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THE CONTROL OF MOTOR SPORT NOISE.

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INTRODUCTION.

The Royal Automobile Club is authorised by the world governing body of Motor Sport (F.I.A.) to control the sport in the U.K. In 1979 the Club formed the R.A.C. Motor Sports Association Ltd (M.S.A.) to assume full responsibility for the control of all types of event within the jurisdiction of the R.A.C. These events include the following:

Autocross, Autotests, Cross Country and 4WD., Drag Racing, Hill Climbs, Kart Racing, Races, Rallies, Rallycross, Sprints and Trials.

The M.S.A. controls the Technical specification of competing vehicles and the authorisation of events. Technical elegibility is the responsibility of the Technical commission of the M.S.A. and this includes setting maximum noise levels for competing vehicles in each type of event.

THE REGULATIONS.

Noise regulations have been in effect since the M.S.A. was formed in 1979 and have been upgraded continuously from that date. The 1986 Regulations lay down the following test procedures and maximum levels.

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R.A.C.M.S.A. 1986 Noise Regulations.

17. Silencing (see diagram below)
17.1. In Circuit Races ALL VEHICLES must be SILENCED to the Section 'A' level unless the requirement is specifically waived for that class of racing. See list in OG 1.13.
17.2. IN ALL EVENTS mandatory silencing may be specified.
(a) if Technical Regulations specify a MANDATORY SILENCER it must be used irrespective of the EXHAUST NOISE generated without it.
(b) Circuit owners/organisers may impose special restrictions in SR's.
(c) Silencing will be subject to environmental requirements and must not be considered as covered by Technical Stability Rules.

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

All measurements at 2.0m or over should be made with the microphone 1.2m above the ground and at 90° with the vehicle axis.

With distances from 2.0m to 8.0m it is necessary that there be a minimum of 20.0m radius open flat space around the vehicle.

Where possible measurements should be taken as close as possible to the vehicle, at the defined distances, to avoid background noise.

Generally it is impractical to take measurements over 8.0m as the background noises create problems with accurate and steady readings.

Measurements for Section 'A' Racing should be made with the engine running at three quarters maximum RPM.

Measurements for Sections 'B' and 'C' should be taken with the engine running at 5000 RPM.

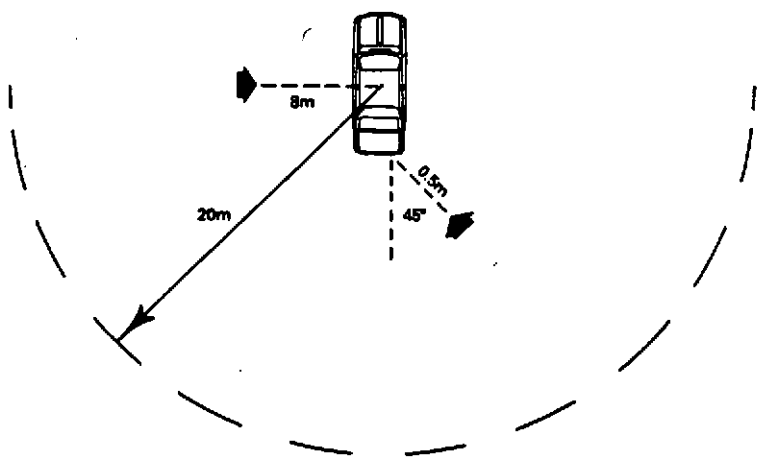
Pre-1939 cars in Sections 'B' and 'C' should run engines at two thirds maximum RPM.

The 8m and 16m locations of the microphone, for practical purposes, can be considered to be 7m and 15m from saloon car bodywork. This measurement can be made from either side of the car. The highest reading registered being the one needing to comply with the MAXIMUM NOISE requirements.

17.3. NOISE METER STANDARDS (minimum requirements).
Type 1 or 2 Instrument.
International Standard IEC 651.
British Standard BS 5969.
Range 70–120 dB(A)
Weighting 'A'.
Time Constants Fast/Slow.
Maximum 'Hold' recommended.

The following table gives alternative distance readings. (Noise measured in dB(A).)

