

## Note 71



### Low pressure crankshafts

#### 'Standard' crankshaft drillings

Where the lubrication of a crankshaft's big-end bearings begins with oil fed via the main journal bearings through radial drillings into longitudinally-drilled centre-line passages - the 'standard' arrangement\* - the centrifugal pressure to be overcome at the main bearing surface is given by:-

$$OP = \frac{1.15 \cdot N^2 \cdot MJ^2}{10^7} \text{ psi} \quad (\text{ref 52, p.197})$$

where **N** = RPM and MJ = Main Journal Bearing diameter (in inches), for oil of Specific Gravity 0.9.

For the 1977 Ford Cosworth DFV at 10,500 RPM and MJ = 2 3/8", OP = 72 psi. With the stated oil pressure of the 'standard' crank being 85 psi, this means the external oilways pressure drop was 13 psi.

#### 'Low pressure' crankshaft drillings

Where the internal longitudinal passages are drilled off-centre at a radius RO, so as to shorten the radial drillings and reduce the 'centrifugal fling', the oil pressure required is:-

$$ROP = \frac{1.15 \cdot N^2 \cdot MJ^2}{10^7} \cdot \left[ 1 - \frac{(RO)^2}{(MJ/2)^2} \right] \text{ psi}$$

This design was introduced into the 1977 Mg-alloy crankcase version of the DFV as noted in the main text and is stated to have reduced the necessary oil pressure to 60 psi. Assuming the external drop was 13 psi as before, then the crank requirement was 47 psi. This corresponds to:-

$$\frac{(RO)^2}{(MJ/2)^2} = 0.6 \quad RO = 0.71"$$

With the overlap of main journals and crankpins being 0.88" = ((2.375" + 1.9375" - 2.550")/2), from an inner radius of 0.3" = ((2.550" - 1.9375")/2), the longitudinal drilling at 0.71" radius would penetrate directly into the crank pin to supply the inner end of the oil exit hole.

These details may not be correct for the particular DFV design of 'low pressure crankshaft' of 1977, but they indicate the powerful effect of the off-centre drilling.

Off-centre crank drilling was used first in the 1961 BRM V8 1.5L, according to (894), which includes a drawing of that crankshaft.

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\*There is another method, via double-end-feed into the crankshaft, eg in the Rolls-Royce Merlin 100 series aero engine of 1944, but this is not practical for most auto installations with a clutch on one end of the crankshaft.