ABSTRACT

It took 200 years for man to realise that excessive noise caused hearing damage. It took a further 100 years for anyone to start doing anything about it. 35 years later, only part of the problem has been tackled and our deaf population is increasing at an alarming rate. Governments in general are very hesitant to legislate when noise is generated other than by industry. Hence outside of work hours, if there is any law at all regarding noise it is merely a directive to keep all noise emission to a reasonable level, and action is taken only if there is a complaint, and then only as a tort. Some activities cause significant noise emission that affects not only unwilling bystanders, but the participants themselves. Then there are effects on the natural environment that cannot be quantified but nevertheless are known to have serious consequences. As the subject of the effects of noise during leisure time is so great, the I-INCE Technical Study Group #1 has taken just the subject of outdoor recreational noise, and has studied the effects of this noise globally for the last two and a half years. The paper summarises their findings. **KEYWORDS**: Recreational, Noise, Sport, Leisure.

INTRODUCTION

In 2002, an advertisement on New Zealand television for a scuba diving course attracted over 1750 candidates. A requirement for their being accepted for the course was that they undergo a hearing test. Over 1000 (57%) had a significant hearing loss [1] – almost all noise induced from recreational activities.

Without doubt, the Industrial Revolution, starting in England in the early 1800s, is the cause of most of our hearing problems today. The internal combustion engine, followed later by electronic amplification systems ensured that, with the inherent selfishness in man, the world and our sound environment would never be the same again. Many of the world’s natural sounds have disappeared for ever under the growth of urban development, and the ever increasing highways to make fast and easier travel between places. People are also spending more time on outdoor leisure activities - indeed whole industries are being set up to cater for the leisure needs of the modern man and woman, and the noise from the tourism industry is permeating all corners of the globe. If people could be made to understand that quiet is good,
rather than loud noise, things might not be so bad. Our sound environment, however, is
degenerating under the sounds of progress: Every day between 35 and 150 species of wildlife
becomes extinct [2] and every minute of the day in the developed world, two or three more
young people become deaf from exposure to noise [3]. Their exposure is usually by choice,
and the noise most often of their own making.

In 17th Century literature it is noted that coppersmiths and blacksmiths usually were deaf, as
were gunners on ships of war, but not until 1831 when John Fosbroke wrote in The Lancet [4]
was any link made between deafness and noise, and not until 1969 when the Walsh Healey
Act was introduced into the United States, was there any attempt to do anything about it. The
resulting occupational laws, enacted in most developed countries, put a limit to the quantity of
sound a worker may receive in industry. When the worker leaves the work premises, the cover
under the occupational law ceases, and often for the remaining hours of the day, and the
weekend, the person has no such protection and may expose themselves, or be exposed to
sound levels well in excess of those compatible with the protection of health.

BACKGROUND

The International Institute of Noise Control Engineering (I-INCE) was well aware that
occupational noise laws were not providing the intended protection from noise induced
hearing loss. Clearly noise received during leisure time had not been taken into the equation
and hearing loss among young people not yet in the workforce, was becoming a real concern.
A symposium on “Recreational Noise” [5] run in conjunction with Internoise 98 did not elicit
the response expected from national authorities but did show other related problems and
concerns - particularly those facing the management of land designated as national parks and
wilderness areas. As a result, I-INCE introduced a technical initiative to study the effects of
recreational noise and how these effects were being controlled. The work clearly was going to
be extensive and beyond the capability of one small group of people, so it was divided into
outdoor and indoor recreational activities, with the study of outdoor recreational noise as the
first task.

THE STUDY

The I-INCE Technical Study Group TSG #1 is examining the effects of noise from
recreational activities in outdoor areas, and the laws governing such noise emissions across
the World. Problem areas of recreational activity (in terms of uncontrolled and/or excessive
noise) are being highlighted, with the aim of producing workable strategies to recommend for
solving or at least mitigating the adverse effects.

Recreational activities can be defined as those pursuits outside one's regular occupation that
are usually undertaken for purposes of relaxation, or for the refreshment of strength and spirits
after work. Noise is produced by many of these recreational activities. While the providers of
such recreational activities may be uninterested, unwilling, or unable to control the noise, non-
participating bystanders (animals as well as people) are sometimes exposed to relatively high
levels of noise, or to noise intrusion that adversely affects their normal life. For example, the
maintaining of natural quiet in national parks and wilderness areas is considered by many to
be paramount to the survival of these preserves of the natural environment, but the incursion of recreational activities involving aircraft, road and off-road vehicles, and watercraft in many of these special areas has greatly changed, and sometimes totally eliminated, the natural acoustic environment. There are many other examples where the incursions of outdoor recreational noise create friction between those making the noise, and the bystanders who are not involved in the recreational activities.

