

Note 139 NURBURGRING Grand Prix cars Fastest Laps

The Nurburgring, built in 1927, hosted Grand Prix races from 1931 to 1976 on its Northern loop (the Nordschleife) which had some 150 corners over 22.81 km (14.173 miles) initially*. It was a notoriously difficult circuit which had few escapes for drivers who misjudged corner speed and poor access for removal of failed or wrecked cars or for ambulances. It was discarded for Grands Prix after a near-fatal accident in 1976 to the reigning Drivers' Champion, Nikki Lauda (who had sought to have the race cancelled on safety issues and who was the only man to have set previously a sub-7 minute time). It was not entirely coincidental that the lap time did not chime well with TV entertainment.

*After a chicane was introduced before the Start/Finish straight in 1967 the lap was 14.189 miles. It was said to have added 10 seconds to the lap time.

From 1935, when Tazio Nuvolari on a somewhat-modernised 1932 Alfa Romeo defeated nine *Neu Ordnung* German cars on their home circuit, the Nurburgring has been understood to be a course where driving skill trumped Power/Weight ratio in producing lap speed. This Note 139 backs up that received wisdom with detailed figures and adds a numerical measure of car *agility* as an important factor in lap speed.



Plan of the circuit (to 1982)



Schloss Nurburg

DASO1020 Temple Press Solid black track = Nordschleife

Lap speed v. Date Fig. 1

A comprehensive list of Nordschleife lap speeds is provided by:-

https://en.wikipedia.org/wiki/List of Nordschleife lap times (racing) (DASO1253).

(This list omits:-(1) a 1955 Mercedes test; (2) Jim Clark's Pole for the 1963 German GP.)

The markers on the charts are coloured according to the racing formula of the time, described below (only the main limits are mentioned).

- Purple:- Formule Libre;
- Yellow with black border:- Maximum 750 kg car weight;
- Green:- 3 Litres Pressure-Charged (PC)/4.5 Litres Naturally Aspirated (NA);
- Red Cross:- 1.5 litres PC/4.5 Litres NA;

PC up to that time was obtained by Mechanical Supercharging (MSC).

- Red Plus:_ 2 Litres NA Formula Two treated as "honorary Grand prix" because of shortage of previous Formula 1 cars:-
- Orange:- 2.5 Litres NA;
- Red:- 1.5 Litres NA;
- Blue:- 3 litres NA.



The data for this chart is given in Appendix A on PP.6-7.

The 1971 re-surfacing removed notorious bumps from the circuit, some of which had caused all four wheels to leave the track!

The historic 1935 Grand Prix had 5 Mercedes-Benz of mixed W25 sub-types plus 4 Auto Union Btypes opposing 3 Scuderia Ferrari Alfa Romeos. The Italian cars were up-dated with 3.2 litre engines and Dubonnet independent front suspensions, but still with rigid rear axles. Starting on a wet track which dried by $1/3^{rd}$ race, and with the 2 supporting Alfas soon out with mechanical troubles, Nuvolari led at 1/2 distance. Refuelling problems then set him well back, but he was on Brauchitsch's tail with 4 miles to go. A "self-inflicted" tyre burst then let Nuvolari through to win. The Auto Unions had a 44% advantage in Power/Lightly-loaded Weight (PP/W) over the Alfa, the Mercs had 52% and it did not avail them against a "Super-driver" on the Nurburgring.

A statistic which supports the 1935 anecdote that power was not decisive at the Nurburgring is that over the life of the 750 kg formula the fastest lap speed rose only about 10% while PP/W rose 76%.

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Moving on to the 1938 formula, Hermann Lang on Mercedes-Benz W154s with M163 2-stage supercharged engines and PP/W of 23.08 HP/Cwt left the pre-WW2 official Lap Record (i.e. set during a race, actually the 1939 Eifelrennen) at 86.16 MPH. He also set the all-time fastest lap as Pole at the German GP at 87.5. Laurence Pomeroy (DASO 4) attributes the slightly higher lap speed, despite a reduction of 26% in PP/W from the preceding W125, to much-better "Fan-cooled" brakes and a lower Centre of Gravity. These were two of the "Time-Related" changes which must always occur from fresh ideas, when a formula does not specifically forbid them by freezing specifications – as it does nowadays.

