly higher Spectral Levels than Untrained Anglophones in the lower frequencies. 9. There were no significant differences for θ.

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Table 1: Mean energy levels (dB) of voice **Trained Anglophones** (N=11) and **Untrained Anglophones** (N=12) measured over selected (1/3 octave) intervals.

Interval		F0e	F1e	θF1F0	B1K	A1K	αAB
						*	**
dB	Tr. Ang.	-21.73	-21.99	-0.13	-17.48	-25.93	-8.45
	Untr. Ang.	-23.50	-23.34	0.15	-19.42	-30.94	-11.51

Table 2: Mean energy levels (dB) of voice **Trained Francophones** (N=12) and **Untrained Francophones** (N=11) measured over selected (1/3 octave) intervals.

Interval		F0e	F1e	θF1F0	B1K	A1K	αAB
dB	Tr. Fra.	-21.73	-22.14	-0.41	-17.93	-29.61	-11.67
	Untr. Fra.	-20.96	-20.48	0.47	-16.53	-28.04	-11.51

Table 3: Mean energy levels (dB) of **Trained Anglophones** (N=11) and **Trained Francophones** (N=12) measured over selected (1/3 octave) intervals.

Interval		F0e	F1e	θF1F0	B1K	A1K	αAB
						*	**
dB	Tr. Ang.	-21.73	-20.99	0.74	-17.48	-25.93	-8.45
	Tr. Fra.	-21.73	-22.14	-0.41	-17.93	-29.61	-11.67

Table 4: Mean energy levels (dB) of **Untrained Anglophones** (N=12) **Untrained Francophones** (N=11) measured over selected (1/3 octave) intervals.

Interval		F0e	F1e	θF1F0	B1K	A1K	αAB
		*			*		
dB	Untr. Ang.	-23.50	-23.34	0.15	-19.42	-30.94	-11.51
	Untr. Fra.	-20.96	-20.48	0.47	-16.26	-28.04	-11.51

* significant at the 0.05 level
** significant at the 0.01 level
*F*0e:Energy at interval 80-160Hz for men, 160-250Hz for women
*F*1e:Energy at interval 315-600Hz
B_{1K}:Energy below 800Hz (80-800Hz in 1/3 octaves)
A_{1K}:Energy above 1000Hz (1000-5000Hz in 1/3 octaves)
θ_{F1F0}: F1e minus F0e
$\alpha_{AB} = A_{1K}$ minus B_{1K}

Normal Speech for Anglophone
Voice Trained VS Untrained

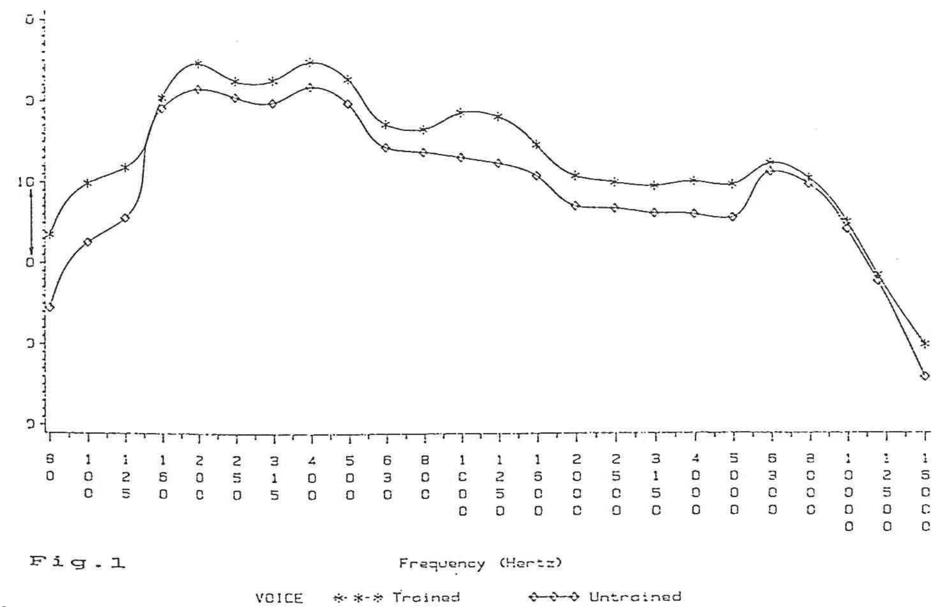

Fig. 1

Normal Speech for Francophone
Voice Trained VS Untrained

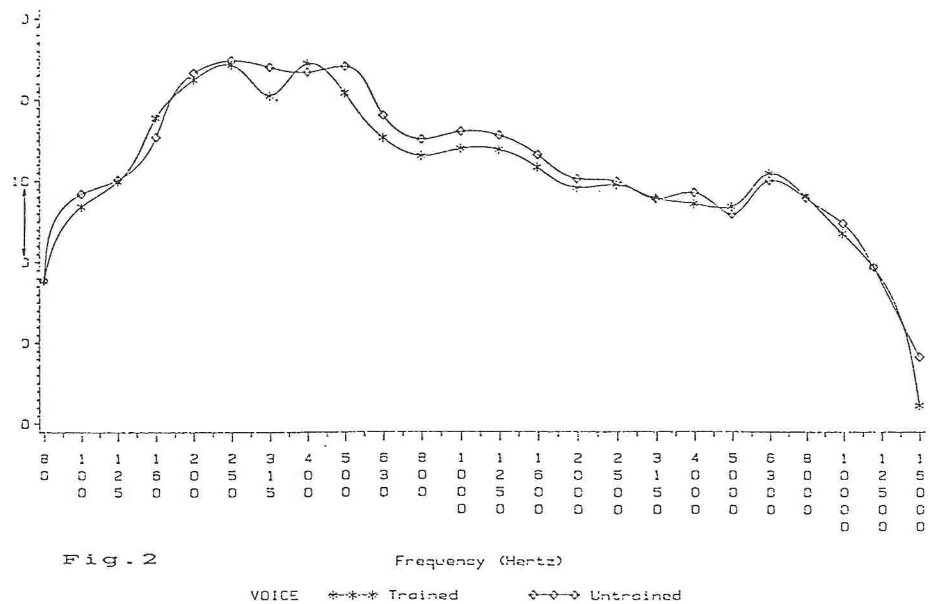

Fig. 2

Normal Speech for Trained Subjects
Anglophones vs Francophones

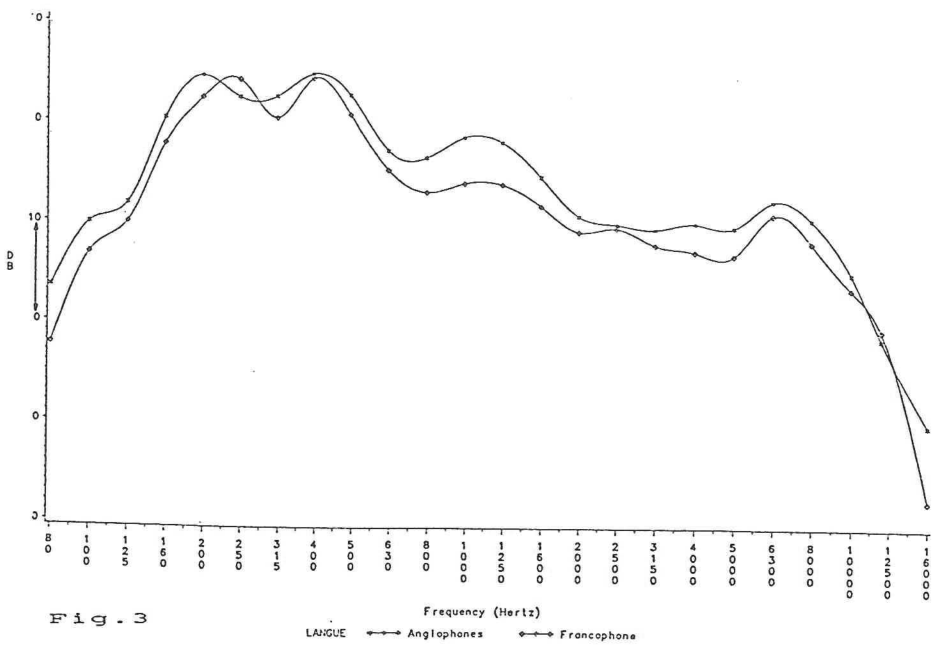

Fig. 3

Normal Speech for Untrained Subjects
Anglophones vs Francophones

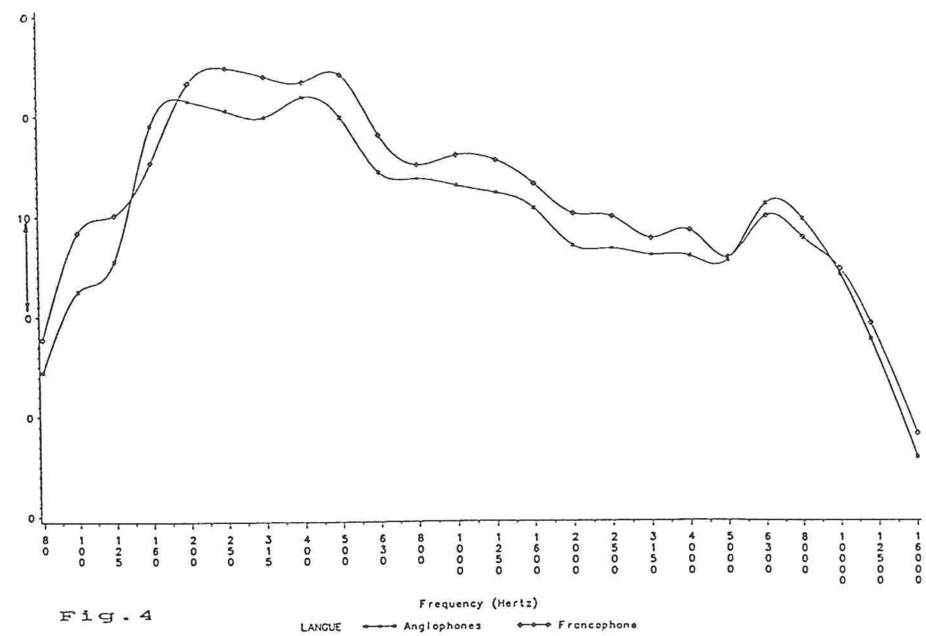

Fig. 4

A PC BASED MEASUREMENT SYSTEM FOR OBTAINING SPATIAL INFORMATION AND OBJECTIVE ROOM-ACOUSTIC INDICATORS.

A. Abdou and R. W. Guy
Centre for Building Studies (CBS),
Concordia University,
Montreal, Quebec, H3G 1M8, CANADA.

ABSTRACT

Over the last twenty years, many subjectively relevant objective room-acoustics quantities or indicators for evaluating the acoustical quality of an enclosure have been introduced. Whilst indicators give new insight into the acoustical goodness of a receiver position, there is still a need to quantitatively establish the extent that they are influenced by the interior physical features of the enclosure. The relationship between objective room-acoustic indicators and details of enclosure design from the point view of cause and effect are not fully understood; in order to contribute knowledge in this area, quality indicators must be obtained with directional information. A PC Based multiple channel measurement system under current development and designed to meet these demands is presented. The system involves software developments together with hardware interfacing. Its potential is discussed and example results are given.

SOMMAIRE

Au cours des vingt dernières années, on a introduit plusieurs quantités objectives subjectivement pertinentes ou paramètres pour l'évaluation de la qualité acoustique d'une enceinte. Bien que ces paramètres donnent des significations nouvelles à la qualité acoustique d'une position d'écoute, on eprouve qu'en même le beison d'établir quantitativement le degré de l'influence exercée sur eux par les caractéristiques physiques intérieures de l'enceinte. La relation causale entre les paramètres acoustiques objectives et les détails de conception des enceintes ne sont pas encore complètement compris; on doit obtenir des paramètres de qualité contenant de l'information directionnelle pour l'éclaircir. A fin de répondre à cette demande, on apporte une contribution originelle en utilisant un système de mesure multicanal basé sur ordinateur personnel. Le système comprend des développements de logiciel ainsi que d'interface. On explore le potentiel du système et on en donne des exemples.

1. INTRODUCTION

Over the last two decades, many subjectively relevant objective room-acoustics quantities or indicators for evaluating the acoustical quality of an enclosure have been introduced. Some of these indicators relate to reverberance and musical clarity, others to spaciousness or spatial impression, some to speech intelligibility and others to acoustic conditions at performer locations. These indicators are typically "Reverberation Time" (*RT*), "Early Decay Time" (*EDT*), "Definition" (*D50*), "Clarity" (*C50,C80*), "Centre Time" (*TS*), "Lateral Energy Fraction" (*LEF*), "Relative Strength" (*L*), "Speech Transmission Index" (*STI*), "Rapid Speech Transmission Index" (*RASTI*), "SUPPORT" (*ST*) and Modulation Transfer Function (*MTF*) [1; 7].

Most of the newer indicators are based on the room impulse response sound energy ratios and except for LEF do not touch upon the sound directional characteristics. Numbers of them are found to be inter-related and to some extent considerable overlap is exhibited;[3; 8] this implies that knowing a few will allow others to be deduced. They have also been correlated to overall geometric variables such as room width, height and wall angles; recently Gade [9] proposed empirical models for their prediction based on statistical analyses. Techniques for precise measurement of these indicators have become common however some of them are position dependent and more sensitive to the early reflection sequence, subsequently they are dependent on both the overall geometrical characteristics of the space and architectural details in the vicinity of the measurement location.

The value of such indicators give new insight into the acoustical goodness of a receiver position but in order to design halls, or to correct an acoustical defect in an existing enclosure, there is a need to quantitatively understand the extent to which they are influenced by the various physical design features of the enclosure. In order to develop this understanding, indicator values must be obtained together with directional characteristics information; thus a need exists for suitable comprehensive instrument development. The purpose is to link the measured indicators to the interior physical features and to assess diagnostic capability with respect to the effect and its cause.

2. INSTRUMENTATION REVIEW

With the advent of portable computers and signal analyzers, sophisticated analysis and data acquisition may be made in situ and there are already a few commercial and research PC based room-acoustics measurement systems. A well documented development is the four generations of measurement system developed at the National Research Council of Canada (*NRCC*) over the past 10 years and designed to measure and evaluate criteria concerning the acoustical conditions in auditoria. Bradley and Halliwell **[10]** review this experience in a comparative approach. The most recent of their systems the two microphone *RamSoftII* **[11]**, is based on using Maximum Length Sequence (*MLS*) as an excitation signal. The authors conclude that there is a need for a system giving more comprehensive directional information.

Another measurement system enabling the in-situ calculation of some room-acoustic parameters has been developed in Denmark **[12]**. The system uses a Bruel & Kjaer Modular Precision Sound Level Meter, type 2331 equipped with an IBM-compatible lap-top computer with a plug-in application software module. A powerful hi-fi amplifier and an omnidirectional loudspeaker constitute the sound source. The system is flexible, gives immediate results, is easy to setup and operate, but it is limited by being single channel therefore, indicators such as LEF cannot be measured.

Recently, a powerful single channel system analyzer,"MLSSA" **[13]** based on the MLS technique has been introduced. The system consists of a hardware component; a plug-in-Board (A/D-160), a software driver and signal processor. The system provides important functions needed in data acquisition, processing and analysis for room-acoustic investigations by post processing the impulse response. The system components and possible applications are discussed in some detail by Rife **[14,15]**.

Marshall **[16]** briefly described an other measurement system, "*MIDAS*", which performs room-acoustic measurements based on Fast Fourier Transform (*FFT*) techniques at full scale or at model scale using a variety of sound sources. The system is implemented on an Apple Mac-II computer and it can be operated either in a single or dual channel mode. A more complete description may be found in **[17]**.

Tachibana et al **[18]** demonstrated a measurement system using a technique for the measurement of the impulse response in real auditoria and in scale models. Their measurement system is described along with its application in both cases and some examples are also presented.

The foregoing systems have been developed primarily to measure existing indicators.

Endoh et al **[19]** have developed a technique by which they are able to grasp the spatial information specially of the early reverberation periods. The measurement technique developed by Yamasaki and Itow **[20]** employs a four channel input system to determine virtual image sources and directivity patterns. Powers of virtual image sources are calculated by a correlation technique. The technique gives new insight and valuable information about the directional characteristics of sound in enclosures however no attempt has yet been made to establish relationships between known room-acoustic indicators and the directional characteristics of the sound field.

