BRITISH ACOUSTICAL SOCIETY: SPRING MEETING at Chelsea College London S.W.3. on Wednesday 25th April to Friday 27th April 1973

MUSICAL ACOUSTICS: SESSION A.

Paper No.

73MA3

ECHOES OF THE JUNGLE

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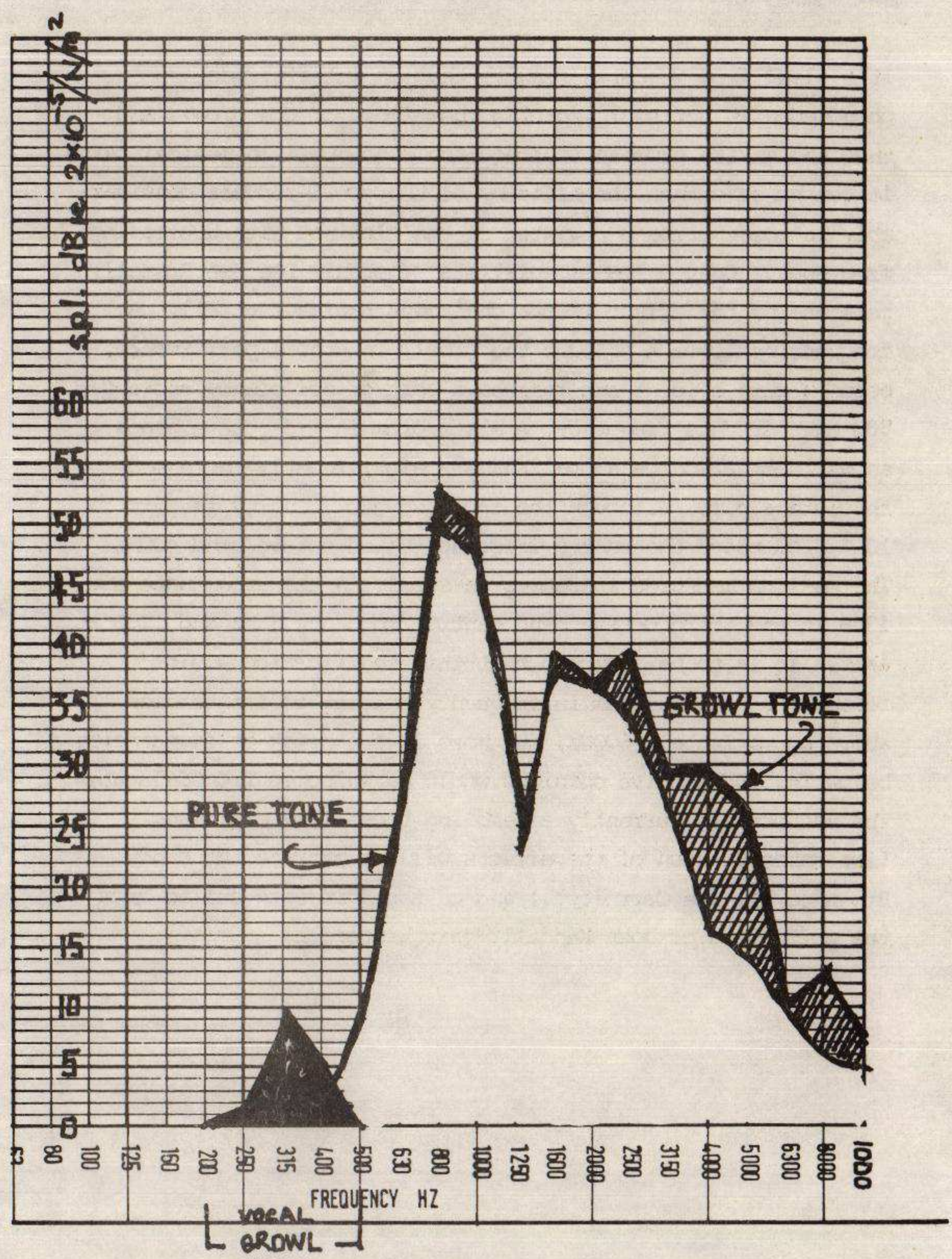
Growling effects on brass instruments have always been a vital part of a jazz musicians' repertoire. Some instrumentalists became known as specialists in this technique - Joe 'Tricky Sam' Nanton, Bubber Miley and later, Cootie Williams and Quentin Jackson of Duke Ellington's Band are examples, and exerpts from their performances are displayed on tape.

