F1-CUP COMPARISON

Line	Parameter	F1 Engine				Cup engine			
	General Data								
1	Bore	3.858	in	98.00	mm	4.185	in	106.30	mm
2	Stroke	1.566	in	39.77	mm	3.25	in	82.55	mm
3	Displacement	146.457	cu in	2.400	ltr	357.65	cu in	5.861	ltr
4	Rod Length	4.016	in	102.00	mm	6.200	in	157.48	mm
5	Rod/Stroke	2.56				1.91			
6	Bore/Stroke	2.46				1.29			
7	PPV position	79.5°	b/a tdc			76.5°	b/a tdc		
8	Power / Displacement	5.16	bhp/ci	314.6	bhp/ltr	2.31	bhp/ci	140.8	bhp/ltr
9	EPF	0.536				0.513			
10	**Peak Torque**	17,000	rpm			7,500	rpm		
11	Torque	214	lb-ft	290	nm	520	lb-ft	706	nm
12	Power	692	hp	516	kw	743	hp	554	kw
13	BMEP	220.07	psi	15.18	bar	219.26	psi	15.12	bar
14	Mean Piston Speed	4437	ft/min	22.5	m/sec	4063	ft/min	20.6	m/sec
15	BMEP x MPS			342				312	
16	Peak Piston Speed	7097	ft/min	36.1	m/sec	6585	ft/min	33.5	m/sec
17	Peak Piston Accel (+)	7675	g			3275	g		
18	Peak Piston Accel (-)	-5170	g			-1917	g		
19	**Peak Power**	19,250	rpm			9,000	rpm		
20	Torque	206.0	lb-ft	279	nm	481.4	lb-ft	653	nm
21	Power	755	hp	563	kw	825	hp	615	kw
22	BMEP	212.10	psi	14.63	bar	202.99	psi	14.00	bar
23	Mean Piston Speed	5024	ft/min	25.5	m/sec	4875	ft/min	24.8	m/sec
24	BMEP x MPS			373				347	
25	Peak Piston Speed	8036	ft/min	40.8	m/sec	8780	ft/min	44.6	m/sec
26	Peak Piston Accel (+)	9841	g			4715	g		
27	Peak Piston Accel (-)	-6629	g			-2761	g		
28	**Redline**	20,000	rpm			10,000	rpm		
29	Mean Piston Speed	5219	ft/min	26.5	m/sec	5417	ft/min	27.5	m/sec
30	Peak Piston Speed	8349	ft/min	42.4	m/sec	8780	ft/min	44.6	m/sec
31	Peak Piston Accel (+)	10622	g			5821	g		
32	Peak Piston Accel (-)	-7155	g	@ 180°	b/a tdc	-3408	g	@ 163°	b/a tdc
	Weights								
33	Piston Weight	0.48	lb	220	gm	0.88	lb	400	gm
34	Ring Package	0.02	lb	9	gm	0.04	lb	20	gm
35	Pin & Circlips	0.15	lb	66	gm	0.18	lb	80	gm
36	Rod Small End	0.19	lb	85	gm	0.31	lb	140	gm
37	Reciprocating Weight	0.84	lb	380	gm	1.41	lb	640	gm
38	Rod Big End	0.44	lb	200	gm	0.85	lb	385	gm
39	Bearing Inserts	0.06	lb	26	gm	0.09	lb	39	gm
40	Rotating Weight	0.50	lb	226	gm	0.93	lb	424	gm
	Loads								
41	Pin Eye Load	6894	lb	3133	kg	6403	lb	2911	kg
42	Beam Tensile Load	8880	lb	4036	kg	8196	lb	3725	kg
43	Crankpin Load	13299	lb	6045	kg	12500	lb	5682	kg
44	Max rod T-stress at RL	20699	psi			27411	psi		

To determine the EPF (line 9), divide Peak Power by VPN, giving an EPF of 755 / 1409 = **0.536** for the Formula One engine, and an EPF of 825 / 1609 = **0.513** for the Cup engine, a difference of only 4.3%.

Again, remember the limitations imposed on the Cup engine. Some of the most severe are the pushrod / rocker arm valvetrain, two-valves-per cylinder, and the single carburettor requirements.

Less obvious, but very significant are limitations [illegible] velocity (inches / degree) that can be attained. However, since the real goal is to achieve velocity at the valve, the Cup engine people have neatly sidestepped that limitation with large base-circle cam lobes, immense rocker ratios, and very stiff pushrods and rocker arms.

Considering the restrictions, the small 4.3% difference in EPF