Confining attention now to the systems described above which display the basic characteristics or potential for directional sensing, namely, digitized raw data capture, software driven and post processing, and two or more channel acquisition, an additional limitation is evident, that is, the current frequency range of application is restrictive. The systems are either low frequency limited (125 Hz) by a lack of low frequency energy content of the source or upper frequency limited (4 kHz) by the temporal length of the digital signal able to be captured and processed.

3. THE NEW MEASUREMENT SYSTEM

A comprehensive measurement system should possess certain features. It should be portable, efficient, and accurate whilst performing the following functions.

- Collect and process extensive time-frequency data in a routine manner over a full range of frequencies and durations.
- Calculate a number of potential useful room acoustic

indicators from the collected data in situ.
- Provide reproducible measurements.
- Provide directional and directivity information of sound in the enclosure in a manner which allows ready interpretation.

In addition the system must be flexible, easy to calibrate, update, set up and operate.

3.1 CBS-RAIMS Components' Description

The *CBS-RAIMS* (Centre for Building Studies-Room Acoustic Indicators Measurement System) is a comprehensive system for obtaining both known room-acoustic indicators and directional characteristic of the sound field. It involves software developments together with hardware interfacing.

The measurement system is based upon acquiring spatial information at the listener location by using an array of 3 microphone pairs arranged in cartesian coordinates or by sequentially measuring in three directions employing one microphone pair. By exciting the enclosure under test with a periodic and well defined signal i.e. MLS, 6 impulse responses can be calculated by Fast Hadamard Transformation and their results presented for preliminary examination at the point and time of measurement; this enables on site validation to be made. Post processing the calculated impulse responses yields the values of most room-acoustic indicators as well as providing a sufficient averaging base to futher enhance the signal to noise ratio. Subsequent signal analysis can also be perfomed which may involve:

- Digital Filtering.
- Energy Analysis.
- Intensity Evaluation.
- Correlation Analysis.
- Cepstrum Analysis.

An impulsive sound produced either by a blank pistol or via a loudspeaker can also be utilized; in the case of employing any non reproducible source, however the six microphone probe should be employed for signal capture.

The measurement system operates in two stages; *the first* is data collection, and *the second* is data processing and analysis. The system is based on a portable AT-386 computer 33 MHz and the main hardware components are shown in Figure 1. The system employs an eight channel signal conditioning board (SCXI-1140)*, and a data acquisition board (AT-MIO-16F-5)* both driven by a software driver. The signal conditioning board allows simultaneous channel sampling using the "Hold and Sample" facility. This feature is useful for preserving inter-channel phase relationships thereby enabling subsequent sound intensity evaluation. The analog input channels can be scanned simultaneously via the signal conditioning board in the HOLD/SAMPLE mode. At the same time as acquisition, the board analog output transmits an excitation signal (*MLS*) of length up to 32767 samples. The transducers currently used are B&K 1/4" pressure microphones Type 4135 mounted on an appropriate 3 dimensional intensity vector probe; in the case of one microphone pair, particular attention need be paid to maintaining the acoustic centre upon reorientation. The analog output channel is connected to a power amplifier which in turn feeds the signal to an isotropic sound source (i.e. loudspeaker). The loudspeaker, currently a B&K Type 4241, consists of a frequency unit composed of 12 high frequency loudspeakers mounted in a dodecahedral body and a low frequency unit. The sound source is isotropic within 3 dB for frequencies below 1000 Hz. Early tests indicate this sound source to lack power when employed in large volume enclosures and a more powerful replacement is currently under construction. The system is also equipped with a triggering device to be used if impulsive sound is desired to be generated while maintaining synchronized triggering with the data acquisition process.

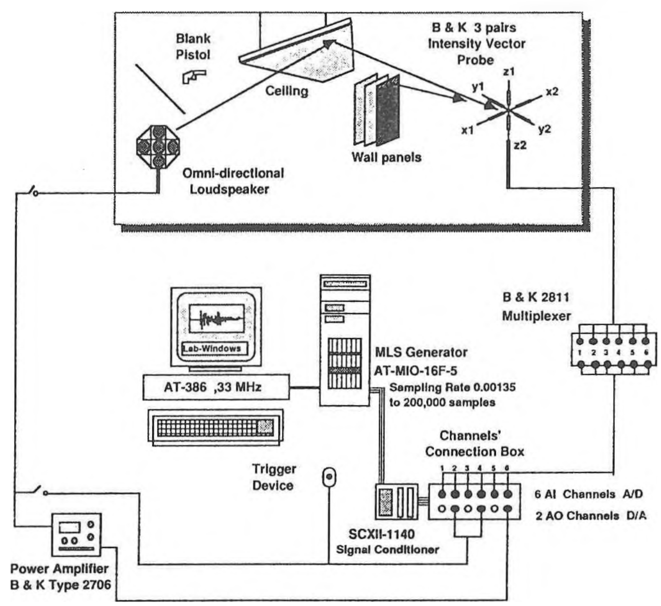

Figure 1. Block Diagram of "*CBS-RAIMS*" Hardware Components.

* Products of National Instruments, Texas, USA.

3.2 Data Processing

Data processing involves first filtering the impulse responses in 8 octave bands from 63 Hz to 8 kHz using a standard qualifying 8-pole band-pass "ButterWorth" digital filter.Third octave or discrete frequency analysis is also available but not generally employed for enclosure evaluation. The average of the filtered impulse responses are then processed to yield the room-acoustic indicators. The Schroeder integrated impulse method [21] is used to obtain the decay curves from which "Early Decay Time" (*EDT*) and "Reverberation Time" (*RT*) values can be calculated. RT values are calculated via a standard regression analysis applied to that part of the decay between -5 and -30 or -35 dB. EDT values are obtained in the same manner but the decay is restricted to the first -10 dB. To minimize the problem of background noise effect and decay length, EDT and RT can be calculated with background noise compensation; this is done graphically in an interactive way by examining the impulse response.

Calculation of various sound energy ratios such as "Definition" (*D50*),"Clarity" (*C50,C80*) and "Running Liveness" (*R*) is done by integration. The "Centre Time" (*TS*) and "Relative Strength" (*L*) are also included. Indicators of speech intelligibility "Speech Transmission Index" (*STI, RASTI*) [22]."Useful-to-Detrimental Sound Ratio" (*U95*) are also calculated. All room acoustic indicators are then output in a comprehensive table for ease of assessment and comparison.

Several sub routines have been developed to achieve further signal analysis. Spectral Analysis using Fast Fourier Transformation involves Power Spectral Density calculation, Cross Spectrum and Complex Transfer Function calculations. Figure 2 shows a flow diagram of the data processing for the purpose of obtaining both objective room-acoustic indicators and directional characteristics of the sound field.

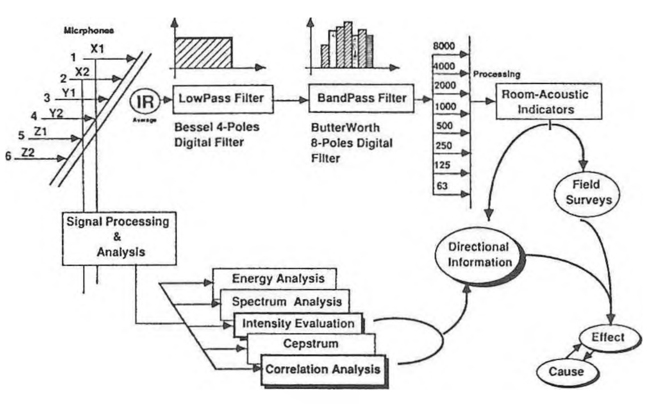

Figure 2. A Data Processing Flow Diagram for Calculating Room-Acoustic Indicators and Obtaining Directional Information.

4. DIRECTIONAL CHARACTERISTICS OF SOUND FIELDS

The objective now is to yield a visually detailed image of incoming sound intensity vectors on a base of time. The filtered 3 sets of impulse response X-X, Y-Y and Z-Z in each octave band allow 3 orthogonal intensity vectors components to be calculated using a finite difference approximation approach. The full record length for each set is used to avoid erroneous results from segmentation and time windowing procedures. This yields instantaneous intensity vectors which can change sign quickly and therefore may cause problems when investigating discrete reflection direction; to minimize this problem the envelope intensity technique could be used [23]. The resultant intensity vectors versus time are then calculated applying a conversion from rectangular to polar coordinates and displayed by employing "AutoCad"* software. An example result is shown in Figure 3.a., it shows the sound intensity vectors of a measurement conducted in the laboratory. Visualizing the temporal arrival, direction and magnitude, particularly of early sound reflections, will allow further detailed study with respect to the direct sound and in relation to each other, their intensity threshold and directions. Figure 3.b. shows only the discrete reflections received from a ceiling while Figures 3.c. and 3.d. display the full directivity patterns at the same location. In practice the graphical output of vectors is color coded for ease of interpretation.

With such information at hand along with values for room-acoustic indicators at the same listener location, it is now possible to attribute cause to effect with respect to the influence of spatial design details such as proscenium, cantilevered or recessed balconies, and facia as in the case of a concert hall or vaults, arches and pillars in a church, as they may effect the incoming early refections sequence. The contribution of left, right, up, down, back or front surface reflections can normally be separated and examined, however it must be accepted that some circumstances arise which might cause erroneous interpretation, for example two angular symmetric vectors of equal amplitude occurring at the same instant of time will be resolved to a single resultant along the axis of symmetry.

* AutoCad ver. 10, AutoDesk, INC., USA.

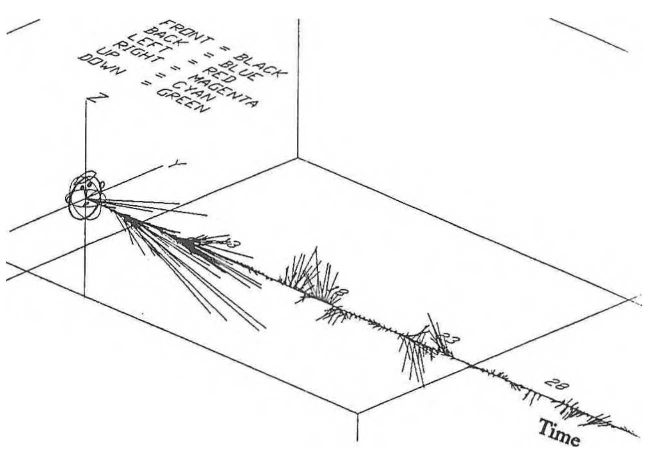

Figure 3.a Example presentation of sound field directional characteristics.

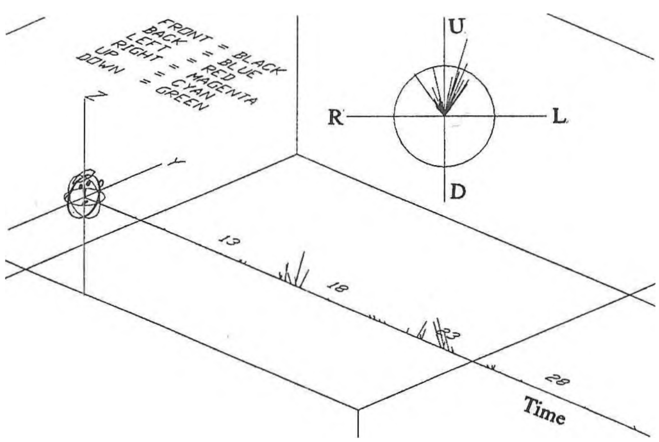

Figure 3.b Discrete reflections received from the upward direction i.e. the ceiling versus time.

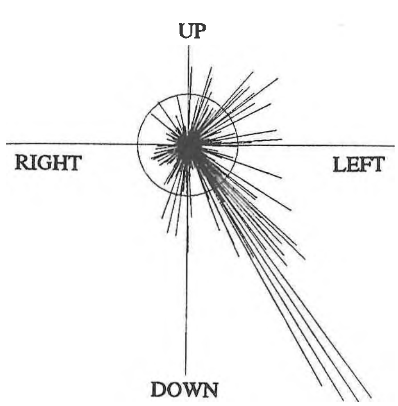

Figure 3.c Directivity Patterns of early reflections (first 50 ms after the direct sound)

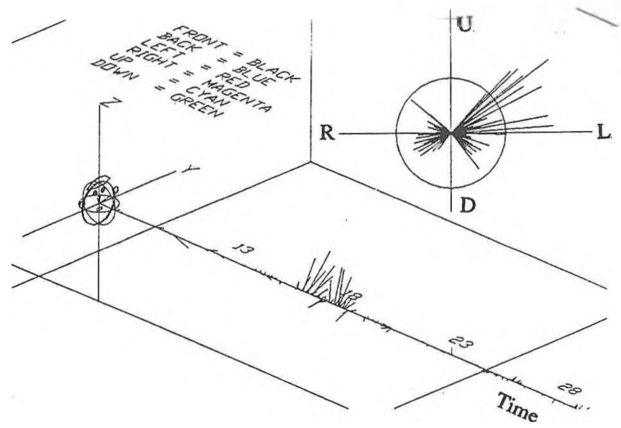

Figure 3.d Directivity Patterns for reflection received from left and right surfaces.

5. CONCLUSION

A knowledge of relationships between the objective room-acoustic indicators and enclosure design in terms of interior architectural details is not yet available. Such knowledge will be valuable for guiding the designer and the acoustician, for example spatial information would contribute towards diagnostic capability and when linked with measured values of the objective room-acoustic indicators for the same listener location, can provide a comprehensive picture of acoustical quality. The interpretation of their values in a more reliable way can lead to effective remedial treatments and possibly improved quality indicators.

The measurement system described here appears capable of providing the needed temporal and spatial information.

ACKNOWLEDGEMENT

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SOUND LEVEL DATA COLLECTION PROJECT IN THE VICINITY OF TORONTO WATERFRONT

T. Kelly, ing.
Aviation Environmental Engineer
Transport Canada Aviation
Ottawa, K1A ON8

ABSTRACT

This article summarizes a three day sound level collection, or monitoring, project. The project was undertaken, in the vicinity of the Toronto waterfront, by Transport Canada Aviation (TCA) and Transport Canada Airports Group (AG) under the auspices of the Toronto Island Airport Liaison Committee (ALC). The sound level data which include aircraft and non-aircraft sound sources, were collected to provide preliminary quantitative information to the ALC for its deliberations concerning the existing acoustic climate in the vicinity of the Toronto waterfront. Both sound dosages (Leq) and single event sound levels (LAmax and SEL) were measured. To maintain impartiality, no analyses have been performed nor have any conclusions been drawn. However, the results indicate that, on average, the ambient and triggered non-aircraft acoustic energies represent 80% of the total energy measured, and; the single event sound levels produced by the island airport aircraft are comparable to those produced by en-route jets and non-aircraft sound sources.

SOMMAIRE

Cet article, décrit un projet de relevé de données sonore d'une durée de trois jours sur la rive du lac Ontario avoisinant l'ile de Toronto. Le projet était une collaboration de Transports Canada- Aviation (TCA) et Transports Canada Groupe des Aéroports (GA) et à été executé à la demande du *Toronto Island Airport Liaison Committee (ALC).* Les émissions sonore provenant de sources aéronautiques et urbaines ont été recueillies dans le but de fournir une base de données quantitative à la ALC pour ses projets d'évaluations préliminaire du climat sonore dans cette région. Les données relevées ont servi à décrire le climat sonore en mesures de niveau de bruit continu équivalent (Leq), niveau maximum en utilisant un filtre de pondération A (LAmax) et niveau d'exposition acoustique (SEL). Cet article présente les résultats du relevé mais ne présente aucune conclusion. Néanmoins, les résultats indiquent qu'en moyenne, l'énergie acoustique ambiante et de sources urbaines, représentent 80% de tout l'énergie mesuré. Les émissions sonores provenant du trafic aérien issu de l'ile de Toronto se compare aux émissions sonores du trafic aérien d'aéronef turboréactés en-route et les sources urbaines.

1. INTRODUCTION

This monitoring, project was initiated by a special sub-committee of the Toronto Island Airport Liaison Committee (ALC).

The project was performed as a joint effort between Transport Canada Aviation (HQ and Ontario region) and Transport Canada Airports Group.

It was agreed at sub-committee meetings that Transport Canada would provide the ALC with impartial sound level data for its deliberations concerning the existing noise climate in the vicinity of the Toronto waterfront. Since raw data are of limited value to the ALC, Transport Canada presented[1] the data to the ALC in a more understandable manner by sorting and plotting them. Accordingly, the impartiality has been maintained while providing the ALC with more meaningful results.