At the inaugural meeting at Internoise 2000 in Nice, the technical working party drew up a line of study for each member of the team. This included studying the problems posed by outdoor recreational noise in each member’s own country and neighbouring countries, to assess what has been achieved to limit outdoor recreational noise, what methods have proven effective, and what have not, what regulations have been drafted or promulgated, and what measurement methods have been prescribed. Of particular interest are:

- The preservation of natural quiet in national parks and wilderness areas
- Noise from amusement parks and theme parks
- Noise from outdoor sports events (including speedways and other motor sports)
- Noise from outdoor concerts
- Noise from outdoor (civilian) shooting ranges
- Music from stereos, boom boxes and vehicles
- Noise from low flying sporting and military aircraft including microlights
- Noise from motorised recreational watercraft

Excluded from the study are those recreational activities and performances that are undertaken indoors with sound leakage from a building to the outdoor areas surrounding the building.

**THE FINDINGS**

Many territorial authorities do care about the levels of noise received in residential areas, and place rules in their plans to control the noise immission in these areas from industry and commerce. For leisure activities there appears to be no law other than in many countries an obligation to ensure that noise emitted from any premises should not exceed a reasonable level. Such a law is a civil law and any disregard only a breach of duty – a “tort”. Taking action to correct such a tort usually can only be conducted by a territorial authority and then has to be triggered by a complaint from a citizen. The process is difficult and time consuming, by which time probably the noise has ceased. So often loud sounds resulting from outdoor recreational activities goes on unchecked. Added to this, to many people loud noise means power so the noise gets louder and the perpetrator gets away without redress. Territorial authorities on whom the obligation for noise control is placed clearly are concerned about the effects of noise to which a person voluntarily subjects himself or herself, but feel helpless in doing anything about it as theoretically it infringes the person’s human rights. A control may be placed on the noise received by local residents from certain recreational activities such as outdoor concerts but in the main the noise from outdoor recreational activities is ignored. The effects on the participants themselves do not come within the responsibility of the local territorial authorities, and so are not of interest and are ignored.
Preservation of quiet in national parks

The technical study group has found that by far the greatest interest and concern is directed towards the preservation of quiet in national parks and wilderness areas. Whether or not this reflects the enthusiasm of those people directly involved in the management of such areas, and the environmentalists who see these areas as the last remnant of a forgotten world, has yet to be determined. Clearly there is a great weight of opinion that the preservation of these areas should outweigh any commercial interests. On the other hand the parks and wilderness areas were set up in the interests of preserving an area of the natural world for the benefit of people – many of whom wish to see how their taxes have been spent, and to experience the environment for themselves. Tourism often is the major industry providing much needed funds for maintaining these special places, indeed it may be the only income. So one has to find a balance between the need to have funds and the disbenefits that in procuring these funds, one is partly destroying the peaceful environment we are trying desperately to preserve.

Regrettably for all the effort put in by the countless dedicated people in the running and preservation of the parks, there is one great legal obstacle that most have been unable to overcome – that of the power of civil aviation who believe anyone with an aeroplane should be able to fly where they like except in designated military and sensitive areas, and the military can fly where they like and when they like. Often people with money do not care about anyone else but their own enjoyment and it is not uncommon for a single action by one of these people to destroy years of work by others. For example: New Zealand’s sole nesting colony of Royal Spoonbills, which had been very carefully protected from the incursion of sightseers and tourists by a dedicated band of volunteers for many years, was totally destroyed by a helicopter pilot who for reasons of his own, made an early morning ultra-low-level pass at high speed over the area, killing the birds and blowing away the nests.

Many tourists with limited time on their hands often want to explore the parks by aircraft, as do some with disabilities, and one may argue that these people have a right also to enjoy the park. Aircraft also allow one to see beautiful scenery that would not be seen from the ground, and is a great tourist draw – not that it would put funds into preserving the parks. Only park operated aircraft, with a total ban on all others, would do this. Even with a complete ban it would be well nigh impossible to keep the aircraft out especially as in some countries the aircraft registration is not visible from the underneath. A survey of national park users, by the New Zealand Department of Conservation [6], found that the noise from aircraft scenic flights in a number of parks bothered 69% of (walking) visitors and was noticed by 91% of them.

Road transportation can be controlled and some parks, such as Zion National Park in Utah, have their own transportation system of quiet busses to visit the main sight seeing areas, otherwise allowing only foot traffic in the park. Keeping off-road Vehicles from some of the remote areas is still a problem, as are snowmobiles in winter, and some watercraft in some of the parks with extensive waterways. Jet skis inevitably cause much concern due to the ease in which they can be brought into the area by a utility vehicle. On open water, the Department of Conservation Study [6] found that motorised recreational watercraft bothered 53% of people using non motorised vessels, and was noticed by 74% of them. On rivers the number of non motorised users bothered by the noise from motorised watercraft dropped to 34%, but this
may be due to speed restrictions fairly rigidly enforced to protect the banks from erosion, which latter is an effect covered by an Act of Parliament.

