THE CONTROL OF MOTOR SPORT NOISE.

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1.INTRODUCTION.

The Royal Automobile Club is authorised by the world governing body of Motor Sport to control the sport in the U.K. In 1979 the Club formed the R.A.C. Motor Sports Association Ltd (MSA) to assume full responsibility for the control of all types of event within the jurisdiction of the R.A.C. Part of the responsibility of the MSA is to control the Technical specification of competing vehicles and this includes setting maximum noise levels for various types of motor sport event.

This paper will examine the current regulations applied to vehicles in motor sport, the systems used to enforce these regulations and the research being carried out to improve event management in the future.

2.THE NOISE REGULATIONS.

Noise regulations have been in effect since the MSA was formed and have been upgraded continuously from that date. The 1992 Regulations lay down test procedures and maximum noise levels. (Figure.1.)

The test procedures and noise levels are based on UK and EEC standards but for practical reasons use static measurements. As the regulations require all vehicles to be tested, it would be impossible to apply the full moving test method to over 200 entrants in one motor sport event.

During 1992, the maximum permitted levels at all U.K. racing circuits reduced by 5dB(A) and the noise regulations were applied to some International classes for the first time. By 1993, the only unsilenced vehicles competing in the U.K. will be Formula 1 cars at the one Grand Prix of the year in this country and FIA Sports cars also at one event. During 1992 these unsilenced events took place at Silverstone and are unlikely to take place at any other UK circuit.

3. ENFORCEMENT.

While it is essential to have Noise regulations, the final result depends on how well these regulations are enforced. In this respect motor sport has the same problems as the rest of the community in ensuring that trained personnel are available to carry out noise tests and that the management structure is able to deal with exceedences.

These matters are under the direction of the Technical committee of the MSA who licence officials to carry out the scrutiny of all competing vehicles for technical eligibility, safety and noise. The MSA currently licence 20 trained Noise Inspectors in the U.K. to act as an auditing inspectorate and they have been in operation since 1984 Their role has been to co-ordinate all noise testing in their geographical area. This has proved to be very successful but,as demand for noise testing has increased and as more classes of vehicle are included in the regulations, further improvements in the structure are to be introduced

There are over 100 registered Noise test officials who carry out testing at events. These officials have not had formal training and are usually appointed by event organisers. During 1993. training courses will be held for all noise test officials and by 1st.Jan. 1994 these officials will be licensed environmental scrutineers reporting to the MSA Technical committee through established management channels within the normal scrutineering system. They will be appointed to each event by a Licensed Chief Scrutineer and this should ensure stricter control over noise testing throughout the U.K. This improvement in control will co-incide with new noise test regulations designed to reduce the noise levels of competing road vehicles in line with current and proposed EEC directives.

4 RESEARCH FOR FUTURE NOISE CONTROL.

Source level control and strict enforcement can not completely solve the problems associated with motor sport noise. The pressure to reduce noise exposure increases with new environmental legislation and the noise at work regulations. The MSA has established a research programme to gather data designed to assist in improved noise control from static venues. This programme will examine the following:

1. Source noise levels of different classes of competing vehicles.
2. Propagation of noise from different types of circuit.
3. Circuit design to reduce noise impact.
4. Location and design of trackside barriers.
5. Event management to reduce daily noise impact.

CONTROL OF MOTOR SPORT NOISE.

Some initial investigations have been carried out and the results can be summarised as follows:

VEHICLE CLASSES.

Source noise levels vary considerably between different types of competing vehicles. Trackside testing at 10m. shows variations as follows.

	dB(A)Leq 30 mins.	Max.
Road Saloon cars.	73	96
British Touring Car Championship.	79	100
Formula 3	90	109
Formula 1 (Unsilenced)	108	124
Long Circuit Gear Box Karts.	97	114

Examples of some measured levels are illustrated in Figures.2 and 3.

NOISE PROPAGATION.

This can also vary considerably depending on the length and layout of the circuit. A small Kart racing track can produce continuous noise levels affecting a specific location compared to a long international circuit which can have relative quiet periods between vehicle by-pass. The effect on the daily Leq. levels from each circuit can vary considerably and are not directly related to the individual source noise levels.

DESIGN AND BARRIERS.

Noise from circuits varies with the position of the vehicle on the circuit and with the direction of travel. Higher levels are experienced when the vehicle is under acceleration and moving away from the receiver. This effect is not apparent when there are many vehicles spread around the circuit and the noise can become a virtual point source at some distance from a small track

Figure 4 illustrates the variation in noise levels of one test kart during one lap of a small circuit at 20m.and at 500m. The variation in levels at 20m. was as much as 40dB(A) between the 7 sections of the track. This was due to distance from the microphone and the track configuration. The variation in levels at 500m. have only a slight distance effect and the variation of up to 10dB(A) was caused by track characteristics.The 500m. variation was affected by high background levels from gusting wind. The highest noise levels from specific areas indicate where barrier control may be most effective.

EVENT MANAGEMENT.

When more research data is available, the information will enable track operators to assess the impact of different types of vehicles. This will allow events to be planned to ensure that the daily noise mix and event timing is sympathetic to local requirements.

5.CONCLUSIONS.