The objectives of the project were:

1) Primarily to provide the ALC with a preliminary quantification of actual sound levels in the vicinity of the Toronto waterfront. These sound levels include those produced by aircraft using Toronto Island Airport, other aircraft e.g. en-route jets, road traffic and community sounds at three pre-selected sites.

2) Secondarily to demonstrate a methodology that could be employed to garner similar data for future studies.

Based on the objectives of this project, the aircraft operations at Toronto Island Airport did not have to be necessarily representative of those that normally exist. However, apart from the unusual easterly winds causing more takeoffs over the monitoring sites than is normal, the number of aircraft operations were typical of that time of the year.

2. STUDY DESIGN

2.1 Site Locations

To enable samples of sounds existing in the vicinity of the Toronto Waterfront to be monitored, three sites were chosen from which to collect data.

The following three data collection locations were pre-selected by the ALC sub-group and inspected by the author prior to commencing monitoring.

Site 1 - located adjacent to First St. on a rough patch of ground on Ward's Island, close to the beach.

Site 2 - located between the Spadina Marina and the Queen's Quay West road, on a small picnic field in King's Landing.

Site 3 - Situated on the Pantry Athletic Field adjacent to Kew Beach Avenue, in the Beaches area during July 14 and 15 (until 1100 hours). This site was moved across the Avenue to the Beaches Park at 1200 hours on July 15 and was set up there on July 16. Site relocation was done due to high ambient levels produced by park users and City of Toronto's grass cutting machines.

2.2 Monitoring Equipment and Procedure

Each monitoring site comprised the following complement of equipment:

Site 1: Transport Canada Aviation HQ Noise Monitoring Vehicle. This is a self sufficient mobile laboratory, specially designed for noise monitoring. It contains similar equipment to that used at sites 2 and 3.

Sites 2 and 3: Bruel and Kjaer (B&K) 4435 Noise Level Analyzer
B&K 4184 Weatherproof Microphone Unit,
B&K 7618 Application Software,
Personal Computer,
Cellular Telephone,
Transceiver,
Binoculars.

Monitoring teams, consisting of two persons, were assigned to each site and all sites were co-ordinated through a central controller. Two way communication between each site and the central controller was conducted throughout the monitoring period.

Data log sheets were used to record all pertinent sound level details at each site during the monitoring periods.

Each day, all sound level data collection equipment was adjusted to the same time, thus synchronizing the sound events. The synchronization time was calibrated to the National Research Council time signal.

Each day all the acoustical instruments were calibrated before commencing monitoring to a known reference source and then checked periodically throughout each day, thus verifying the acoustical integrity of the measurement systems. These signals were recorded in the computer data bases. When calibration drift was found to occur, it was only several tenths of a decibel and was corrected immediately.

Continuous sound level measurements were taken simultaneously at the three independent sites from approximately 0630 hours to 1800 hours. However, monitoring was terminated on July 14, at approximately 1700 hours, due to rain.

Shortly after every hour, the sound level data collected were downloaded into the personal computer data bases and compared with the log sheets to ensure that the measurement systems were functioning properly.

Because the ambient levels varied among sites and sometimes throughout the day, the event recording criteria (ERC), required by the computer software, were set and adjusted accordingly. These site-specific criteria were set such that sufficient community sounds were captured but also, such that Toronto Island Airport and en-route jet aircraft were monitored. This allowed for a variety of sounds to be monitored and subsequently compared with each other.

The ERC are required by the monitoring system to discriminate aircraft sounds from non-aircraft sounds. The ERC consist mainly of two parameters 1) the SETL and the 2) the MINIMUM DURATION. The SETL stands for Single Event Trigger Level (in dBA) and is the sound level which a sound event must exceed to be labelled as a possible aircraft event. Once the SETL has been exceeded (triggered), the sound level must remain above it for a time period equal to, or greater than, the MINIMUM DURATION for the event to be recorded as an aircraft event.

All sound level measurements were triggered using 1 second Leq on Slow detector response.

2.3 Data Presentation

The sound level data presented in the report[1] to the TCA Ontario region and ALC were "as-measured", that is, no corrections were applied to them.

The data are presented in two main ways, single event sound level descriptors i.e. LAmax and SEL and, a noise dosage or equal energy descriptor i.e. Leq.

2.4 Data Legitimacy

Apart from the easterly winds causing more takeoffs over the monitoring sites than is normal, the number of aircraft operations during the monitoring period is typical of this time of year.

The data collected at sites 1 and 3 may be considered typical of the sound levels in those vicinities. However, the sound levels measured at site 2 are not necessarily typical of this general vicinity, due to the unique operational patterns of the various sound sources affecting the ambient sound levels and the complexity of building structures affecting the acoustic environment. In other words, care should be exercised in extrapolating these levels to other locations in the same vicinity.

The quantity of data collected during July 14 is limited due to the inclement weather conditions that existed. Data were collected whenever the rain subsided.

During the monitoring time periods sufficient sound events were recorded to ensure acceptable statistical accuracy for those events.

3. RESULTS

3.1 Data Treatment

Since the ERC were set to capture a selection of community sound events, the raw sound level data recorded had to be filtered at site 2. Each aircraft and non-aircraft event was then correlated with the source. Correlation of sound event with sound source was accomplished using the sound level data logs and the ATC logs.

Filtering of sound events was only necessary at site 2 due to the continual stream of road traffic and periodic en-route aircraft. When these sound events occurred at the same time, or approximately at the same time, as the Toronto Island aircraft events, the two (or three) sound events synthesized resulting in a worthless composite sound level measurement.

Additionally, some non-aircraft sound sources, e.g. trucks, motor boats etc., satisfied the ERC, consequently these events were recorded as aircraft events. This produced erroneous single event sound levels and also sound dosage levels (Leq). Only clearly identifiable events were used in the results section to ensure the highest possible integrity. For example, the dosage sound levels have been re-computed to account for the errors mentioned above.

One noticeable acoustical effect at site 2, was the reverberation of sounds off the adjacent condominium complex, located at 460 Queen's Quay.

3.2 Constraints of the Measurements

Although all the sound levels recorded are as accurate as can be expected, they are affected by certain constraints caused by the acoustic climates at the measurement sites and the objectives of the project. These constraints are described below, however, their effects are not considered to be serious.

Constraint 1.

The ERC may have affected the measured SEL and Leq results in an minor way as they were set to capture a selection of community sounds at each site and because of variation in amplitude and duration of similar pertinent events and also of the ambient levels. For example, the SETL had to be set sufficiently high so that most extraneous sound events were not recorded as events. Consequently, when an aircraft or other pertinent sound event occurred, some of the low level acoustic energy could have been missed, due to the required SETL setting.

Constraint 2.

Similarly, due to the acoustic climate, a pertinent sound event might have satisfied, and thus commenced, recording of the sound event, but the recording may have been prolonged by the fluctuating ambient levels. This phenomenon could have also occurred in the reverse order.

The effects of the first constraint mentioned above are not serious because of at least three reasons: 1) not all events were affected, 2) any low acoustic energy missed would be insignificant compared to the total acoustic energy, and 3) because the SETLs were set just above the average local ambient level, most of the acoustic energy missed would be buried in the ambient levels and would thus be inaudible.

The effects of the second constraint are caused by the project objectives and are unavoidable. Again, any additional acoustic energy added by the ambient levels to pertinent sound events would likely be insignificant if compared to the total sound event acoustic energy.

3.3 Meteorological Conditions

Weather records during the three days of monitoring. show that the winds, were generally blowing from the east. This resulted in aircraft taking off from runway 08. Typically the winds blow from the west, resulting in aircraft taking off from runway 26. Accordingly, few approach or landing sound levels were recorded at the three monitoring sites. The change in wind directions caused more aircraft to overfly the three monitoring sites than would normally have happened.

Wind speeds during the three days of data collection were light, averaging approximately 5 knots. Temperatures varied between approximately 15 and 21 degrees celsius during the monitoring period. A local low pressure system on July 14, brought light intermittent rain and cooler temperatures than the other two monitoring days. Monitoring was conducted on July 14, whenever the rain subsided. The sky was generally overcast on July 14, but scattered and broken cloud was prevalent on July 15 and 16 with clear visibility.

3.4 Data Comparison

The monitoring time period varied a little among days and sites. Typically though, complete hourly measurements were taken between 0700 hours and 1700 hours.

Due to the slight variation in monitoring periods, the word "daily" has been used in the graphs to represent the appropriate Leq time period.

The data presentation is divided into two parts, 1) sound dosages or energy averages i.e. Leq values and 2) single event sound levels i.e. LAmax and SEL. Further to this, the data have been compared on an intra-site and an inter-site basis. These comparisons show the variation in average sound levels within the sites and among sites respectively.

3.5 Sound Dosage Data

These data compare the average sound levels produced by different groups of sound sources (e.g. aircraft versus cars) at a given site over a given time period.

Five groups of sound sources have been identified at site 1, these are:

T.I.A. Aircraft - those aircraft using the island airport which triggered the monitoring equipment.

Jet Aircraft - en-route aircraft (not using the island airport) which triggered the monitoring equipment.

Non Aircraft - extraneous, or ambient sounds, which triggered the monitoring equipment, e.g. motor boats, wave motion, voices etc.

Unknown sound sources - those sounds that triggered the monitoring equipment but which were unidentifiable e.g. community sounds, voices.

Ambient sound levels - all sounds which were monitored, but which did not trigger the monitoring equipment, e.g. wind noise, wave motion, distant aircraft.

At site 2, six groups of sound sources have been identified. These are the same as those at site 1, with the addition of multiple sound sources. These sounds occurred at the same time but were produced by different sources. Also, the non aircraft sounds were produced by road traffic.

At site 3, six groups of sound sources were also identified. These are the same as those at site 2, except that the non aircraft sounds were produced by road traffic, grass cutting machines, and people.

3.5.1 Leq Graphs

Graphs 1a to 1c show the variation in "daily" Leq for each sound source on a site basis.

Graphs 2a to 2c compare the "daily" Leq for each sound source at each site on a daily basis.

Graphs 3a to 3c show the distribution of acoustic energy (as percentages) for the various sound sources among the sites, on a daily basis.

Graphs 4a to 6c show the distribution of acoustic energy (as percentages) among the various sound sources at each site on a daily basis.

Graphs 3a to 6c, mentioned above, indicate the contribution of each sound source to the total Leq measured. At sites 1 and 2, it is clear that the ambient levels dominated the acoustic climate.

At site 3, the ambient and non aircraft levels dominated the acoustic climate.

The non aircraft sound sources are specific 'ambient' sounds which triggered the ERC. Therefore these two sound sources essentially belong to the same group. On average, the ambient and non aircraft acoustic energies represent approximately 80% of the total measured acoustic energy.

The contribution of the T.I.A. aircraft acoustic energy to the total measured acoustic energy (Leq), averaged over three days, at sites 1, 2 and 3 is approximately 14, 12 and 3% respectively (less than one decibel).

3.6 Single Event Sound Level Data

These data compare the sound levels produced by individual sound sources (e.g DHC-8 versus high altitude jets) during the monitoring period. To summarize the results of these comparisons, average levels are presented below.

3.6.1 LAmax and SEL Tables

Individual and average LAmax and SEL levels were compared[1] for various sound sources at sites 1, 2 and 3 respectively.

At site 1, the 3-day average levels were:

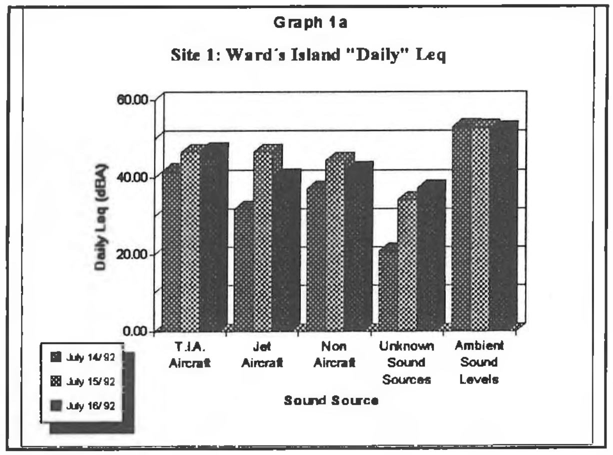
Source	SEL(dBA)	LAmax(dBA)
Jets	76.7	65.5
Gen. Av.	76.8	67.6
DHC-8	72.9	64.1
Non Ac.	75.7	67.0

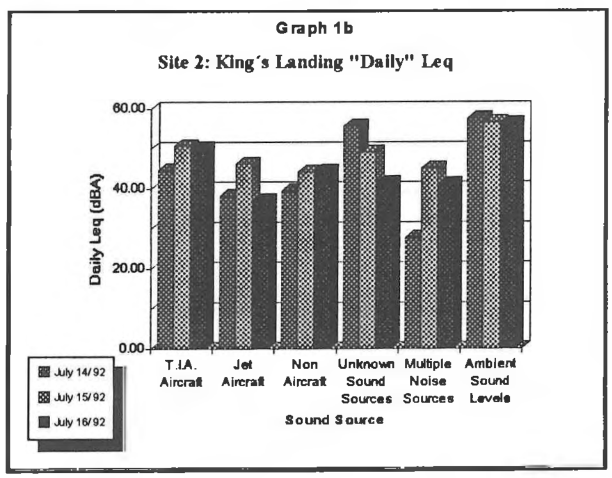
At site 2, the 3-day average levels were:

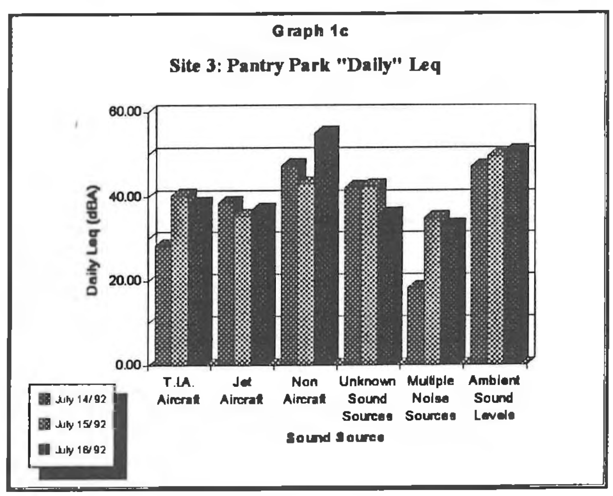
Source	SEL(dBA)	LAmax(dBA)
Jets	78.9	67.5
Gen. Av.	78.5	68.4
DHC-8	76.1	66.3
Non Ac.	75.1	67.1

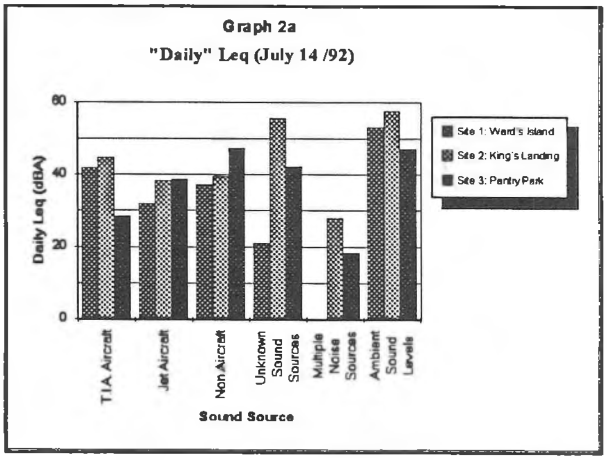
At site 3, the 3-day average levels were:

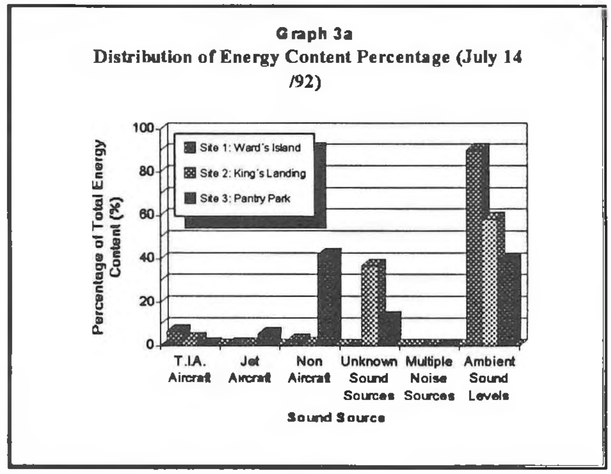
Source	SEL(dBA)	LAmax(dBA)
Jets	75.0	64.4
Gen. Av.	71.8	62.4
DHC-8	72.6	62.2
Non Ac.	79.0	71.7