Jet boats too can be a problem, although some commercial companies have been able to reduce the noise emission to such low levels that some parks are happy to allow them to take visitors to some of the remote areas without disturbing the wildlife. An increasing problem, albeit not one of noise, is the incursion of mountain bikes for sport rather than sightseeing. This certainly contributes to the large number of species of wildlife becoming extinct.

If the parks were amply funded, and controls could be put in place by law, things might be better, but many parks run on very little funding, and some government agencies are unwilling to put controls on some of the activities most disturbing to the natural environment, but for which the law of trespass would be hard to apply.

**Motor racing**

As people become more affluent, young people have more access to motor vehicles and some abuse the privilege by engaging in street and drag racing, to the severe annoyance of local residents. This is of concern also to the managers of racing tracks who see this adding to the difficulties already being posed by increasing urban development that threatens the existence of some racetracks, most of which originally were set up well away from residential areas. Unorganised street racing in a number of countries is proving almost impossible to control under local law, and the police through lack of resources have been unable to take action in many cases. Some laws have been brought in allowing the impounding or confiscation of cars for serious unruly behaviour, but when a few police are faced by hundreds of unruly youngsters in high powered vehicles, such enforcement often puts the safety of the individual police at great risk. Such racing, and the noise it produces, also has generated a new health problem known as illness experience, and this is occurring in some of the most unlikely of places in the world - such as in the jungle villages of North East Thailand [7] where no such problem would ever be expected.

Organised street car racing, on the other hand, often is treated as a holiday occasion, and if organised well with adequate limits to the noise at source, may cause little or no upset to the local community. Indeed such occasions may well bring in much needed funds to help alleviate the tax burden on the community. It is understood that some countries even have motor racing take place in a national park with little or no adverse comment.

There appears to be little or no work done on the sound exposure received by participants and spectators in motor sports and other similar motorised outdoor activities where sound levels may be very high over long periods of time. Added to this, high power stereo systems in cars are very popular and it is not uncommon to hear the bass boom of a car stereo before the sound (and sight) of the car itself. Such are often set to deliver in excess of 110 dBA - for which just 90 seconds would be equivalent in many countries to the maximum permitted daily sound exposure in industry. The average trip of 40 minutes per day at this level is equivalent to more than 5 week’s maximum permitted industrial sound exposure.
Outdoor Concerts

Once the major concern for territorial authorities, outdoor concerts are causing less trouble to them than in the past. Ways have been found to limit the noise received at the nearest residential boundaries with fairly severe penalties on the promoters and organisers if the strict rules are disobeyed. But no controls on the noise received by those attending the concerts have been found. The noise may exceed 115 dBA for long periods of time and concert goers may receive the equivalent of more than a year’s maximum permitted industrial noise dose in just one concert. Until such time as the media and concert promoters can be made aware of the damage such high levels can do to hearing and other biosystems, and strive to get the sound emission down to reasonable levels, our young people will continue to suffer significant hearing loss at an early age.

The reaction by unwilling bystanders to the noise from an outdoor concert depends on the type of music and the type of audience attracted to that music. The crowd that attends “Opera in the Park” has a totally different nature from that attending a “Heavy Metal” concert, the crowd’s behaviour after the events is different, and it is the expected behaviour that governs the community’s response to the noise. The prime factor in the response is not the loudness of the received sound but the message that the sound conveys.

Amusement Parks

There usually is much concern by local residents if an amusement park is planned in their vicinity. In general, such parks are not wanted and developers are faced with stiff opposition. The main reason given is usually that the noise emission will be unreasonable and unacceptable – whereas the true reasons are most likely to be that the sight of the facility offends and the residents fear the behaviour of the people attracted to that type of amusement. If the amusement parks were put in an industrial area away from local residential areas, the local people may accept them, but then the park would not have the appeal to those intended to use it and the income would not be as great. Inevitably such parks are mainly private ventures out of which the local residents will get no benefit, and that makes the situation worse. As far as the noise emission is concerned, techniques have been developed to minimise the sound of all the machinery involved and in many cases the sound emission is well within the local ordinances set, and is not a problem even though some of the sources may be high above the ground and the sound theoretically able to travel several hundred metres. But the sounds of those enjoying the park facilities is a totally different matter. People screaming at the top of a roller-coaster or vertical drop would appear to be quite unacceptable to local residents whatever the sound level received. Certainly amusement parks draw people into the area, but in general the local people do not benefit in any way, and the parks are not wanted.