	0.5m	2.0m	8.0m	16.0m	
Section 'A'	115	103	91	85	CAR RACE, HILL CLIMB & SPRINT MAXIMUM
Section 'B'	108	96	84	78	AUTOCROSS, AUTOTEST, RALLYCROSS, STAGE RALLY, TRIALS MAXIMUM
Section 'C'	102	90	78	72	ROAD RALLY MAXIMUM



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The levels were set using the basic maximum of 84dB(A) laid down in the Construction and Use Regulations and the test procedure was based on BS 3425 1966, also quoted in the C.and U. Regs. as the preferred method. The method varies from the B.S by using a static test and giving alternative measurement distances instead of the moving test at 7.5m. only. The 8m. distance in the M.S.A. test is taken from the vehicle centre line and testing is carried out at 7m. distance from the bodywork of a saloon car and is comparable to the 7.5m. centre line distance quoted in B.S.3425. The maximum levels at other distances were calculated using the formula for hemi-spherical distance reduction. i.e. 6dB reduction with doubling of distance.

It should be noted that the maximum permitted level for "Road Rally" vehicles is 6dB(A) lower than the permitted legal maximum. This is because vehicles competing in these events have competitive sections on public roads as distinct from "Stage Rally" vehicles where the competitive sections are on private land. The levels for vehicles competing in events where there is no use of public roads is 7dB(A) higher than the legal road maximum.

All tests must be carried out using approved sound level meters conforming to B.S. 5696 / IEC 651 Type 1 or 2.

For all events using public roads for any part of the event, the organisers must carry out a Noise test on all vehicles prior to the start and also at least one further test on route. Noise Officials can prohibit cars from starting and Noise Judges on route can penalise cars for excessive noise.

For all events on private land, the organisers are responsible for ensuring that vehicles are tested in accordance with the procedure for that type of event and do not exceed the maximum levels laid down. If necessary, event organisers can impose stricter levels, if this is intimated in advance to the competitors.

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CONTROL.

Noise control in Motor sport is no different from any other field. It is essential to have Regulations, but the final result depends on whether the Regulations are workable and how well they are applied. The organisers of events are responsible for ensuring that the M.S.A. Regulations are complied with.

Up to 1982, there were no standards in the M.S.A. Regs. for sound level meters and the individual event organisers, responsible for arranging for equipment and test officials, had little experience in noise measurement.This meant that inexperienced operators were trying to carry out noise tests with very cheap equipment and inevitably, there was great inconsistency in the results. In order to try to improve this, the M.S.A. appointed some Noise Officials who, although responsible persons, still had no training and dubious equipment. The result of this was that although noise testing was being carried out, very few people were being penalised as the event officials had no confidence in the test results.

In 1984, the M.S.A. decided to appoint Noise Inspectors, equip them with good sound level meters and lay down a minimum requirement for all noise test equipment. These inspectors were given training by the meter manufacturers (C.E.L.) and their role was to co-ordinate all noise testing activity in their geographical area. The position in 1986 is that there are 17 Noise Inspectors approved and licensed annually by the M.S.A. and over 70 Noise officials. The Inspectors control and supervise the area Officials and report directly to the Technical Commission of the M.S.A.

Since the end of 1984, results have been improving and mandatory silencing is being introduced to more categories of off road events. It is difficult to control all sections of the Sport at once and where special efforts have been made in any one category, the results have been impressive.

Special Stage Rallying attracts more public attention than any other type of event using the Public Roads and particular attention was paid to improving noise levels on this type of event. Figures for Stage Rallies in Scotland show the following improvements.

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Event Date	Vehicles Tested	Fail on 1st Test	%
1984			
Aug.	144	54	37.
1985.			
Feb.	115	25	22
Apr.	93	10	11
May.	88	11	12
Jun.	94.	14	15
Aug.	117.	12	10
Sep.	72.	8	11
Oct.	119	10	8
Total	698.	90	13.
1986.			
Feb.	124.	10	8
Apr.	146.	11	7.
May.	110.	8	7.
June.	96.	4	4.
Total.	476.	33	7.

All the above tests were carried out by myself or under my direct supervision and the results can, therefore, be accurately compared.

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NOISE PROBLEMS.

The problems associated with Motor sport noise can be divided into two main categories:

Noise from road events. (Rallies etc.)
Noise from individual venues. (Race meetings,Hill Climbs etc.)

The nature of the noise complaints, the complaint procedure and the possible solutions vary between these two categories.

1) Road Events.
Complaints are usually from householders near the route of the event and are mainly about disturbance at night. As the cause is increased noise due to extra traffic on the public highway, the initial complaint is usually to the Police.

