



The Cosworth DFY and F3000 engines

During 1982 KD was seeking a way to extract more power from 3L NA because he considered that the DFV had reached the most possible with its valve area (850) (although Judd claimed more in 1983, see main text). Variants of the DFV had been built for sports car racing with B increased from 85.674 to 90 mm (type DFL) and this bore was chosen for a Grand Prix redesign with S = 58.8 mm, B/S = 1.531 (an increase of nearly 16% over the original DFV). An increase of IVD from 1.36" (34.5 mm) to 1.42" (36.1 mm) was then possible (IVA +9.0%) (59). Difficulties were experienced immediately with these larger valves - KD said that the cams which produced high RPM did not give the power improvement required and those that gave the power broke valve springs (851). This was to be expected as B/S was increased. The final DFY specification had IVL = 0.432" (11.0 mm) (59), IOD \wedge 320° and obtained NP = 11,000 RPM (59) so that MVSP = 4.5 m/s. The 1983 DFV with DA12 cams (IVL = 0.46"), presumably the same IOD, had NP = 11,200 RPM, reaching MVSP = 4.9 m/s.

The short-stroke DFY engine was actually produced in two stages. For early 1983 delivery, a new head retained VIA = 32° over the bigger bore. A batch of 14 units was supplied (McLaren took 6, Ligier 3, Lotus 2 and all these were raced; Williams took 3 but did not race them, preferring their Judd-developed DFVs it seems, according to the engine numbers recorded meticulously in (877) (note that these interim units were labelled by their maker as 'DFY'). The much more extensively redesigned (by Mario Illien) (419) second series DFY appeared in May 1983, 10 units having been bought by Tyrrell at £34,000 each (£70,800 at 2002 level) (544). The VIA was reduced to 22.5° and there was a 27 kg (17%) weight saving from the latest DFV (to 132 kg) - 20 kg saving had been achieved by the first series, partly a consequence of the higher B/S ratio and partly that the crankshaft was altered, as had been done on the DFX, to have only four counter-balances. Another interesting DFX feature used in the DFY was con rod section altered from the conventional I to H. The DFX may have shown that off-centre gas loads on the piston needed this 90° shift of major axis to better resist tilting forces (62, 351, 847); or it may have been that the original US Los Angeles modifiers of the DFV to short-stroke Indy capacity had simply used the local Carillo company, who favoured the H-section anyway (see [Note 88B](#)).

As the Ford oval logo appeared on the cam covers for the first time, instead of just 'Ford', it is presumed that they had paid for the development.

Powers claimed for the DFY, both series, at 520 HP were only 10 HP up on the 1983 DFV, although (877) states that the second series had an extra 25 HP between 6500 and 7000 RPM. Nevertheless, the result of all this work must have been a disappointment. The definitive DFY won only one GP, in 1983 on the slow Detroit street circuit, for Tyrrell.

The interim DFY disappeared from GP races during the 1983 season as TC engines were adopted more widely. Tyrrell ran his DFYs through to the middle of 1985, when Renault 1.5L TC units became available. His experience of these engines is interesting as it emerged when he defended himself in 1984 against a charge of breaching the rules in the Detroit GP that year (where second place was obtained and the car post-race inspected) by using water injection 'plus an illegal fuel' into the DFY intakes. Tyrrell denied this and stated the water-only was simply to improve reliability (by evaporative cooling). He quoted 17 valve-or-piston-related engine failures in 1983 (a mixture of 14 DFV and 16 second series DFY entries, total 30) and none in 1984 up to 2/3 season, using 13 litres of water per race to complement the regulation 220 litres of petrol (544). There was no *direct* power gain, of course, but the possibility of using higher RPM for longer with adequate reliability. The team, nevertheless, were banned from further races and all places and points deducted, because

'infinitesimal' traces of hydrocarbon were found in the water tank.* Tyrrell's evidence does illustrate the knife-edge reliability of even the redesigned Cosworth V8 when giving 500-plus HP ((896) quotes 542 HP for 1984 DFY).

As the door closed on the Cosworth DFV in Grand Prix racing so the FI Constructors' Association managed to open another for the redundant engine stock - to use them in 1985 and onwards in a new 'stepping stone' formula to replace F2: F3000. Partly to keep costs down but also to limit the power for 'apprentice FI drivers' moving to F3000 from low-power formulae, the maximum RPM were restricted to 9000 - the original DFV limit - by an electronic governor which cut the ignition for one second if exceeded. Needless to say Cosworth and the rebuilders very soon set about optimising valve timing and porting for higher BMEP at the lower RPM. In later years rival F3000 engines appeared and more development was done on the Cosworth engine, including the use of DFY B and S. The 'original-as-developed' DFV finally began to be phased out of second line racing in 1993, when Cosworth produced a completely new and smaller engine (type AC; see "[Significant Other](#)" Fig. SO21A), specifically for F3000, weighing 12 kg (8.5%) less (130 kg v 142) (65). The DFV still appears in Historic racing, as do many of the other engines in this review.

* Under 1/1000% of the 13L tank, probably because it was filled from the Detroit River. In any case, the 220L petrol tank was only 80% full for that slow race (896).

However, the water-injection system was also a ploy to run an under-minimum 540 kg car. When the tank was topped in a late race stop, 64 kg of lead shot was loaded with the water via a special device! The FISA ruled also that this was illegal ballast because 'unfixed', which Tyrrell disputed because tools were needed to remove the tank (896).