Colonial or hands-on museum parks, set up to give people an impression of how things were in the past, in general evoke an entirely different response. The (ancient) machinery noise may be tolerated at a much higher sound level than that of an amusement park and the element of fear about the patrons’ behaviour on leaving the park appears to be minimal. Such parks appear to be readily acceptable without problem to all but a very few people.
Outdoor Ball Games

Arguably more people attend outdoor ball games than all other recreational activities put together. Football stadiums (or stadia) may attract tens of thousands of spectators, all of whom are happy to shout encouragement to their team of choice. The games may be in an open field, or in a purpose-built stadium, and the noise emission from the crowd may be measured in megawatts. Many of those attending may use rattles, gongs and horns to show their appreciation of the play, and some of these devices (from measurements) can produce peak levels approaching 150 dB at one metre – quite enough to damage the hearing and other biosystems of nearby spectators. Territorial authorities in charge of noise control are powerless to control such activities – though it would appear the majority believe no control is necessary if people are enjoying themselves and not physically hurting others. The designers of a new stadium in a new area, face many difficulties. There be strong opposition from local residents who are happy to go to such a venue each week “but not in my back garden”, and there is little data on the noise generation of such places and how the sound propagates to surrounding areas from the (undeterminable) microclimate formed around such venues.

Other Outdoor Spectator Sports

A recurring problem that appears widespread, is annoyance due to public address systems that inevitably are used at events such as gymkhanas, horse and dog racing, and athletics. The sport itself may generate little or no noise, and almost the entire noise emission may be from the public address system. In most cases this can be corrected if the knowledge is there locally, and the territorial authority is willing to act. Most territorial authority officers, however, are far too busy with more important, sometimes life-threatening, matters on their minds, and as this sort of noise generally is only irritating, rather than injurious to health, little if anything is done about it. Local people have to be prepared to accept the situation, or move away.

Shooting Ranges

Of all sports, that of shooting arguably is the hardest for which to set meaningful noise limits, even though few people would argue the necessity so to do. As the sounds are impulsive, it would seem logical to set limits based on measurements of peak level. Unfortunately not only are $L_{\text{peak}}$ measurements very difficult to take with any accuracy, but using this metric to set limits acceptable to both local unwilling recipients of the noise and people using the shooting range, has met with little success. Simply minimising the sound levels received by means of barriers and screens, usually is not enough. The repetition of the sounds must also be taken into account and rarely is this done. One method under trial is that of limiting this type of sound exposure received by local residents to one quarter that of all other sources. A penalty of 5 dB for the impulsive nature of the sound is also applied, and the use of the range limited to daytime hours only. So, for example, if the most exposed local resident receives a sound exposure level of 70 dBA per shot on average (0.0040 pascal-squared-seconds) and the local noise ordinance for the area is a time average level of 55 dBA for the daytime 07:00 to 19:00 (with a 5 dB penalty for impulsiveness, this is a daily sound exposure of 1.7278 pascal-squared-seconds), the shooting range would be permitted $0.25 \times 1.7278 / 0.0040$ or 108 shots...
per day. Alternatively, they could be limited to 650 in any one week or 2800 in any one month, certain days excluded. As this is a fairly new concept under trial, data on its success rate has yet to be received. An early observation is that using this system there may not be the need for a 5 dB penalty.

**In General**

The main issue in the control of recreational noise appears not to be an unwillingness to accept that such noise can cause severe annoyance and may be injurious to the health of people and the natural environment, but that of insufficient resources to administer and police any regulation that may be set. The thought also of being faced with legal challenges countering any regulation that may be seen as an abuse of human rights is often sufficient to deter even the most dedicated of territorial authorities. Thus the problems are simply ignored.

**IN CONCLUSION**

Although more than 30 years have passed since the first occupational noise legislation was enacted and a control put on the amount of noise to which one may be exposed in industry, there has been little further progress to protect individuals from noise induced hearing loss. There is little or no control on the noise produced by leisure activities unless it causes annoyance in a residential area where local ordinances may apply, and the source of the noise can be determined and the person or persons responsible named. It is realised by many authorities that nowadays a large proportion of all hearing loss is primarily caused or initiated by excessive sound from recreational activities. Unfortunately there seems to be little that can be done to alleviate the situation unless manufacturers of audio equipment and recreational vehicles, the media and education authorities all pull together to convince our young people that noise does not mean power and it is the quality of sound that should be paramount in their thoughts, not the amount of noise they can make or endure.

**REFERENCES**

1. Personal communication from NZ Department of Labour, Division of Occupational Safety and Health November 2002
2. Figures given by CNN television March 2003.
3. Figures extrapolated from NZ Ministry of Health Statistics.