

Note 83



Exhaust resonant speed

In the '60s Jack Williams of AJS gave the following relation for the crank speed at which the engine's exhaust system would resonate (to improve breathing via overlap). He had found that it fitted accurately the case of his type 7R one-cylinder 350 cc motor-cycle racing unit (544).

$$\text{Resonant N} = \frac{1}{24} \times \left(\frac{\text{EOD}}{\text{LEX} + \text{LX}} \right) \times \text{A} \quad \text{RPM}$$

where EOD = Exhaust Valve Open Duration (crank degrees);

LEX = Exhaust Pipe Length (inches) from flange to the start of megaphone (racing motor-cycles), taken here to be start of final collector pipe;

LX = Exhaust length (inches), internal to cylinder head from back of valve to flange;

A = Speed of Sound in Exhaust Gases, given by Williams from research by Belilove in 1943 as 18,500 inches/sec.

The various DFV exhaust systems can be estimated from this relation as follows:
for each

EOD = 320° and LX = 2.8"

Date	<u>1967</u>	<u>1968</u>	<u>1971</u>	<u>1975</u>
Type	4-2-1	4-1	4-1	4-1
LEX	15" + 15"	30.5"	25.5"	23.5"
Resonant N				
RPM	7520	7407	8716	9379