These figures became the post-WW2 targets. The Record was approached closely in the 1951 German Grand Prix meeting and, sensationally, in the *ersatz* Formula 2-as-Grand Prix 1953 race when Alberto Ascari on a Ferrari type 500 4-cylinder car lapped at 85.61 MPH with PP/W of only 14 HP/Cwt. A miss by 0.6% from the Record with 39% lower Power to Weight. This gives the clue to the other significant Nurburgring characteristic – that an *agile car was worth a lot of PP/W in dealing with the incessant S-bends*.

Mercedes-Benz, after Germany was allowed back into Grand Prix racing, had the satisfaction of beating their own Record, albeit un-officially, at 86.46 in 1954 with Juan Fangio driving their new W196 with PP/W 14.8. They went further, to exceed the all-time target, when the following year he tested their short-wheel-base W196 version to achieve 89 MPH on PP/W of 19.32. This emphasised the *agility* factor. It needed the ability of a "Super-driver", i.e. one with exceptionally- quick reaction time, to make best use of this: whereas Fangio and Stirling Moss cut 5.5 seconds off the times they set on the medium-wheelbase car (88.15 MPH by Fangio with PP/W of 17.3), the respectable driver Karl Kling was 2 seconds slower.

It was Fangio in 1956 who officially set the Record above Lang's fastest time at 87.74 MPH on a Ferrari-Lancia D50 having 18.1 HP/Cwt. Then, in 1957 with a drive of which he said afterwards *"I did things I've never done before and I don't ever want to drive like that again!"* he raised the Record to 91.54 (+4.3%) on a Maserati 250F having negligible advantage over the D50 in PP/W.

The 1958 German Grand Prix, won by Tony Brooks in a Vanwall with Stirling Moss raising the Record to 92.9 MPH, gives another example of how "time-related development" could overcome problems. The Vanwalls of 1958 were apparently the same as the 1957 cars which had performed so badly at the 'Ring with such handling problems that an exhausted Moss could only take 5th place and Brooks, 9th, was so shaken-about that he was actually sick. Subtle spring and damper adjustments must have been made.

After a GP run on the Berlin AVUS track in 1959 and a F2 race on the Sudschleife in 1960, full Grand Prix racing on the Nordschleife only resumed in 1961. Unfortunately, this means there is no Nurburgring data for the "Cooper Revolution" of those years which introduced Champion midengined cars. The 1961 race became famous for another demonstration of virtuosity overcoming technical inferiority – Moss beat four V6 Ferraris which had a 26% superiority in PP/W over his basically1960 Lotus type 18 chassis powered by a slightly - upgraded 1.5 litre Climax 4-cylinder engine. He *was* aided very substantially by risking use of soft high-hysteresis Dunlop D12 rain tyres on a dry track, the Ferraris on Dunlop R5 dry tyres, and not paying a life penalty when the last 2 laps (13%) were run in heavy rain.

The 1.5 litre NA cars continued to set ever-higher lap speeds from 1961 to 1965 and this again shows how *agility* was rewarded at the Nurburgring. This will be discussed after viewing the relationship – or lack of it – of lap speeds to PP/W on Fig.2 below on P. 4



The data for this chart is given in Appendix A on PP.6-7.

The striking point on this chart is that the last 1.5 litre figure, of 101.5 MPH by Jimmy Clark on a Lotus type 33/Climax with PP/W of 19.6, was only exceeded by himself in 1967 with a Lotus type 49/Cosworth by 4% (105.52) although having 68% higher Power/weight!

After June 1968, when Ferrari introduced a rear aerofoil to Grand Prix racing at Spa, all bets were off. The chart figure of 106.91 was produced by Chris Amon with a Ferrari type 312 tested in July 1968 at the Nurburgring with a little less PP/W than the previous year's L49. With ever-increasing downforce by "upside-down-wings" the lap speeds soared up for the next 7 years.