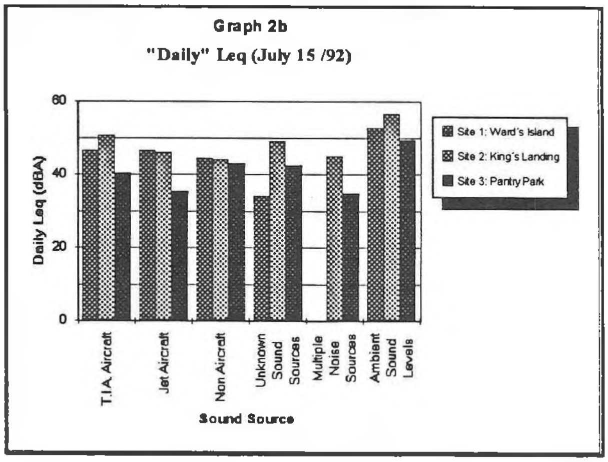


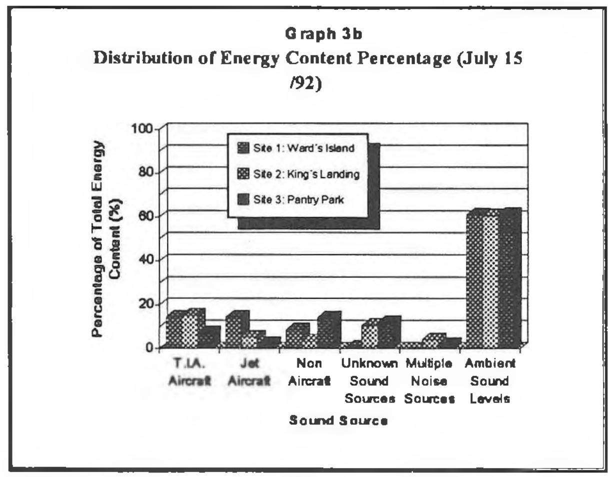


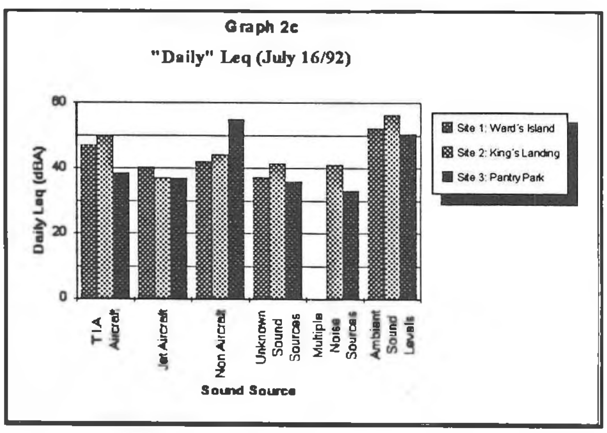


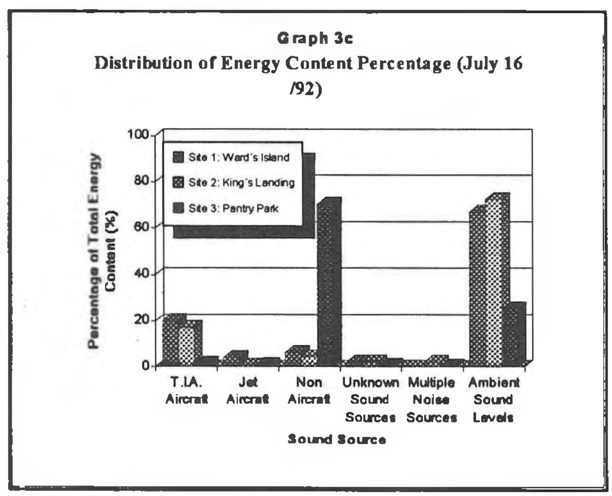

Graph 2a
"Daily" Leq (July 14 /92)
Daily Leq (dBA)
Site 1: Ward's Island
Site 2: King's Landing
Site 3: Pantry Park
T.I.A Aircraft
Jet Aircraft
Non Aircraft
Unknown Sound Sources
Multiple Noise Sources
Ambient Sound Levels
Sound Source


Graph 3a
Distribution of Energy Content Percentage (July 14 /92)
Percentage of Total Energy Content (%)
Site 1: Ward's Island
Site 2: King's Landing
Site 3: Pantry Park
T.I.A. Aircraft
Jet Aircraft
Non Aircraft
Unknown Sound Sources
Multiple Noise Sources
Ambient Sound Levels
Sound Source

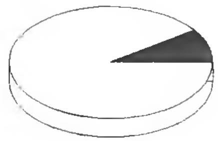

Graph 2b
"Daily" Leq (July 15 /92)
Daily Leq (dBA)
Site 1: Ward's Island
Site 2: King's Landing
Site 3: Pantry Park
T.I.A Aircraft
Jet Aircraft
Non Aircraft
Unknown Sound Sources
Multiple Noise Sources
Ambient Sound Levels
Sound Source


Graph 3b
Distribution of Energy Content Percentage (July 15 /92)
Percentage of Total Energy Content (%)
Site 1: Ward's Island
Site 2: King's Landing
Site 3: Pantry Park
T.I.A. Aircraft
Jet Aircraft
Non Aircraft
Unknown Sound Sources
Multiple Noise Sources
Ambient Sound Levels
Sound Source


Graph 2c
"Daily" Leq (July 16/92)
Daily Leq (dBA)
Site 1: Ward's Island
Site 2: King's Landing
Site 3: Pantry Park
T.I.A Aircraft
Jet Aircraft
Non Aircraft
Unknown Sound Sources
Multiple Noise Sources
Ambient Sound Levels
Sound Source


Graph 3c
Distribution of Energy Content Percentage (July 16 /92)
Percentage of Total Energy Content (%)
Site 1: Ward's Island
Site 2: King's Landing
Site 3: Pantry Park
T.I.A. Aircraft
Jet Aircraft
Non Aircraft
Unknown Sound Sources
Multiple Noise Sources
Ambient Sound Levels
Sound Source

Site 1: Ward's Island
"Daily" Leq Acoustic Energy Distribution for July 14, 1992.

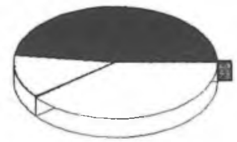


Graph 4a

Site 2: King's Landing
"Daily" Leq Acoustic Energy Distribution for July 14, 1992

Graph 5a

Site 3: Pantry Park
"Daily" Leq Acoustic Energy Distribution for July 14, 1992



Graph 6a

Site 1: Ward's Island
"Daily" Leq Acoustic Energy Distribution for July 15, 1992.

Graph 4b

Site 2: King's Landing
"Daily" Leq Acoustic Energy Distribution for July 15, 1992

Graph 5b

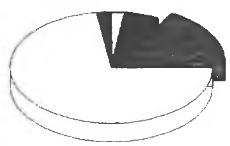
Site 3: Pantry Park
"Daily" Leq Acoustic Energy Distribution for July 15, 1992

Graph 6b

Site 1: Ward's Island
"Daily" Leq Acoustic Energy Distribution for July 16, 1992.

Graph 4c

Site 2: King's Landing
"Daily" Leq Acoustic Energy Distribution for July 16, 1992



Graph 5c

Site 3: Pantry Park
"Daily" Leq Acoustic Energy Distribution for July 16, 1992

Graph 6c

LEGEND:

- T.I.A. Aircraft
- Other Aircraft
- Non-Aircraft
- Multiple Sound Sources
- Unknown Sound Sources
- Ambient Sound Levels

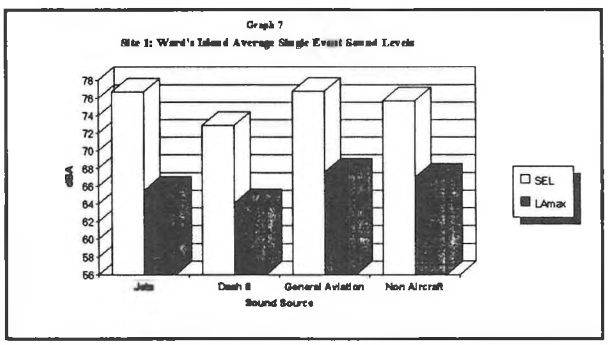
3.6.2 LAmax and SEL Graphs

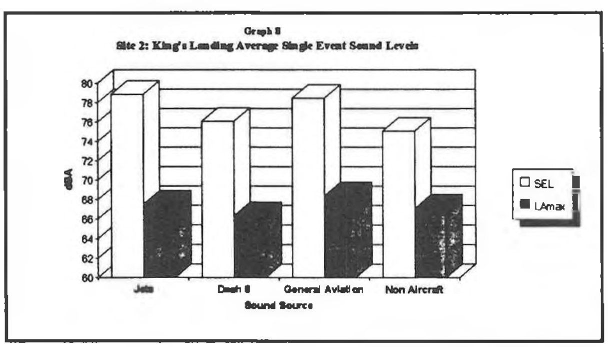
Graphs 7, 8 and 9 compare the average single event sound levels within each of the three monitoring sites for the various sound sources.

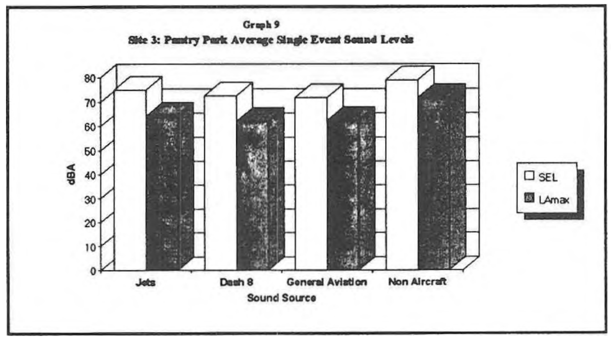
These graphs show that the average sound levels produced by T.I.A. aircraft are comparable to those produced by jets and non aircraft sound sources, at sites 1 and 2. At site 3, however, the average sound levels produced by T.I.A. aircraft are slightly lower than those produced by jets and non aircraft sound sources.

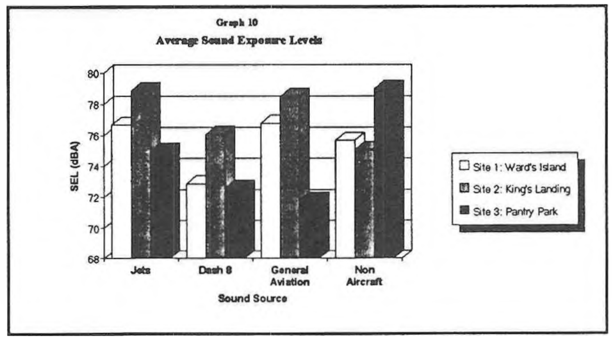
Graphs 10 and 11 compare the average SEL and LAmax levels respectively, among the three monitoring sites for the various sound sources.

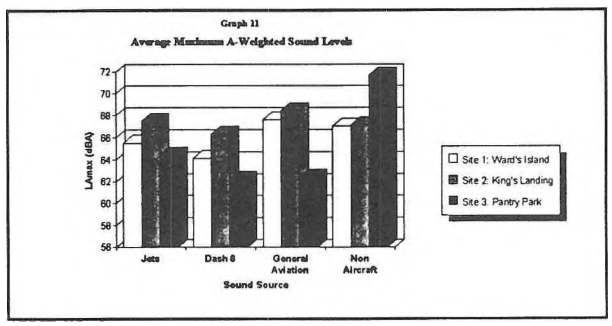
These graphs show that the relative significance of a sound source is dependent on the site. For example general aviation was the most significant sound source at site 1, jet aircraft and general aviation were the most significant sound sources at site 2, and non aircraft sound sources were most significant at site 3.











REFERENCES

1. Kelly, T., "Sound Level Data Collection Project in the Vicinity of the Toronto Waterfront", Transport Canada Aviation, Air Navigation System Requirements Branch , (1992).

125th MEETING OF THE ACOUSTICAL SOCIETY OF AMERICA

OTTAWA, MAY 17 - 21, 1993

The Acoustical Society of America (ASA) will hold its 1993 spring meeting at the Château Laurier hotel in Ottawa [telephone: (613) 232-6411]. Over 750 papers will be presented in all branches of acoustics.

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- effects of aging on hearing and touch;
- auditory front ends for speech recognizers;
- novel applications of ultrasound in medicine;
- acoustics in space;
- acoustical determination of polar ocean processes; and
- rapidly developing subject areas - "hot topics" in acoustics.

Pre-registration is not required. The registration fee of $75 (US) for members and $ 125 (US) for nonmembers is payable on arrival at the meeting.

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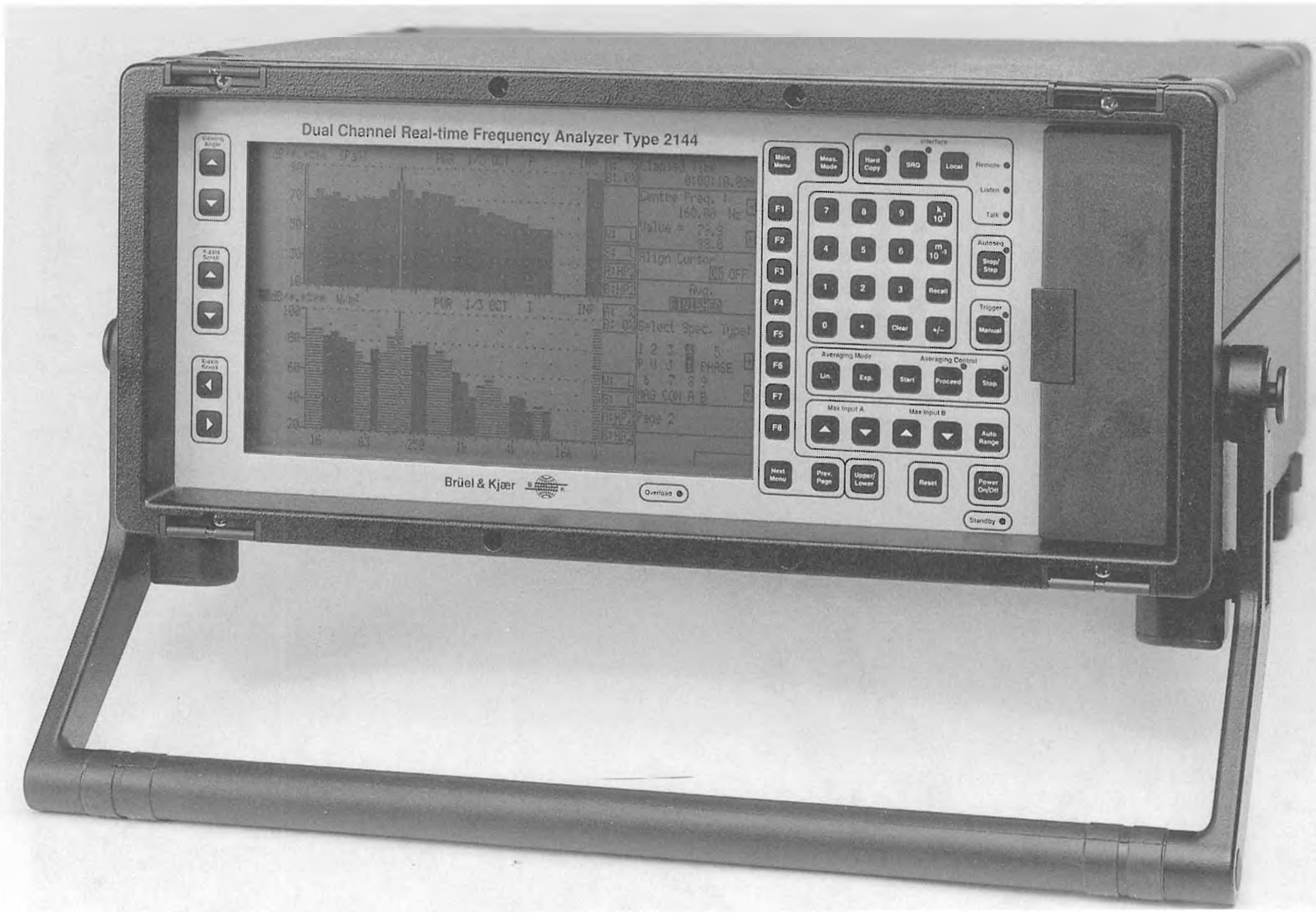

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ACOUSTICS BEGINS WITH ACO

COMMON MISCONCEPTIONS ABOUT HEARING

Marek Roland-Mieszkowski
School of Human Communication Disorders, Dalhousie University
5599 Fenwick Street, Halifax, Nova Scotia, B3H-1R2, Canada.