As these growl effects are invariably used in conjunction with a 'wah-wah' or plunger mute, both of which vary the attenuation of upper partials of the tone, it is difficult to separate the effects quantitatively from actual performances. It is, of course, possible to compare pure tone and growl tone in a free field. The authors have chosen to compare these sounds as played on a clarinet where, in a real performance, no acoustic filters in the form of mutes are used. (The clarinet mute is largely ineffective and seldom used in any circumstances because the preponderant sound power emanates from the tone holes rather than the bell).

The method used to make the clarinet and other reed instruments growl is to hum tunelessly through the instrument, the s.p.l. of the vocal hum being approximately 15dB average below that of the single reed/air column complex of the clarinet. The discrepancy is frequency concious dropping to approximately 5dB at frequencies below C = 256Hz and increasing to 20dB at frequencies above C = 1024Hz. The values must be approximate because of the dynamic range included by the performer while employing the growl. This range is very much more restricted than that in normal use as the growl indicates tension and demands f - ff. playing power, but can be averaged at 5-10dB maximum.

It's clear from measured results that an interference phenomenon is active in forming the timbre of the growl, and that the entire process is frequency concious. In musical terms it can be said that the efficacy of the growl reduces considerably in the chalumeau register of the clarinet with decreasing frequency. Only a few 'specialists' (notably Pee Wee Russell) make use of the effect in the chalumeau register at all. At frequencies above A = 440Hz the growl, in actual performance, becomes more evident and reaches a peak of efficiency above A = 880 Hz. At this frequency, a histogram in 1/3 octave bands, shows that harmonics above 2Khz are significantly increased in absolute s.p.l., although the isolated growl energy is zero re 10^{-5} N/M^2 above the centre frequency third octave band 400Hz. The maximum measured increases in s.p.l. in the growl note are 13dB in the third octave band centre frequency 5Khz and 12dB at 4Khz. It is to be expected that this modification would resemble a human scream in frequency content at frequencies above approximately 600Hz, and more like a croak at frequencies below it. Subjective opinions would be welcomed from delegates. The authors are currently assembling those from musicians. Live demonstration of the effects will be provided by Sandy Brown (c/t), Ian Carr (tpt.) and on taped inserts culled from the collection of John Kendall, jazz historian.



INTERFERENCE PHENOMENON ON PURE CLARINET TONE BY VOCAL METHOD

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The Lateral Oscillations of Railway Vehicles

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Summary

It is the purpose of this lecture to review developments in the theoretical and experimental aspects of the lateral dynamics of railway vehicles with special reference to high speeds. The application of these developments to the Advanced Passenger Train will be described and progress with the APT project reviewed.

Railway vehicles achieve guidance by use of coned wheels acting in conjunction with the forces applied at the wheel treads by the track. This form of guidance in effect involves feedback so that there is the possibility of dynamic instability. The oscillations that result from this instability are commonly referred to as hunting, and at high speeds hunting can lead to acceleration and stress levels which are unacceptable. Not only must stability be obtained, but adequate response characteristics in relation to economically feasible track geometries are required. It follows that in addition to the obvious function of supporting the weight of the vehicle, the suspension has the following functions:

(a) to control the tread forces which guide the vehicle, so that it follows the track with proper entry into curves and satisfactory negotiation of other track features;

(b) to stabilise the lateral motions of the vehicle so that hunting does not occur, any critical speed being removed from the operational speed range;

(c) to filter out the effects of imperfections in track geometry, so that the pay-load experiences a smooth ride and the dynamic stresses applied to both the vehicle and the track are minimised.

In the past an empirical approach has been necessary, but for high speed vehicles a more scientific and analytical approach is essential. In the lecture the basic concepts of a linear theory of the lateral dynamics of railway vehicles are discussed and these comprise:

(i) creep
(ii) wheel/rail kinematics
(iii) kinematic oscillation
(iv) influence of suspension characteristics
(v) curving
(vi) response to irregular track

These concepts are then used to differentiate between two different vehicle design philosophies; one based on the linear theory and one which is a rationalisation of past empirical practices.

The majority, if not all, of high speed railway vehicles now in existence fall into the latter category, whilst the former category is represented by the British Rail experimental vehicle HSFV-1, freight vehicle HSFV-5 and the APT.

The APT exploits the linear dynamical theory and it will be discussed how the concepts of this theory have influenced the design features of the train.

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