Control of noise is important to the future of motor sport and the RACMSA is playing an active part in ensuring that source levels are reduced and properly enforced. The research programme should provide sufficient information to ensure that Motor Sport events and venues should be able to continue to operate successfully with acceptable levels of environmental noise intrusion.

CONTROL OF MOTOR SPORT NOISE.

FIGURE 1.

RACMSA REGULATIONS 1992.
EXTRACTS FROM NOISE REGULATIONS.

The noise regulations apply to all competing vehicles. The following are subject to waivers when competing in FISA Championship events only.

Formula 1, Formula 3000, Formula 3. FIA Sports Cars (Group C)

The following table gives maximum permitted levels at alternative distances.
Noise measured in dB(A). Minimum Meter requirements. Type 1 or 2 IEC651. Range 70-120dB(A) Fast/Slow time constants. Maximum Hold recommended.

Section	0.5m	2.0m	8.0m	16m	Type of event.
A	115	103	91	85	CAR RACE RALLYX @ 3/4 max r.p.m.
A*	110	98	86	80	CAR RACE RALLYX @ 3/4 max r.p.m.
B	113	101	89	83	HILLCLIMB SPRINT @2/3 max r.p.m.
C	108	96	84	78	AUTOX AUTOTEST TRIALS STAGE RALLY CCV @ 5,000 r.p.m.
D	102	90	78	72	ROAD RALLY @ 5,000 r.p.m.
KARTS.	102				UK KARTS @ 7,100/8,100 r.p.m. Depending on stroke.

* NB The lower levels for Section A apply from 1/3/92.
Special regulations will also apply for British F3000(F2) and F3.

All measurements at 0.5m must be made with the microphone at exhaust outlet level at an angle of 45 degrees with the exhaust axis.

All measurements at 2m or over should be made at 1.2m. above ground and at 90 degrees to the vehicle axis.

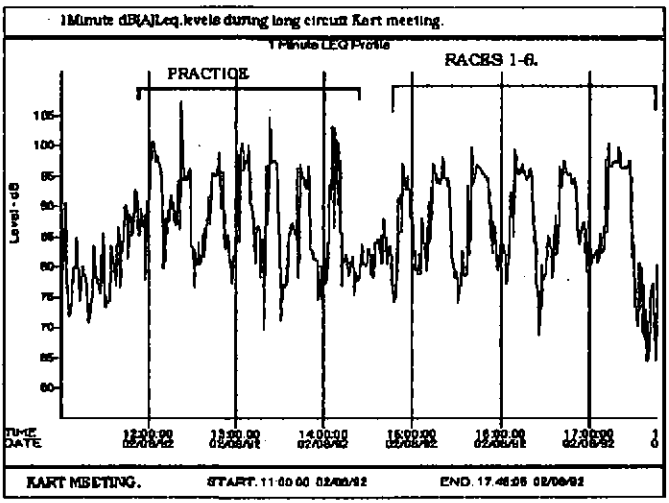
With measurements at 2.0m to 8.0m there must ba a minimum of 20m. radius open flat space around the vehicle.

Generally it is impractical to take readings at over 8m. as the background noise creates problems with accurate and steady readings.

FIGURE 2. Noise Levels at 10m. from track. 1Min.dB(A)Leq.levels.

NOISE FROM LONG CIRCUIT GEAR BOX KARTS.

1 Minute dB(A)Leq. Levels.
12.00-14.15hrs. Practice sessions for different classes.
14.45-17.30hrs. 6 Races for different classes.



CONTROL OF MOTOR SPORT NOISE.

FIGURE 3. Noise Levels at 10m. from track. 1Min.dB(A)Leq.levels.

CAR RACE MEETING.
1 Minute dB(A)Leq. levels.

1. Formula 1 Practice.
2. Vauxhall Lotus Euroseries (Racing Cars)
3 Road Saloon Cars.
4. Formula 1.Grand Prix.(Unsilenced).
5. Touring Cars.

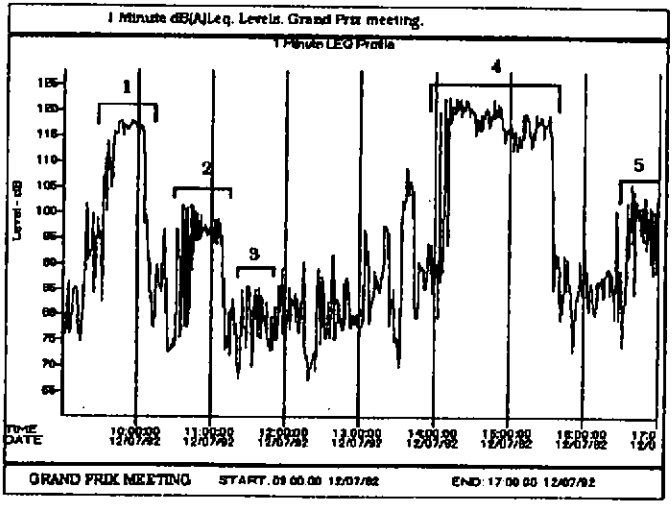


FIGURE 4.

Noise levels at 20m and 500m.from a small Kart circuit. dB(A)Levels of 1 lap by test Kart with 7 track sections identified.

500m. levels affected by high gusting wind. Background higher than normal.