1. GENERAL MISCONCEPTIONS ABOUT SOUND AND HEARING

Loud sound is not dangerous, as long as you don't feel any pain in your ears.

Not true: Our threshold for pain is at about 120 - 140 dB SPL but sound begins to damage our hearing when it is above 85 dB SPL (for an 8 hour period).

Hearing loss after sound exposure is temporary.

Not true: Most of the hearing loss will be permanent.

If you have a hearing loss already, you don't have to protect your hearing any more.

Not true: Hearing loss accumulates. More exposure to loud sounds leads to more hearing loss.

Hearing loss is mostly caused by aging.

Not true: Research shows that accumulative exposure to loud sounds, not age, is the major cause of hearing loss.

Hearing loss can be repaired by medicine, surgery or hearing aids.

Not true: Although certain improvements can be obtained by the use of hearing aids. In the case of hearing losses inflicted due to the noise exposure, the resulting quality of hearing will be far from normal. So far no drugs or therapy can correct the noise-induced hearing loss. This could affect your professional performance as a musician, sound engineer, medical doctor, air traffic controller, telephone operator, pilot and driver or in any other profession where performance depends on good hearing. Also, your enjoyment of music would suffer.

Loud sound only damages your hearing.

Not true: Loud sound can change your heart rate, vision and reaction time. It may make you more aggressive and in general, negatively affect you.

2. COMMON MISCONCEPTIONS ABOUT 'SOUND ENGINEERS' AND SOUND REINFORCEMENT

They know what they are doing, when adjusting sound.

Not true: Most of so-called "sound engineers" (about 99%) have no formal training in acoustics and sound reinforcement. The operation of sound systems does not require any licence or qualifying exam, yet the operators are in control of a potentially very damaging form of energy.

They adjust sound to safe levels.

Not true: Most (about 99%) don't use sound level meters to measure intensity. Instead they judge the sound level "by ear", an inexact procedure even if assumed they had no hearing loss. Research in Halifax night spots showed in 1986 that a risk of hearing loss for patrons was present in 64% of all tested locales during 1 hour of exposure and in 95% during 4 or more hours of exposure (a typical evening at a night club lasts 4 hours).

Equalization and adjustments of sound parameters are properly done.

Not true: Many of the so-called "sound engineers" have significant hearing losses. Sound adjusted to their liking may be far from well-balanced sound. This could further increase the danger of exposure to harmful sound levels.

Sound systems have built-in safety features.

Not true: Most sound systems are tremendously powerful and are capable of producing sounds much louder than adjusted levels. However, these systems have no built-in protection against surges in sound due to feedback or accidents.

There is a law to protect the public against unsafe sound levels.

Not true: In Canada, no law exists to protect patrons who frequent entertainment premises (such as: clubs; concerts; school dances; etc.) from harmful sound exposure, which could result in permanent hearing loss. Although there is a law governing the safety of workers, it appears not to be enforced in the entertainment industry.

3. COMMON MISCONCEPTIONS ABOUT 'WHAT PEOPLE LIKE' AND PEOPLE'S RIGHTS

Most people like their music loud.

Not true: Although some people like loud music, especially if they already have a hearing loss, most audiences note little perceptible difference between sound levels of 85 dB SPL and 100 dB SPL. However, 100 dB is much more dangerous than 85 dB sound, having 32 times more destructive power (115 dB sound found in many clubs has 1000 times more destructive power than 85 dB sound).

Most patrons of night clubs enjoy being immersed in loud music.

Comment: Most of the patrons attend night clubs for the social interaction. They are not interested in music performed so loudly that they are unable to carry on a conversation. In many environments which were tested during our "Sound Survey", normal conversation was impossible. People were shouting in each others ears, further increasing the danger of receiving a significant hearing loss. I would strongly suggest that bars cash in on "safety zone" advertising (no more than 85 dBA sound level).

Everyone has a right to decide what sound level to listen to.

Comment: It could be argued that patrons who choose to attend night clubs, especially young adults, are unaware of the potential danger. On the other hand, those who knowingly expose themselves to overly loud sounds are creating future medical problems for themselves. In my opinion, this burden should not be put on the average taxpayer.

In the range of safe sound levels (let's say up to 85 dBA for an 8-hour exposure) adjustment should not be restricted. However, levels above 85 dBA are dangerous and can cause permanent hearing damage. Given the choice, more sensible people would not knowingly choose to put themselves in an environment that was considered hazardous to their health. However, many patrons are unaware of the potential danger of sustaining permanent hearing loss and are also unaware of the fact that noise levels over 85 dBA are dangerous.

An informed public, coupled with rational behaviour, are key ingredients in the protection of individuals from both hearing loss and extra health costs. Unfortunately, existing legislation does not require informing patrons of potential health hazards that could harm them, thereby eliminating the concept of "informed consent". Enforcement of existing workplace laws would protect nightclub employees, patrons, teachers, musicians, D.J.'s or any other individual who may be exposed to dangerous noise levels that could pose a potential health hazard. Regretfully, such laws are very seldom implemented or enforced.

4. FACTS ABOUT SOUND AND HEARING

Frequency range: With normal hearing, one can hear frequencies from 20 Hz to 20,000 Hz. (20 cycles/sec to 20,000 cycles/sec)

Intensity range: With normal hearing, one can hear intensities from 0 dB to 140 dB. This corresponds to power ratio (defined as ratio of the highest audible intensity to the lowest audible intensity) equal to 100,000,000,000,000. Recommended maximum allowable exposure times (by Nova Scotia Department of Labour) are:

16 hours for 80 dBA sound
8 hours for 85 dBA sound
4 hours for 90 dBA sound
2 hours for 95 dBA sound
1 hour for 100 dBA sound
30 min for 105 dBA sound
15 min for 110 dBA sound
7.5 min for 115 dBA sound
0 min for above 115 dBA sound (there should be no exposure at this level)

Number of channels: We often characterize sound systems by number of channels. Mono means 1 - channel system, stereo means 2 - channel system, quadro means 4 - channel system. We have two ears, so one can think, that auditory system is stereo (2 channel) , but as a matter of fact sound in each ear is divided into 24 discrete channels called critical bands. Therefore auditory system (hearing system) acts as 48 - channel system. Critical bands allow discrimination of different sounds simultaneously. Also they allow us to hear sounds in noisy situations (for example conversation during a party or in the cafeteria). Hearing loss is often accompanied by damage to the critical bands, which in some situations can profoundly change the ear's selectivity. Hearing aids (HA's) act like 1-channel devices since they can't feed signals directly to separate critical bands. Therefore they do not compensate for this deficiency.

Illustration of hearing loss (intensity): Let's assume that a single bird sitting far away in the tree produces a sound level 0 dB (barely audible). A person with hearing loss (after going to "bad clubs") requires a minimum sound level of 40 dB in order to hear the sound. How many birds have to sit in the tree in order for this person to hear them? Answer: 10,000. For the person with 50 dB loss it will take 100,000 birds and with 60 dB loss it will take 1,000,000 birds.

Potential dangers: Hunting and target shooting, power tools, noisy vehicles, loud music (concert, club, walkman, stereo system at home or in the car). Please wear hearing protection in situations like that.

ACOUSTICS WEEK IN CANADA 1993

Delta Chelsea Inn, Toronto, Ontario

- AN INVITATION -

The annual meeting of the Canadian Acoustical Association will take place 4-8 October 1993 at the Delta Chelsea Inn, 33 Gerrard West, Toronto. The first two days, 4-5 October, will, as in previous years, be set aside for Seminars/Courses. The two that will be offered are briefly described in this issue. Please indicate whether you might be interested in these on the Registration Form. The organizers will then send you additional information and a sign-up form. There will be a substantial reduction in the fee if you can commit before August 15. Enrollment will be limited to 50 individuals per course.

The Symposium will begin the evening of Tuesday, October 5 with a Welcome Wine and Cheese Reception, sponsored in part by our Exhibitors. On each of Wednesday, Thursday, and Friday mornings, we will start with an invited plenary session speaker in an area of acoustics of general interest, followed by three simultaneous sessions of invited and presented papers in more focused areas. The Reception and Banquet will be held on Wednesday evening and the Annual Meeting on Thursday afternoon. More time has been set aside for the meeting than in previous years to allow for in-depth coverage of important issues. Your participation is crucial. The Symposium will end at noon on Friday, 8 October with an Awards Ceremony and light Buffet, sponsored by local Consultants. Tours of the CBC have been arranged for those of you who are planning either to arrive early on Tuesday afternoon or to stay late on Friday.

Acoustics Week in Canada will be held at the newly expanded and refurbished Delta Chelsea Inn located in downtown Toronto. The exceptional space set aside for our Exhibitors is in close proximity to the meeting rooms. A block of rooms has been set aside for our delegates and we urge you to take advantage of the considerable discounts negotiated. Reservations may be made by providing the information requested on our Registration Form or by calling the hotel directly at 416 - CHELSEA (243-5732) or 1-800-268-9070.

Over the next few pages, you will find a brief description of the Seminars, Information for Exhibitors, the Call for Papers, the Registration Form, the Student Award Form, and the Instructions for the preparation of the Abstracts and Conference Proceedings Papers. Please note that Registration and submission of a Conference Proceedings Paper are pre-requisites for giving a talk.

DATES TO REMEMBER: April 30 - Deadline for Receipt of Abstracts; May 24 - Notification of Acceptance; July 1 - Deadline for Receipt of 2-page Conference Proceedings Papers; August 15 - Deadline for Receipt of Discounted Registration and Seminar Fees.

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SEMAINE CANADIENNE D'ACOUSTIQUE 1993

Delta Chelsea Inn, Toronto, Ontario

- UNE INVITATION -

Le congrès annuel de l'Association Canadienne d'Acoustique aura lieu au 4 au 8 octobre 1993 au Delta Chelsea Inn, 33 Gerrard West, Toronto. Les deux premiers jours, 4 et 5 octobre, seront réservés aux Seminaires/Cours, comme par le passé. Les deux cours offerts cette année sont brièvement décrits dans ce numéro. Nous vous serions reconnaissants de nous aviser de votre intérêt à vous inscrire à ces cours sur le formulaire d'inscription. Les organisateurs vous feront alors parvenir des informations supplémentaires et un formulaire à compléter. Il y aura une réduction substantielle des coûts si vous vous inscrivez avant le 15 août. Le nombre d'inscriptions est limité a 50 pour chacun des cours.

Le congrès débutera le mardi soir 5 octobre avec une réception vin et fromage, commanditée en partie par nos exposants. Chacune des matinées du mercredi, jeudi et vendredi débutera avec un conférencier invité à l'intérieur de sessions plénières portant sur un domaine d'intérêt général en acoustique, suivi de trois sessions simultanées de communications invitées ou proposées dans des domaines plus spécifiques. La réception et le banquet auront lieu le mercredi soir et l'assemblée générale annuelle, le jeudi après-midi. Comparativement aux années précédentes, plus de temps a été accordé à cette réunion afin de permettre des discussions plus approfondies sur des éléments importants. Votre participation est cruciale. Le congrès prendra fin vendredi midi, le 8 octobre avec la cérémonie de remise des prix et un léger buffet, commandités par les exposants locaux. Des visites de Radio Canada ont été organisées pour ceux qui planifient d'arriver tôt mardi après-midi ou demeurer plus tard vendredi après-midi.

La Semaine Canadienne de l'Acoustique aura lieu au Delta Chelsea Inn qui a été récemment rénové et agrandi, localisé au centre-ville de Toronto. L'espace exceptionnel réservé pour nos exposants sera situé à proximité des salles de réunion. Un bloc de chambres a été réservé pour nos participants et nous vous invitons à profiter des taux préférentiels que nous avons négociés pour vous. Les réservations peuvent être faites à l'aide du formulaire d'inscription au congrès ou en appelant directement à l'hôtel au 416-CHELSEA (243-5732) ou 1-800-268-9070.

Dans les pages qui suivent, vous trouverez une brève description des cours, de l'information pour les exposants, l'appel aux communications, le formulaire d'inscription, le formulaire pour les prix étudiants et les instructions pour la préparation des résumés et des actes du congrés. Veuillez prendre note que l'inscription et la soumission d'un papier constituent de pré-requis à une présentation orale.

DATES A SE RAPPELER: 30 avril-date limite pour soumettre un résumé; 24 mai-avis d'acceptation; 1er juillet-date limite pour la réception des papiers pour les actes du congrès; 15 août-date limite pour obtenir des tarifs réduits pour l'inscription au congrés et au cours.

TRANSPORTATION AERIENNE

Air Canada est le transporteur officiel de notre congrès, à Toronto. Epargnez jusqu'à 50% en fonction des disponibilités. Rabais garanti de 15% du tarif regulier des classes Hospitalite et Affaires.

Afin de profiter de ces reductions, veuillez contacter votre agence de voyages ou Air Canada 1-800-361-7585. Lors de l'émission de votre billet, nous vous prions d'informer l'agent d'inscrire votre numéro de dossier CV930528 dans la case réservée au code (IT) et le code de référence CAA dans la case endos du billet, peu importe le tarif payé.

ACOUSTICS WEEK IN CANADA 1993
SEMAINE CANADIENNE D'ACOUSTIQUE 1993

Delta Chelsea Inn, Toronto, Ontario

- SEMINARS -

INTENSITY MEASUREMENT TECHNIQUES AND PRACTICAL APPLICATIONS

This one day seminar, scheduled for October 5, is intended to assist anyone interested in the application of intensity measurement techniques to the solution of noise and vibration problems. It also has advantages for quality control applications and sound power measurements, particularly where an anechoic test facility is not available. The development of these new techniques for measurement of energy flow has provided a fresh and greatly improved understanding of the dynamic behaviour of structures. Determination of the way in which acoustical sources receive the energy they transmit and the localization of associated damping mechanisms has substantially improved the use of damping materials with great economic significance. Topics will include intensity methods for identification, ranking and source location of noise and vibration problems and advanced techniques to isolate events which occur briefly during machinery operating cycles. Instrumentation requirements will be covered with particular emphasis on calibration methods. The principal lecturer for this seminar will be Gunnar Rasmussen of Brüel & Kjaer, Denmark. The seminar fee is $200.00 and will include lunch and seminar materials. A discount of $25.00 will apply for paid registration before August 15, 1993.

MODERN TECHNIQUES IN ESTIMATING AND TROUBLESHOOTING HVAC NOISE

Two independent 1-day sequential courses on HVAC noise are offered on October 4 and 5.

I. Estimating Noise from HVAC Systems (students should bring lap-tops). This course will include an overview of: ARI/AMCA sound standards, ASHRAE acoustical algorithms, review of existing sound estimating programs, acoustical models useful for estimating space noise levels, hands-on problem solving, the use of spreadsheets to model prolems and environmental noise prediction.

II. Avoiding HVAC Noise Problems. The topics covered will include the setting of realistic design goals, acoustic quality, avoiding costly retrofit by design, duct design practices, and system considerations.

The principal instuctors will be Charles E. Ebbing, P.E, Carrier Corporation and Richard J. Peppin, P.Eng., P.E., Scantek, Inc. The cost for one course is $300.00, both $550.00. A discount of $50.00/course will apply for paid registration before August 15, 1993. The price includes copies of the overheads and Day 1: copy of problem solving software, Day 2: copy of A Practical Guide to Vibration and Noise Control for HVAC Sysems by Mark E. Schaffer. Course subject to sufficient attendance.