"Agility" and how to measure it

Enough has been written above to show that the author believes that a quality which has been called "*Agility*" is responsible for the big increases in lap speed by the smaller-engined cars on this particular circuit. If it was available the Polar Moment of Inertia (PMI) should be significant in the ability of the driver to corner at speed in the S bends so prevalent on the Nordschleife. Such figures were probably never calculated in the years of this review and, if they were, they are certainly not available now. Designers *did* appreciate the importance of the factor. Ferdinand Porsche always strove to *minimise* PMI – not always with successful results. His designs were "Hard to drive". When combined with basic oversteer in the PorscheWagen, which design was bought by Auto Union, only Hans Stuck and Bernard Rosemeyer could master them. Mercedes-Benz, after the poor handling of the W25 *Kurz* of 1936 (see "Spectacular Loss of Performance between seasons") went the other way and deliberately *increased* PMI for the 1937 W125. This was fine for fast open circuits. On the Nurburgring Rosemeyer beat them to GP Pole (an anecdote about this is given in Appendix C on P.9). Generalities aside, the problem was how to include some measure of "*Agility*" to this review. The dimensions of PMI are **Mass x (Length)**². The author thought it would be worth-while to try, as a surrogate for the real factor, the combination:-

 $[Dry Weight (WD lb)] x [Wheelbase (WB ft)]^2$ $lb.ft^2$. This has been labelled 'Z'.

The data is given in Appendix B on P.8. The factors [PP/W] and [Z] were entered as Logarithmic Variables in a Multi-variable Regression Analysis (LINEST in Excel). The result over 22 points (excluding speeds influenced by aero downforce, 1968 -1975) yielded:-

Lap Speed MPH = $398.04 \text{ x} [PP/W]^{0.214} / [Z]^{0.186}$, with R² = 0.87.

The result is plotted on Figs. 3 and 4 below on P. 5.

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When the points are identified by the 8 different formulae involved the result is shown below on

Fig. 4



The data for these charts is given in Appendix B on P.8.

The real values of PMI must be some proportion of Z. It would be expected that Mid-engined cars would have lower values than Front-engined. The disposition of the errors from the trendline shows that this was so, generally speaking.

Conclusion

The inclusion of the inverse factor '(Z)^{0.186} to represent "Agility", as defined above, combined with (PP/W)^{0.214}, does help to make sense of the Grand Prix lap speeds achieved on the Nurburgring Nordschleife over 1932 – 1967, before un-quantifiable aero downforce entered the subject.

<u>Additional Evidence for Fig.4 is given in a P.S at the end of this Note 139.</u> References

Details of the following DASO can be found in <u>Appendix 3</u> on this website:-31, 32, 468, 938, 1133, 1251, 1252, 1253.

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Appendix A

NURBURGRING Circu	it Records								
Race		GP	GP	GP	GP	GP	E'rennen	GP pole	
Year		1932	1934	1935	1936	1937	1939	1939	
Make		A. Romeo	A. Union	Merc	A. Union	A. Union	Merc	Merc	
Model		Р3	A	W25C	С	С	W154/M163	W154/M163	
V (L)/CN		2.65/8	4.4/16	4.3/8	6./16	6./16	3./12	3./12	
Driver		T. Nuvolari	H. Stuck	Brauchitsch	Rosemeyer	Rosemeyer	H. Lang	H. Lang	
Power PP HP		212	295	397	520	520	464	464	
Data source		Аррх 1	Note 44	Аррх 1	Аррх 1	Appx 1	Аррх 1	Аррх 1	
Dry Weight kg		700	810*	810	810	810			
Dry Weight Ib		1543	1786	1786	1786	1786	2005	2005	
Data Source		D938	Per Formu	ıla			D468	D468	
+ Load lb**		250	250	250	250	250	250	250	
Total Weight Ib		1793	2036	2036	2036	2036	2255	2255	
Total Wgt W Cwt		16	18.2	18.2	18.2	18.2	20.1	20.1	
PP/W HP/Cwt		13.25	16.21	21.81	28.57	28.57	23.08	23.08	
Lap Speed MPH		78.57	79.25	80.73	85.57	87.04	86.16	87.5	
Data source		D1253	D1253	D1253	D1253	D1253	D1253	D32	
	*The 1934	formula o	f Max. 750	kg dry wei	ight exclud	ed tyres.	Official		
	These hav	e been ado	ded at 15 k	g each, tota	al 60 kg.		pre-WW2		
	**Nomina	l added loa	ad , large e	ngines:-			Record		
	Water 3 g	allons x 10	/gal = 27	0.					
	Methanol	Aethanol for 1 lap 3 gallons x 9 lb/gal = 27 lb							
	Kitted Driv	ver 180 lb.	Total load	264 lb. Sa	y, 250 lb.				
	For smalle	er engines u	use 220 lb.						