All events using public roads require route authorisation from the M.S.A. and the local police and this is a Statutory requirement of the Motor Vehicles (Competion and Trials) Regulations 1969. There is, therefore, a mechanism for controlling the passage of competing cars through areas where noise is likely to be a problem. In extreme cases, the use of certain roads is prohibited and in other cases "Quiet Zones" are used where competitors are observed and excluded from the event if found to be making too much noise. Considerable advance P.R. work is undertaken by organisers of road events in advance of authorisation being granted and preventing possible noise complaints is one of the objectives of this work.

The above controls, in conjunction with effective vehicle noise testing, provide a strong base for ensuring that noise complaints from road events are minimised. The mechanism exists for control and appears to be working well in many areas of the country. With proper communications between the event organisers, the Police, Local Authorities and M.S.A. Noise officials, it is perfectly possible to run Motor sport events on the Public Highway without causing a noise nuisance.

2) Venue events.
Here the problem is completely different. The complaints still arise mainly from householders, but in this case they complain about noise from a specific location and the complaint is referred to the local Environmental Health Dpt. The possible nuisance would then be dealt with in terms of the Control of Pollution Act, in the same way as any other entertainment or industrial noise source.

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The complaints usually refer to high maximum noise levels occuring during week-end daylight hours. As the source noise is variable depending on the type and number of vehicles competing in each event and as the number and type of event held at the venue may also vary, it is very difficult to assess degree of annoyance or nuisance. If you take into account the intermittant nature of the events, variations in receiver levels due to weather etc the problems of monitoring and control can be very difficult.

The control measures that can be taken by the operators of the venue are limited to reducing the noise break-out of the venue. This can be done by imposing noise limits on competing vehicles, improving the attenuation of the noise transmission path or managing events to reduce the exposure time of the highest source levels.

The current M.S.A. test procedure helps to limit vehicle noise levels, but becaause the static test is carried out at 3/4 max. r.p.m., it is not necessarily comparable with the noise produced by that vehicle at maximum r.p.m. under load. During competitive events, all the vehicles reach maximum r.p.m. under load at various parts of the course and it is these maximum noise levels that produce most of the complaints. Comparison testing has shown that some vehicles passing the static test at 3/4 r.p.m. produce more noise at maximum revs. than other vehicles which fail the static test.

At one particular venue where the noise regulations have been applied for the first time this year, the overall Leq. levels at a complainant's house have reduced by 6dB(A), but the maximum levels measured by some types of vehicle have only reduced by about 1dB(A). The regulations are being used, but the complainant still has a problem.

This means that the current regs. do not directly address the problem of noise nuisance for venues, although they have had an effect in reducing overall levels. Certain types of racing cars are exempt from the silencing regulations and other classes show poor correlation between the tested levels and the noise that causes the complaints.

Venue operators are free to set their own noise limits, but the combination of the problem of the test method and the difficulties experienced in developing efficient silencers to meet these levels means that there has been only a small reduction in environmental noise levels.

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FUTURE DEVELOPMENTS.

While the M.S.A. have been very pleased with the progress achieved since the introduction of Noise Inspectors in 1984, they realise that further improvements are required. During this year, research is being carried out to try to find ways of improving the test procedure for off-road events. Changing regulations can take several years and there is no point in change until something better has been devised.

In 1987 it will be mandatory for all vehicles competing in Hill Climbs to be silenced according to the regulations. At present, the decision on silencing for this type of event rests solely with the event organisers or the owner of the venue. Some Hill Climb venues have been having problems with noise complaints and have tried to impose mandatory silencing at their venue. This has resulted in some difficulty with competitors who do not understand the need to alter their very specialised vehicles to attend certain meetings. The result has caused a lot of problems for organisers and even loss of entries at some events. As a result of this, the M.S.A. decided to include Hill Climbs in the list of events where silencing is mandatory. During this season, prior to the Regulation taking effect, a great deal of work has been done by competitors and event organisers to ensure that all vehicles will comply with the noise limits by next year.

The ultimate responsibility for noise control rests with event organisers and /or the owners of the venue. The M.S.A. can only provide the framework within which individual organisers work. By providing enough back up and co-ordinating the activity of the noise officials, the M.S.A. hopes to encourage event organisers to take every practicable step to ensure that motor sport can be enjoyed without causing annoyance due to noise.