ACOUSTICS WEEK IN CANADA 1993

Delta Chelsea Inn, Toronto, Ontario

- EXHIBITION -

The Organizing Committee for AWC '93 are pleased to announce that an Exhibition of Instumentation, Software, Materials and Literature related to all aspects of Acoustics, Noise and Vibration will be held as part of the event. A complete room is available as Exhibition space, adjacent to the meeting rooms. The cost of entering the Exhibition is $275 for an 8 ft. table. This price includes partial subsidy of a Reception held in the Exhibition space on Tuesday evening, as well as coffee for the the delegates during the Conference. Space will be reserved on a first come, first served basis. You are advised to reserve as soon as possible, as space is limited. A non-refundable deposit of $100 must accompany all reservations, the balance being due on or before October 5th, 1993. To reserve space and /or obtain further inforamation, please contact **John R. Hemingway, P.Eng., 2410 Old Pheasant Road, Mississauga, Ontario, Canada L5A 2S1 (Tel/Fax: (416) 949-2164).**

SEMAINE CANADIENNE D'ACOUSTIQUE 1993

Delta Chelsea Inn, Toronto, Ontario

- EXPOSANTS -

Le comité organisateur de l'SCA '93 est heureux d'annoncer la tenue d'une exposition d'instruments, de logiciels, de matériel et de documents reliés à tous les aspects de l'acoustique, du bruit et des vibrations. Une salle d'exposition complète, attenante aux salles de réunion, est prévue à cet effet. Les frais de location sont de 275$ pour une table de 8 pieds. Ce prix inclut une contribution partielle à la reception qui se tiendra le mardi soir dans la salle d'exposition, ainsi que le café qui sera servi aux participants lors du congrès. Les espaces seront réservés sur la base du premier arrivé, premier servi. Vous êtes priés de réserver tôt, compte tenu de l'espace limité. Un dépot non remboursable de 100$ doit accompagner toute réservation, le solde étant payable lá ou avant le 5 octobre 1993. Pour réserver un espace ou pour toute autre information, communiquer avec **John R. Hemingway, P.Eng., 2410 Old Pheasant Road, Mississauga, Ontario, Canada L5A 2S1 (Tel/Fax: (416) 949-2164).**

CALL FOR PAPERS

Acoustics Week In Canada

October 4-8, 1993

Acoustics Week in Canada 1993 will be held at the Delta Chelsea Inn, Toronto, Ontario. The symposium will take place on October 6th, 7th, and 8th. The social programme will include a welcome wine and cheese on Tuesday evening, October 5th, a banquet on Wednesday evening, October 6th, and a closing reception at noon on Friday, October 8th. The Annual Business Meeting of the Association has been scheduled for Thursday afternoon, October 7th. The local planning committee will not be taking on the responsibility of arranging the seminars which normally precede the symposium. Anyone interested in giving a seminar should contact Sharon Abel with the details. Meeting rooms will be set aside for this purpose on Monday and Tuesday, October 4th and 5th. There will be an exhibition of acoustical measurement instrumentation, software and acoustical materials. Please contact John Hemingway (Tel/Fax: 416 949-2164) for information.

SYMPOSIUM

The programme will include daily plenary sessions, followed by three parallel sessions of invited and contributed presentations. Authors are invited to submit abstracts for these sessions in any area of acoustics and vibration. These include:

- Noise and Vibration
- Architectural Acoustics
- Acoustical Sources
- Physical Acoustics
- Musical Acoustics
- Speech, Hearing and Communication
- Land Use Planning
- Acoustical Measurement
- Electroacoustics
- Performance Acoustics

The organizers will develop several structured sessions with round table discussions on particular themes. All submissions will be reviewed for suitability, and accepted abstracts will be published in *Canadian Acoustics.* Abstracts should be limited to 300 words and must be received by April 30, 1993. Instructions for the preparation of abstracts are provided in this issue of the journal. Completed abstracts should be directed to:

Dr. Moustafa Osman
Ontario Hydro
700 University Ave., H13
Toronto, Ontario.
M5G 1X6
Tel: (416) 592-4988

Students are particularly invited to participate and awards will be given to the three best presentations. Students must signify their intention to compete by submitting a special form (see March issue) along with the abstract.

Host City: Toronto, Home of the World Champion Blue Jays
Chair: Dr. Sharon Abel, Tel: (416) 586-8278

APPEL DE COMMUNICATIONS

Semaine Canadienne d'Acoustique

4-8 Octobre 1993

La Semaine Canadienne d'Acoustique aura lieu a l'auberge Delta Chelsea de Toronto, Ontario. Le congrès se tiendra du 6 au 8 octobre. Parmis les activités sociales, une soirée de vins et fromages le mardi 5 octobre, un banquet le soir du mercredi 6 octobre et une réception de clôture à midi le vendredi 8 octobre. L'assemblée générale annuelle se tiendra l'après-midi de jeudi 7 octobre. Le comité d'organisation ne sera plus responsable pour organiser des séminaires, qui normallement précedent le congrès. Des personnes intéressées à organiser un tel séminaire doivent prendre contact avec Sharon Abel. Des salles de conférence spéciales pour ces seminaires seront réservées le lundi et le mardi, 4 et 5 octobre. Il y aura une exposition d'instruments des mesures acoustiques, de logiciel et de matérieaux acoustiques. Veuillez prendre contact avec John Hemingway (Tel/Fax: 416 949-2164).

CONGRES

Le programme du congrès commencera chaque jour par des sessions plénières, suivi par trois sessions parellèles d'invités spéciaux et de générales. Les auteurs sont invités à soumettre leur résumés pour ces sessions dans tous les domaines de l'acoustique et des vibrations. Il s'agit de:

- Bruit et vibrations
- Acoustique architecturale
- Sources acoustiques
- Acoustique de physique
- Acoustique de musique
- Parole, Audition et Communications
- Aménagement du territoire
- Mesures acoustiques
- Electro-acoustique
- Acoustique des salles de spectacle

Les organisateurs planifiront plusieurs sessions stucturées avec tables rondes des thèmes particuliers. Tous les résumés seront révisés afin de vérifier leur pertinence et les résumés acceptés seront publiés dans l'*Acoustique Canadienne*. Les résumés doivent être limités à 300 mots et être reçus avant le 30 avril 1993. Les résumés soumis doivent être préparés selon les instructions pour la préparation des résumés inclus dans ce numéro de l'*Acoustique Canadienne*. Les résumés complets doivent ètre convoyés à:

Dr. Moustafa Osman
Ontario Hydro
700 University Ave., H13
Toronto, Ontario
M5G 1X6
Tel: (416) 592-4988

Les étudiants sont particulièrement invités à participer et des prix seront donnés selon les trois meilleures exposés. Des étudiants intéressés devront remplir un formulaire special (voir le numéro de mars 1993) accompagné d'un résumé.

Ville hôte: Toronto, la ville des champions mondiaux les Blue Jays
Présidente: Sharon Abel (Tel: 416 586-8278)

ACOUSTICS WEEK IN CANADA
SEMAINE CANADIENNE DE L'ACOUSTIQUE

REGISTRATION FORM/FORMULAIRE D'INSCRIPTION

4-8 October, 1993
Delta Chelsea Inn, 33 Gerrard West
Toronto, Ontario
Canada

Surname/Nom:____________________ First Name/Prénom:____________________
Institution/Institution:____
Address/Addresse:____
____
Postal Code/Code Postal:____________________ Tél:____________________
Companion/Person(ne) accompagnent(e):____

SYMPOSIUM/CONGRES
6-8 October 1993

	MEMBERS/MEMBRES	STUDENTS/ETUDIANT(E)S
REGISTRATION/INSCRIPTION		
-before August 15/avant le 15 août	$125	$20
-after August 15/après le 15 août	$150	$25
BANQUET TICKET/BILLET DE BANQUET	Incl.	$35
- additional, $35 ea./en plus, $35	$______	$______
TOTAL/SOMME	$______	$______

TOURS - Two afternoon tours of CBC have been arranged. If you are interested, please indicate your prefered date. Deux visites pendent l'après-midi avant ete organises pour Radio Canada. Si vous êtes intéressés, indiquez S.V.P. la date préferée 5 Oct. ______ or/ou 8 Oct. ______ (Limit: 20).

SEMINARS
- Intensity Measurement Techniques, 5 Oct. __________
- Modern Techiques in Estimating and Troubleshooting HVAC Noise, 4-5 Oct. __________

HOTEL RESERVATION - Delta Chelsea Inn ($95, single or double/un ou deux personnes)
Date of Arrival/Date d'arrivée:____
Date of Departure/Date de départ:____
Name(s)/Nom(s): (1)____________________ (2)____________________

Please make cheques payable in Canadian funds to CAA '93 (Toronto) and mail to:
S.V.P. faites vos chèques à l'ordre de CAA'93 en fonds canadiens et postez à:

Dr. Sharon Abel
Mount Sinai Hospital, Room 843
600 University Avenue
Toronto, Ontario
M5G 1X5

ANNUAL STUDENT PRESENTATION AWARDS

The Canadian Acoustical Association makes awards to students whose papers are presented at the CAA Annual Symposium. Students contemplating papers for the 1993 Symposium should apply for these awards with the submission of their abstract.

RULES

1. These awards are presented annually to authors of outstanding student papers that are presented during the technical sessions at Acoustics Week in Canada.

2. In total, three awards of $500.00 are presented.

3. Presentations are judged on the following merits:
   - i) The way the subject is presented;
   - ii) The explanation of the relevance of the subject;
   - iii) The explanation of the methodology/theory;
   - iv) The presentation and analysis of results;
   - v) The consistency of the conclusions with theory and results.

4. Each presentation is judged independently by at least three judges.

5. The applicant must be:
   - i) a full-time graduate student at the time of application;
   - ii) the first author of the paper;
   - iii) a member of the CAA;
   - iv) registered at the meeting.

6. To apply for the award, the student must send this application simultaneously with the abstract. Multiple authors are permitted, but only the first author may receive an award.

PRIX ANNUELS RELATIFS AUX COMMUNICATIONS ETUDIANTES

L'Association Canadienne d'Acoustique decement des prix aux étudiants qui présenteront une communication au congrès annuel de l'ACA. Les étudiants qui considèrent presenter un papier au congrès doivent s'inscrire à ce concours au moment ou ils soummettent leur résumé.

REGLEMENTS

1. Ces prix sont decernes annuellement aux auteurs de communications exceptionelles presentées par des étudiants lors des sessions techniques de la Semaine Canadienne de l'Acoustique.

2. Au total, trois prix de 500$ sont remis.

3. Les présentations sont jugées selon les critères suivants:
   - i) La facon dont le sujet est présente;
   - ii) Les explications relatives à l'importance du sujet;
   - iii) L'explication de la methodologie;
   - iv) La présentation et l'analyse des résultats;
   - v) La consistence des conclusions avec la theorie et les résultats.

4. Chaque présentation est evaluée separement par au moins trois juges.

5. Le candidat doit être:
   - i) un étudiant à temps plein de niveau gradué au moment de l'inscription;
   - ii) le premier auteur du papier;
   - iii) un member de l'ACA;
   - iv) un régistrant au congrès.

6. Afin de s'inscrire au concours, l'étudiant doit envoyer ce formulaire d'inscription en même temps que son résumé. Plusieurs auteurs sont permis, mais seul le premier auteur peut recevoir le prix.

APPLICATION FOR STUDENT PRESENTATION AWARD AT ACOUSTICS WEEK IN CANADA

FORMULAIRE D'INSCRIPTION POUR LES PRIX DESCERNES AUX ETUDIANTS LORS DE LA SEMAINE CANADIENNE DE L'ACOUTIQUE

NAME OF THE STUDENT/NOM DE L'ETUDIANT:____________________

TITLE OF PAPER/TITRE DU PAPIER:____________________

UNIVERSITY/COLLEGE/UNIVERSITE/COLLEGE:____________________

NAME, TITLE OF SUPERVISOR/ NOM ET TITRE DU SUPERVISEUR:____________________

STATEMENT BY THE SUPERVISOR/DECLARATION DU SUPERVISEUR:

The undersigned affirms that the student mentioned above is a full-time student and the paper to be presented is the student's original work./Le sous-signe affirme que l'étudiant mentionne ci-haut inscrit à temps plein et que la communication qui'il présentera est le fruit de son propre travail.

Signature:____________________ Date:____________________

Instructions for the Preparation of Abstracts

1) Quadruplicate copies of an abstract are required for each meeting paper; one copy should be an original. Send the four copies to the Technical Program Chairperson, in time to be received by April 30th. Either English or French may be used. A cover letter is not necessary. **2)** Limit the abstract to 300 words, including title and first author's name and address; names and addresses of coauthors are not counted. Display formulas set apart from the text are counted as 40 words. Do not use the forms "I" and "we"; use passive voice instead. **3)** Title of abstract and names and addresses of authors should be set apart from the abstract. Text of abstract should be one single, indented paragraph. The entire abstract should be typed double spaced on one side of 8 1/2 x 11 in. or A4 paper. **4)** Be sure that the mailing address of the author to receive the acceptance notice is complete on the abstract, to insure timely deliveries. **5)** Do not use footnotes. Use square brackets to cite references or acknowledgements. **6)** Underline nothing except what you wish to be italicized. **7)** If the letter l is used as a symbol in a formula, loop the letter l by hand and write "lc ell" in the margin of the abstract. Do not intersperse the capital letter O with numbers where it might be confused with zero, but if unavoidable, write "capital oh" in the margin. Identify phonetic symbols by appropriate marginal remarks. **8)** At the bottom of an abstract give the following information: **a)** If the paper is part of a special session, indicate the session; **b)** Name the area of acoustics most appropriate to the subject matter; **c)** Telephone number, including area code, of the author to be contacted for information. Non-Canadian Authors should include country; **d)** If more than one author, name the one to receive the acceptance notice; **e)** Overhead projectors and 35mm slide projectors will be available at all sessions. Describe on the abstract itself any special equipment needed.

Instructions pour la Préparation des Résumés de Conférences

1) Quatre copies du résumé sont requises pour chaque papier soumis; une des copies doit être un original. Envoyer les quatre copies au Président du Comité technique, suffisamment à l'avance pour qu'elles soient reçues avant le 30 avril. L'anglais ou le français peut être utilisé. Une lettre de présentation n'est pas requise. **2)** Limiter le résumé à 300 mots, incluant le titre, le nom et l'adresse du premier auteur; les noms et les adresses des co-auteurs ne sont pas comptabilisés. Les formules en retrait du texte comptent pour 40 mots. Ne pas utiliser la forme "je" ou "nous"; utiliser plutôt la forme passive. **3)** Le titre du résumé, les noms et les adresses des auteurs doivent être séparés du texte. Le texte du résumé doit être présenté en un seul paragraphe. Le résumé entier doit être dactylographié à double interlignes sur une face d'une page 8 1/2 x 11 pouce ou du papier A4. **4)** S'assurer que l'adresse postale complète de l'auteur qui doit recevoir l'avis d'acceptation est inscrite sur le résumé afin d'assurer une livraison rapide. **5)** Ne pas utiliser les notes de bas de page. Utiliser les crochets pour les références et les remerciements. **6)** Ne souligner que ce qui doit être en italique. **7)** Si la lettre l est utilisée comme symbole dans une formule, encercler la lettre l à la main et écrire "lc ell" dans la marge du résumé. Ne pas introduire la lettre majuscule O dans les chiffres lorsqu'elle peut être confondue avec zéro, mais se cela n'est pas possible, écrire "O majuscule" dans la marge. Identifier les symboles phonétiques à l'aide de remarques appropriées dans la marge. **8)** A la fin du résumé, fournir les informations suivantes: **a)** Si la communication fait partie d'une session spéciale, indiquer laquelle; **b)** Identifier le domaine de l'acoustique le plus approprié à votre sujet; **c)** Le numéro de téléphone, incluant le code régional, de l'auteur avec qui l'on doit communiquer pour information. Les auteurs étrangers doivent indiquer leur pays; **d)** S'il y a plus d'un auteur, mentionner le nom de celui qui doit recevoir l'avis d'acceptation; **e)** Des projecteurs à acétates et à diapositives seront disponibles dans chaque session. Indiquer les besoins spéciaux, si nécessaire.

Instructions pour la Préparation des Articles à être Publiés dans le Cahier des Actes du Congrès

Général - Soumettre un article prêt-à-copier d'un maximum de deux pages présenté en deux colonnes. Ne pas inclure de sommaire. Tout le texte en caractères Times-Roman. Disposer les figures dans le haut ou le bas des pages si possible. Lister les références dans un format logique à la fin du texte. Envoyer l'article au président du Programme Technique avant le 1 juillet. Le format optimal peut être obtenu de deux façons:

Méthode directe - Imprimer directement sur deux feuilles 8.5" x 11" en respectant des marge de 3/4" dans le haut et sur les côtés et un minimum de 1" dans le bas. Titre en 12pt, caractères gras, en simple interligne (12pt), centrés sur la page. Le reste du texte en 9pt en 0.75 (9pt) interligne, dans un format en deux colones, avec une largeur de colonnes de 3.4" et une séparation de 1/4". Noms des auteurs et adresses centrés sur la page avec les noms en caractères gras. Les titres de sections en caractères gras.

Méthode indirecte - Dactylographier ou imprimer comme suit, réduire au trois-quart (s.v.p., s'assurer de bonnes photocopies) et assembler l'article sur un maximum de deux pages 8.5" x 11" avec les côtés et un minimum de 1" dans le bas. Titre en 16pt avec 1.33 (16pt) interligne, centré sur la page. Le reste du texte en 12pt avec simple (12pt) interligne. Noms et adresses des auteurs centrés sur la page avec les noms en caractères gras. Titres des sections en caractères gras. Imprimer les colonnes de texte sur quatre feuilles 8.5" x 14" avec une largeur de colonnes de 4.5", une longueur maximum de 12.25", en laissant de la place pour le titre, les noms et les adresses sur la première page.

Instructions for Preparation of Articles to be Published in the Conference Proceedings Issue

General - Submit the camera-ready article on a maximum of two pages in two-column format. Do not include an abstract. All text in Times-Roman font. Place figures at the top and/or bottom of the pages, if possible. List references in any consistent format at the end. Send to the Chairperson of the Technical Programme by July 1. The optimum format can be obtained in two ways:

Direct method - Print directly on two sheets of 8.5" x 11" paper with margins of 3.4" top and sides, and 1" minimum at the bottom. Title in 12pt bold with single (12pt) spacing, centred on the page. All other text in 9pt with 0.75 (9pt) line spacing, in two-column format, with column width of 3.4" and separation of 1/4". Authors' names and addresses centred on the page with the names in bold type. Section headings in bold type.

Indirect method - Type or print as follows, reduce to three-quarters size (please ensure good copies) and assemble article on a maximum of two 8.5" x 11" pages with margins of 3.4" top and sides, and 1" minimum at the bottom. Title in 16pt bold type with 1.33 (16pt) line spacing, centred on the page. All other text in 12pt with single (12pt) line spacing. Authors' names and addresses centred on the page with the names in bold type. Section headings in bold type. Print individual text columns on four sheets of 8.5" x 14" paper with a column width of 4..5", a maximum length of 12.25", and leaving room for the title and names and addresses on the first page.

The Canadian Acoustical Association
l'Association Canadienne d'Acoustique

BOARD OF DIRECTORS MEETING / REUNION DES DIRECTEURS

Date / Date: May 16 / 16 mai 1993
Time / Heure: 10:00 a.m. / 10h00
Place / Endroit: Château Laurier Hotel
Ottawa, Ontario

AGENDA / ORDRE DU JOUR

1. Report of the President (Chapman)

2. Report of the Executive Secretary (Hemingway)

3. Report of the Treasurer (Bolstad)

4. Report of the Editor of *Canadian Acoustics* (Laroche)

5. Report of the Membership Chairperson (Sydenborgh)

6. Awards Committee Report (Dunn):

   Directors Award (Laroche)
   Bell Speech Prize (Jamieson)
   Fessenden Prize (Chapman)
   Eckel Award (Hodgson)
   Student Oral Presentations (Behar)
   Science Fair (Laville)
   Postdoctoral Prize (Abel)

7. Acoustics Week in Canada Reports

   1992 Vancouver Meeting (Whicker)
   1993 Toronto Meeting (Abel)
   1994 Ottawa Meeting (Nightengale)
   1995 ??? Meeting

8. Other business

9. Discussion: By-law review

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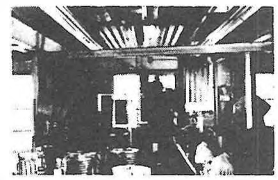

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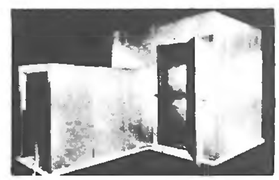

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- **Machinery & Equipment Noise Dampening**

The Eckoustic Noise Barrier provides a unique, efficient method for controlling occupational noise. This Eckoustic sound absorbing-sound attenuating material combination provides excellent noise reduction. The material can be readily mounted on any fixed or movable framework of metal or wood, and used as either a stationary or mobile noise control curtain.

Acoustic Materials & Products for dampening and reducing equipment noise

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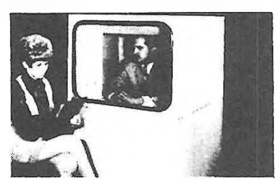
Multi-Purpose Rooms

Rugged, soundproof enclosures that can be conveniently moved by fork-lift to any area in an industrial or commercial facility. Factory assembled with ventilation and lighting systems. Ideal where a quiet "haven" is desired in a noisy environment: foreman and supervisory offices, Q.C. and product test area, control rooms, construction offices, guard and gate houses, etc.

Audiometric Rooms: Survey Booths & Diagnostic Rooms

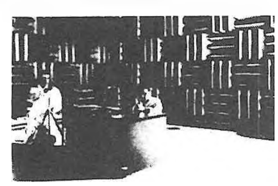
Eckoustic Audiometric Survey Booths provide proper environment for on-the-spot basic hearing testing. Economical. Portable, with unitized construction.

Diagnostic Rooms offer effective noise reduction for all areas of testing. Designed to meet, within ±3 dB, the requirements of MIL Spec C-81016 (Weps). Nine standard models. Also custom designed facilities.



An-Eck-Oic® Chambers

Echo-free enclosures for acoustic testing and research. Dependable, economical, high performance operation. Both full-size rooms and portable models. Cutoff frequencies up to 300 Hz. Uses include: sound testing of mechanical and electrical machinery, communications equipment, aircraft and automotive equipment, and business machines; noise studies of small electronic equipment, etc.



For more information, contact

ECKEL INDUSTRIES OF CANADA, LTD., Allison Ave., Morrisburg, Ontario • 613-543-2967

ECKEL INDUSTRIES, INC.

NEWS/INFORMATIONS

CONFERENCES

NOISE-CON 93: The 1993 National Conference on Noise Control Engineering, Williamsburg, Virginia, May 2-5, 1993. NOISE-CON 93 is being organized in conjunction with the Second Conference on Recent Advances in Active Control of Sound and Vibration.

International Noise and Vibration Control Conference: St Petersburg, Russia, May 31- June 3, 1993. Contact: Noise Control Association Leningrad Mechanics Institute, Professor Nickolai Igorevich Ivanov, St. Petersburg, Russia.

6th International Congress on Noise as a Public Health Problem: Nice, France, July 6-9, 1993. Contact: Noise and Man '93, Inrets-Len, P.O. Box 24, 69675 Bron Cedex, France.

INTER-NOISE 93: The 1993 International Congress on Noise Control Engineering, Leuven, Belgium, August 24-26, 1993. Contact: Inter-Noise 93, Conference Secretariat, Christine Mortelmans, TI-K VIV, Desgiunlei 214, B-2018, Antwerpen, Belgium.

Structural Intensity and Vibrational Energy Flow: 4th International Congress on Intensity Techniques CETIM, Senlis (France), August 31 - September 2, 1993. Contact: CETIM, Secretariat of 4th International Congress on Intensity Techniques, Acoustical Department, BP 67 - 60304 SENLIS Cedex (France), Tel: (33) 44 58 34 15; Fax: (33) 44 58 34 00.

FASE-Symposium 1993: September 15-17, 1993, Bucharest, Romania. Vibroacoustics of machines and structures. Transducers for noise and vibration. Secretariat: FASE Symposium 1993, Acoustical Commission of Romanian Academy, Calea Victoriei 125, Sector 1, 71102 Bucharest..

7th International Symposium in Audiological Medicine 1993: September 19-22, 1993, Cardiff, Wales, UK. Genetic Hearing Loss, Training in Audiology for Primary Physicians, Investigation of Vertigo - how and why? Details: Dr. D. Stephens, Welsh Hearing Institute, University Hospital of Wales, Cardiff CF4 4XW, Wales.

126th Meeting of the Acoustical Society of America: October 4-8, 1993, Denver, Colorado, USA. Contact: Acoustical Society of America, 500 Sunnyside Boulevard, Woodbury, NY 11797.

INTER-NOISE 94: The 1994 International Congress on Noise Control Engineering, Yokohama, Japan, from August 29 to 31, 1994. Contact: Inter-Noise 94 - Congress Secretariat, Sone Lab. R.I.E.C., Tohoku University, 2-1-1 Katahira, Aoba-Ku, Sendai, 980 Japan. Fax: +81-22-263-9848, +81-22-224-7889. E-Mail: in94 @ riec.tohoku.ac.ip.

COURSES

Penn State's June 1993 Program in Acoustics: General and Applied Acoustics (4 courses), Underwater Acoustics and Sonar (4 courses) and Noise and Vibration control (3 courses), For further information contact: Dr. Alan D. Stuart, summer Program Coordinator, The Penn State Graduate Program in Acoustics, P.O. Box 30, State College, PA, 16804 Tel: (814) 863-4128, Fax: (814) 865-3119.

CONFERENCES

Conférence Noise-Con 93: Williamburg, Virginie, du 2 au 5 mai 1993. Conférence organisée conjointement avec la Second Conference on Recent Advances in Active Control of Sound and Vibration.

Conférence internationale sur la maîtrise du bruit et des vibrations; Saint-Pétersbourg, Russie, du 31 mai au 3 juin 1993. Renseignements: Noise Control Association, Leningrad Mechanics Institute, Professeur Nickolai Igorevich Ivanov, Saint-Pétersbourg, Russie.

6^{e} conférence internationale sur le bruit comme problème de santé publique: Nice, France, du 6 au 9 juillet 1993. Renseignements: Noise and Man '93, Inrets-Len, Boîte postale 24, 69675 Bron Cedex, France.

Conférence Inter-Noise 93: Leuven, Belgique, du 24 au 26 août 1993. Renseignements: Inter-Noise 93, Conference Secretariat, Christine Mortelmans, TI-K VIV, Desgiunlei 214, B-2018, Antwerpen, Belgique.

4^{e} conférence internationale sur les techniques de mesure de l'intensité: Senlis, France, du 31 août au 2 septembre 1993. Renseignements: CETIM, secrétariat de la 4^{e} conférence internationale sur les techniques de mesure d'intensité, département d'acoustique, B.P. 67, 60304 Senlis, Cedex, France; téléphone (33) 44 58 34 15; télécopieur (33) 44 58 34 00.

Symosium 1993 de la fédération européenne des sociétés d'acoustique (FASE); Bucharest, Roumanie, du 15 au 17 septembre 1993. Sujets à l'ordre du jour: la vibro-acoustique des machines et des structures; les transducteurs pour le bruit et les vibrations. Renseignements: FASE Symposium 1993, Acoustical Commission of Romanian Academy, Calea Victoriei 125, Sector 1, 71102 Bucharest, Roumanie.

7^{e} symposium international d'audiologie: Cardiff, pays de Galles, Grande-Bretagne, du 19 au 22 septembre 1993. Sujets à l''ordre du jour: la perte auditive d'origine génétique, la formation en audiologie pour médecins, les vertiges. Renseignements: D.D. Stephens, Welsh Hearing Institute, University Hospital of Wales, Cardiff CF4 4XW, Wales.

126^{e} rencontre de L'Acoustical Society of America: Denver, Colorado, du 4 au 8 octobre 1993. Renseignements: Acoustical Society of America, 500 Sunnyside Boulevard, Woodbury, NY 11797, USA.

Conférence Inter-Noise 94: Yokohama, Japan, du 29 au 31 août 1994. Renseignements: Inter-Noise 94, Congress Secretariat, Sone Lab. R.I.E.C., Tohoku University, 2-1-1 Katahira, Aoba-Ku, Sendai, 980 Japon. Télécopieur +81-22-263-9848; +81-22-224-7889; courrier électronique en 94 @ riec.tohoku.ac.ip.

COURS

Program in Acoustics: State College, Pennsylvanie, juin 1993. Programme comprenant 4 cours sur l'acoustique générale et appliquée, 4 cours sur l'acoustique sous-marine et les sonars et 3 cours sur la réduction des vibrations. Renseignements: Dr. Alan D. Stuart, Summer Progrm Coordinator, The Penn State Graduate Program in Acoustics, P.O. Box 30, State College, PA 16804, USA; téléphone (814) 863-4128, télécopieur (814) 865-3119.

Sound Intensity: June 7-11, 1993. The sound intensity method is becoming increasingly important in the fields of acoustics and noise control. Sound-intensity measurements are made to isolate sources of noise and quantify the sound-power output of sources or the components of sources. With modern instrumentation, the sound intensity method gleans information in a fraction of the time required by traditional methods and provides valuable noise-source data not normally obtainable by other means. For further information contact: Dr. Alan D. Stuart, summer Program Coordinator, The Penn State Graduate Program in Acoustics, P.O. Box 30, State College, PA, 16804 Tel: (814) 863-4128, Fax: (814) 865-3119.

Strategies and Techniques in Noise Control: October 28, 1993. The 1986 Draft Regulation Prescribing Noise as a Designated Substance, stresses engineering controls, rather than HPD's to reduce worker noise exposures below 90 dBA. Although this legislation is still "pending", we know from the nature of the "holdup" that the requirements of the Regulation (when enacted) will not be any less. This session will review some basic physics of sound and then evaluate: noise sources and spectra; sound power and sound pressure levels, instrumentation for sound and vibration measurement and analysis, sound level standards and surveys: ANSI, CSA, MOL; noise control strategies: vibration isolation, surface treatments, barriers and enclosures. There will be a number of calculations of predicted noise reduction: attendees are requested to bring a calculator to this session. Attendance at this session will facilitate in-house noise solutions and create a more knowledgeable consumer of noise control produces and services. For further information contact: Dr. Alan D. Stuart, summer Program Coordinator, The Penn State Graduate Program in Acoustics, P.O. Box 30, State College, PA, 16804 Tel: (814) 863-4128, Fax: (814) 865-3119.

Industrial Audiometry and the Effective Hearing Conservation Program: March 2-4 and December 8-10, 1993. The 1986 Draft Noise Regulation stipulates that where workers are exposed to a daily TWA noise exposure of 85 dBA or greater, a Hearing Conservation Program (HCP) is required; where a weekly TWA is 85 dBA or greater, the HCP must include audiometric tests. This three-day course will provide the background necessary to introduce an effective HCP into your workplace. As well, it will offer the specific training required to meet the definition of "competent audiometric tester" as specified by the Code for Audiometry of Noise Exposed workers. Curriculum will include anatomy of the ear, noise-induced hearing loss, workers' compensation, ethics of audiometry hearing protection, legal requirements, etoscopy and audiometry laboratories. Participants are encouraged to bring their own audiometer, if one is available in-house. For further information contact: Dr. Alan D. Stuart, summer Program Coordinator, The Penn State Graduate Program in Acoustics, P.O. Box 30, State College, PA, 16804 Tel: (814) 863-4128, Fax: (814) 865-3119.

Applied Noise & Vibration Control: November 16-19 in Chicago, ILL. Contact: Education Section, ASHRAE, 1791 Tullie Circle NE, Atlanta, GA 30329, Tel: (404) 636-8400, Fax: (404) 321-5478.

Sound Intensity: du 7 au 11 juin 1993. L'intensité acoustique est une méthode de mesure de plus en plus utilisée dans les domaines de l'acoustique et de la réduction des bruits. À l'aide d'instruments modernes, elle permet d'isoler les sources de bruit et de quantifier leur puissance, en une fraction du temps normalement requis par les méthodes traditionnelles de mesure. Elle permet également d'obtenir des données impossibles à mesurer à l'aide des méthodes moins perfectionnées. Renseignements: Dr. Alan D. Stuart, Summer Program Coordinator, The Penn State Graduate Program in Acoustics, P.O. Box 30, State College, PA 16804, USA; téléphone (814) 863-4128, télécopieur (814) 865-3119.

Strategies and Techniques in Noise Control: le 28 octobre 1993. Le projet de loi américain de 1986 qualifiant le bruit de substance désignée privilégie les moyens extérieurs techniques, aux dépens des protecteurs auricaulaires individuels, pour amener l'exposition des travailleurs sous le seuil des 90 dBA. Bien que ce texte ne soit pas encore devenu loi, nous savons, de par les raisons du retard de son adoption, que les exigences de la loi, une fois celle-ci adoptée, seront aussi sévères, sinon plus, que celles du projet de loi. Ce séminaire d'une journée passera en revue les sujets suivants: physique fondamentale du bruit; sources et spectres des bruits; puissance sonore et niveaux de pression sonore; instruments de mesure et d'analyse des sons et des vibrations; normes ANSI, CSA et MOL de niveau sonore; mesures de niveau sonore; stratégies de réduction du bruit: isolation des vibrations, traitements des surfaces, barrières et enceintes. Les participants seront appelés à estimer des niveaux de bruit après réduction (il est conseillé d'apporter sa propre calculatrice). Le but du séminaire est d'aider les participants à élaborer d'eux-mêmes des stratégies de réduction du bruit et à prendre des décisions éclairées lors du choix de produits et de services pour la réduction du bruit. Renseignements: Dr. Alan D.Stuart, Summer Prgram Coordinator, The Penn State Graduate Program in Acoustics, P.O. Box 30, State College, PA 16804, USA; téléphone (814) 863-4128, télécopieur (814) 865-3119.

Industrial Audiometry and the Effective Hearing Conservation Program: du 2 au 4 mars et du 8 au 10 décembre 1993. Le projet de loi américain de 1986 sur le bruit stipule l'existence d'un programme de préservation de l'ouïe sur les lieux de travail où l'exposition au bruit est de 85 dBA et plus, et des tests audiométriques lorsque l'exposition est de 85 dBA et plus. Ce cours de trois jours devrait fournir aux participants les éléments de base nécessaires à la mise sur pied d'un programme de préservation de l'ouïe sur leurs lieux de travail. Les participants recevront la formation d'évaluateur compétent en audiométrie, telle que prescrite dans le Code for Audiometry of Noise Exposed Workers. Les sujets suivants seront abordés: anatomie de l'oreille, perte d'audition due au bruit, audiométrie, protection de l'ouïe, programmes d'indemnisation des travailleurs, règlements, laboratoires d'étoscopie et d'audiométrie. On demande aux participants d'apporter, si possible, leur propre audiomètre. Renseignements: Dr. Alan D. Stuart, Summer Program Coordinator, The Penn State Graduate Program in Acoustics, P.O. Box 30, State College, PA 16804, USA; téléphone (814) 863-4128, télécopieur (814) 865-3119.

Applied Noise and Vibration Control: Chicago, Illinois, du 16 au 19 novembre 1993. Renseignements: Education Section, ASHRAE 1791 Tullie Circle NE, Atlanta, GA 30329; téléphone (404) 636-8400, télécopieur (404) 321-5478.

NEW PRODUCTS

Scantek, Inc.: Scantek Inc., announces the availability of hard-to-get instruments for vibrations and acoustics. Included are tapping machines meeting ISO and ASTM requirements, environmental noise loggers, dosimeters, octave- and 1/3rd octave-band analyzers, portable FFTs, sound level meters, vibration meters and accessories. Rental periods start at weekly minimum. Contact: Richard J. Peppin, P.E., President, Scantek, Inc., 916 Gist Avenue, Silver Spring, MD 20910, Tel: (301) 495-7738, Fax: (301) 495-7739.

Sonométric Inc.: If you are having problems with warning sounds, then the solution may be Detect Sound. This product has been designed to evaluate and help in the selection of warning sounds. It is a user-friendly tool and runs on IBM-PC compatible computers. Contact: Sonométric Inc., 5757 Decelles, Suite 514, Montreal, Quebec, H3S 2C3.

New Book: An ALL NEW Key Reference for Solving Noise and Vibration Control Problems - Noise and Vibration Control Engineering Principles and Applications. Editors: Leo L. Beranek, former President and Istvan L. Vér, current Principal Consultant of Bolt, Beranek and Newman, Inc., Cambridge, Massachussetts. To Order by Phone, Call Toll-Free: 1-800-225-5945, or Fax: 212-850-6088.

PEOPLE IN THE NEWS

John Hemingway is pleased to announce that he is now the Canadian Representative for Scantek, Inc. Sound and Vibration Instrumentation and Software as well as other product lines. It is expected that further product lines will be added in the near future. Contact: 2410 Old Pheasant Road, Mississauga, Ontario, L5A 2S1, Tel: (416) 949-2164.

NOUVEAUX PRODUITS

Scantek, Inc. assure la location d'instruments de mesure des vibrations souvent difficiles à trouver, comme par exemple des machines à chocs répondant aux normes ISO et ASTM, des enregistreurs automatiques de bruits environnementaux, des dosimètres, des analyseurs par bande d'une octave et de 1/3 d'octave, des analyseurs de niveau sonore et de vibration. La période minimale de location est d'une semaine. Renseignments: Richard J. Peppin, P.E., Président, Scantek, Inc., 916 Gist Avenue, Silver Spring, MD 20910. Téléphone (301) 495-7738; télécopieur (301) 495-7739.

Sonométric Inc. a mis au point le logiciel d'évaluation et de comparaison des sons avertisseurs Detect Sound. Ce logiciel convivial fonctionne sur IBM. Renseignements: Sonométric Inc., 5757, Décelles, bureau 514, Montréal (Québec) H3S 2C3

Nouveau guide de référence pour solutionner les problèmes de réduction des bruits et des vibrations intitulé Noise and Vibration Control Engineering Principles and Applicaitons. Rédacteurs en chef: Leo L. Beranek, ancien président de Bolt, Beranek and Newman, Inc., et Istvn L. Vér, conseiller principal, Bolt, Beranek and Newman, Inc., Cambridge, Massachussetts. Commandes par téléphone 1-800-225-5945; par télécopieur 212-850-6088.

LES GENS QUI FONT PARLER D'EUX

John Hemingway est heureux d'annoncer qu'il est le nouveau représentant commercial au Canada de Scantek, Inc., distributeur d'instruments et de logiciels dans les domaines de la réduction du bruit et des vibrations. L'adresse de M. Hemingway est 2410 Old Pheasant Road, Mississauga (Ontario) L5A 2S1, et son numéro de téléphone, (416) 949-2164.

The Canadian Acoustical Association
l'Association Canadienne d'Acoustique

PRIZE ANNOUNCEMENT

A number of prizes, whose general objectives are described below, are offered by the Canadian Acoustical Association. As to the first four prizes, applicants must submit an application form and supporting documentation before the end of February of the year the award is to be made. Applications are reviewed by subcommittees named by the President and Board of Directors of the Association. Decisions are final and cannot be appealed. The Association reserves the right not to make the awards in any year. For some awards applicants must be members of the Canadian Acoustical Association. Preference will be given to citizens and permanent residents of Canada. Potential applicants can obtain full details of the prizes and their eligibility conditions, as well as application forms and procedures from: The Secretary, Canadian Acoustical Association, P.O. Box 1351, Station F, Toronto, Ontario M4Y 2V9.

EDGAR AND MILLICENT SHAW POSTDOCTORAL PRIZE IN ACOUSTICS

This prize is made to a highly qualified candidate holding a Ph.D. degree or the equivalent, who has completed all formal academic and research training and who wishes to acquire up to two years supervised research training in an established setting. The proposed research must be related to some area of acoustics, psychoacoustics, speech communication or noise. The research must be carried out in a setting other than the one in which the Ph.D. degree was earned. The prize is for $3000 for full-time research for twelve months, and may be renewed for a second year. Coordinator: Sharon Abel. Past recipients are:

1990 Li Cheng, Université de Sherbrooke

ALEXANDER GRAHAM BELL GRADUATE STUDENT PRIZE IN SPEECH COMMUNICATION AND BEHAVIOURAL ACOUSTICS

The prize is made to a graduate student enrolled at a Canadian academic institution and conducting research in the field of speech communication or behavioural acoustics. It consists of an $800 cash prize to be awarded annually. Coordinator: Don Jamieson. Past recipients are:

1990 Bradley Frankland, Dalhousie University
1991 Steven Donald Turnbull, University of New Brunswick
Fangxin Chen, University of Alberta
Leonard E. Cornelisse, University of Western Ontario

FESSENDEN STUDENT PRIZE IN UNDERWATER ACOUSTICS

The prize is made to a graduate student enrolled at a Canadian university and conducting research in underwater acoustics or in a branch of science closely connected to underwater acoustics. It consists of $500 cash prize to be awarded annually. Coordinator: David Chapman.

1992 Daniela Dilorio, University of Victoria

ECKEL STUDENT PRIZE IN NOISE CONTROL

The prize is made to a graduate student enrolled at a Canadian academic institution pursuing studies in any discipline of acoustics and conducting research related to the advancement of the practice of noise control. It consists of a $500 cash prize to be awarded annually. The prize was inaugurated in 1991. Coordinator: Murray Hodgson.

DIRECTORS' AWARDS

Three awards are made annually to the authors of the best papers published in *Canadian Acoustics*. The first author must study or work in Canada. All papers reporting new results as well as review and tutorial papers are eligible; technical notes are not. The first award, for $500, is made to a graduate student author. The second and third awards, each for $250, are made to professional authors under 30 years of age and 30 years of age or older, respectively. Coordinator: Chantal Laroche.

STUDENT PRESENTATION AWARDS

Three awards of $500 each are made annually to the undergraduate or graduate students making the best presentations during the technical sessions of Acoustics Week in Canada. Application must be made at the time of submission of the abstract. Coordinator: Alberto Behar.

The Canadian Acoustical Association
l'Association Canadienne d'Acoustique

ANNONCE DE PRIX

Plusieurs prix, dont les objectifs généraux sont décrits ci-dessous, sont décernés par l'Association Canadienne d'Acoustique. Quant aux quatre premiers prix, les candidats doivent soumettre un formulaire de demande ainsi que la documentation associée avant le dernier jour de février de l'année durant laquelle le prix sera décerné. Toutes les demandes seront analysées par des sous-comités nommés par le président et la chambre des directeurs de l'Association. Les décisions seront finales et sans appel. L'Association se réserve le droit de ne pas décerner les prix une année donnée. Pour certains des prix, les candidats doivent être membres de l'Association. La préférence sera donnée aux citoyens et aux résidents permanents du Canada. Les candidats potentiels peuvent se procurer de plus amples détails sur les prix, leurs conditions d'éligibilité, ainsi que des formulaires de demande auprès de: Le Secretaire, Association Canadienne d'Acoustique, C.P. 1351, Station F, Toronto, Ontario M4Y 2V9.

PRIX POST-DOCTORAL EDGAR ET MILLICENT SHAW EN ACOUSTIQUE

Ce prix est attribué à un(e) candidat(e) hautement qualifié(e) et détenteur(rice) d'un doctorat ou l'équivalent qui a complèté(e) ses études et sa formation de chercheur et qui désire acquérir jusqu'à deux années de formation supervisée de recherche dans un établissement reconnu. Le thème de recherche proposée doit être relié à un domaine de l'acoustique, de la psycho-acoustique, de la communication verbale ou du bruit. La recherche doit être menée dans un autre milieu que celui où le candidat a obtenu son doctorat. Le prix est de $3000 pour une recherche plein temps de 12 mois avec possibilité de renouvellement pour une deuxième année. Coordonnatrice: Sharon Abel. Les récipiendaires antérieur(e)s sont:

1990 Li Cheng, Université de Sherbrooke

PRIX ETUDIANT ALEXANDER GRAHAM BELL EN COMMUNICATION VERBALE ET ACOUSTIQUE COMPORTEMENTALE

Ce prix sera décerné à un(e) étudiant(e) inscrit(e) dans une institution académique canadienne et menant un projet de recherche en communication verbale ou acoustique comportementale. Il consiste en un montant en argent de $800 qui sera décerné annuellement. Coordonnateur: Don Jamieson. Les récipiendaires antérieur(e)s sont:

1990 Bradley Frankland, Dalhousie University
1991 Steven Donald Turnbull, University of New Brunswick
Fangxin Chen, University of Alberta
Leonard E. Cornelisse, University of Western Ontario

PRIX ETUDIANT FESSENDEN EN ACOUSTIQUE SOUS-MARINE

Ce prix sera décerné à un(e) étudiant(e) inscrit(e) dans une institution académique canadienne et menant un projet de recherche en acoustique sous-marine ou dans une discipline scientifique reliée à l'acoustique sous-marine. Il consiste en un montant en argent de $500 qui sera décerné annuellement. Coordonnateur: David Chapman.

1992 Daniela Dilorio, University of Victoria

PRIX ETUDIANT ECKEL EN CONTROLE DU BRUIT

Ce prix sera décerné à un(e) étudiant(e) inscrit(e) dans une institution académique canadienne dans n'importe quelle discipline de l'acoustique et menant un projet de recherche relié à l'avancement de la pratique en contrôle du bruit. Il consiste en un montant en argent de $500 qui sera décerné annuellement. Ce prix a été inauguré en 1991. Coordonnateur: Murray Hodgson.

PRIX DES DIRECTEURS

Trois prix sont décernés, à tous les ans, aux auteurs des trois meilleurs articles publiés dans l'*Acoustique Canadienne.* Le premier auteur doit étudier ou travailler au Canada. Tout manuscrit rapportant des résultats originaux ou faisant le point sur l'état des connaissances dans un domaine particulier sont éligibles; les notes techniques ne le sont pas. Le premier prix, de $500, est décerné à un(e) étudiant(e) gradué(e). Le deuxième et le troisième prix, de $250 chaqun, sont décernés à des auteurs professionnels âgés de moins de 30 ans et de 30 ans et plus, respectivement. Coordonnatrice: Chantal Laroche.

PRIX DE PRESENTATION ETUDIANT

Trois prix, de $500 chaqun, sont décernés annuellement aux étudiant(e)s sous-gradué(e)s ou gradué(e)s présentant les meilleures communications lors de la Semaine de l'Acoustique Canadienne. La demande doit se faire lors de la soumission du résumé. Coordonnateur: Alberto Behar.

INSTRUCTIONS TO AUTHORS PREPARATION OF MANUSCRIPT

Submissions: The original manuscript and two copies should be sent to the Editor-in-Chief.

General Presentation: Papers should be submitted in camera-ready format. Paper size 8.5" x 11". If you have access to a word processor, copy as closely as possible the format of the articles in Canadian Acoustics 18(4) 1990. All text in Times-Roman 10 pt font, with single (12 pt) spacing. Main body of text in two columns separated by 0.25". One line space between paragraphs.

Margins: Top - title page: 1.25"; other pages, 0.75"; bottom, 1" minimum; sides, 0.75".

Title: Bold, 14 pt with 14 pt spacing, upper case, centered.

Authors/addresses: Names and full mailing addresses, 10 pt with single (12 pt) spacing, upper and lower case, centered. Names in bold text.

Abstracts: English and French versions. Headings, 12 pt bold, upper case, centered. Indent text 0.5" on both sides.

Headings: Headings to be in 12 pt bold, Times-Roman font. Number at the left margin and indent text 0.5". Main headings, numbered as 1, 2, 3, ... to be in upper case. Sub-headings numbered as 1.1, 1.2, 1.3, ... in upper and lower case. Sub-sub-headings not numbered, in upper and lower case, underlined.

Equations: Minimize. Place in text if short. Numbered.

Figures/Tables: Keep small. Insert in text at top or bottom of page. Name as "Figure 1, 2, ..." Caption in 9 pt with single (12 pt) spacing. Leave 0.5" between text.

Photographs: Submit original glossy, black and white photograph.

References: Cite in text and list at end in any consistent format, 9 pt with single (12 pt) spacing.

Page numbers: In light pencil at the bottom of each page.

Reprints: Can be ordered at time of acceptance of paper.

DIRECTIVES A L'INTENTION DES AUTEURS PREPARATION DES MANUSCRITS

Soumissions: Le manuscrit original ainsi que deux copies doivent être soumis au rédacteur-en-chef.

Présentation générale: Le manuscript doit comprendre le collage. Dimensions des pages, 8.5" x 11". Si vous avez accès à un système de traitement de texte, dans la mesure du possible, suivre le format des articles dans l'Acoustique Canadienne 18(4) 1990. Tout le texte doit être en caractères Times-Roman, 10 pt et à simple (12 pt) interligne. Le texte principal doit être en deux colonnes séparées d'un espace de 0.25". Les paragraphes sont séparés d'un espace d'une ligne.

Marges: Dans le haut - page titre, 1.25"; autres pages, 0.75"; dans le bas, 1" minimum; aux côtés, 0.75".

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