Appendix A continued

	Red cross	Red cross	Red plus					
Race	GP pole	GP	GP	GP pole	Test	GP	GP	GP
Year	1951	1951	1953	1954	1955	1956	1957	1958
		Α.						
Make	Ferrari	Romeo	Ferrari	Merc	Merc	Ferrari	Maserati	Vanwall
Model	375/50	159	500/53	W196	W196SW*	D50	250F	
V (L)/CN	4.5/12	1.5/8	2./4	2.5/8	2.5/8	2.5/8	2.5/6	2.5/4
Driver	A. Ascari	J. Fangio	A. Ascari	J. Fangio	J. Fangio	J. Fangio	J. Fangio	S. Moss
Power PP HP	345	365	182	253	286	270	271	265
Data source	D1252	D31+D1133	D1252	Аррх 1	Аррх 1	Аррх 1	Аррх 1	Appx 1
Dry Weight kg	850		560			645	630	550
Dry Weight Ib	1874	1714	1235	1670	1410	1422	1367	1213
Data Source	D1252	D31	D1252	D468	D468	D938	D938	D938
+ Load Ib**	250	250	220	250	250	250	250	250
Total Weight lb	2124	1964	1455	1920	1660	1672	1617	1463
Total Wgt W Cwt	19	17.5	13	17.1	14.8	14.9	14.4	13.1
PP/W HP/Cwt	18.2	20.9	14	14.8	19.32	18.12	18.82	20.23
Lap Speed MPH	85.64	85.64	85.61	86.46	89	87.74	91.54	92.9
Data source	D1253	D1253	D1253	D1253	D32	D1253	D1253	D1253

Appendix A continued on P.7

*SW = Short Wheelbase

Appendix A continued										
Race	GP pole	GP pole	GP pole	GP pole	GP pole	GP pole	GP pole	Test		
Year	1961	1962	1963	1964	1965	1966	1967	1968		
Make	Ferrari	Porsche	Lotus	Ferrari	Lotus	Lotus	Lotus	Ferrari		
Model	156/120	804	L25	158	L33	L34	L49	312		
V (L)/CN	1.5/6	1.5/8	1.5/8	1.5/8	1.5/8	2./8	3,/8	3./12		
Driver	P. Hill	D. Gurney	J. Clark	J. Surtees	J. Clark	J. Clark	J. Clark	C. Amon		
Power PP HP	192	185	195	210	212	244	405	404		
Data source	Appx 1	D938	Appx 1	Аррх 1	Аррх 1	Note 20	2NA/Eg. 47	1252		
Dry Weight kg	460	465	455	460	450	470	510	530		
Dry Weight Ib	1014	1025	1003	1014	992	1036	1124	1168		
Data Source	D938	D938	D938	D938	D938	Estimate	D938	D938		
+ Load Ib**	220	220	220	220	220	220	250	250		
Total Weight Ib	1234	1245	1223	1234	1212	1256	1374	1418		
Total Wgt W Cwt	11	11.1	10.9	11	10.8	11.2	12.3	12.7		
PP/W HP/Cwt	17.45	16.67	17.88	19.09	19.6	21.8	32.9	31.8		
Lap Speed MPH	95.33	96.78	9 7.0 4	98.42	101.5	102.76	105.52	106.91		
Data source	D1253	D1253	D1251	D1253	D1253	D1251	D1251	D1253		

Chicane added

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Appendix A completed

Race	GP pole	GP pole	GP pole	Test	GP pole	GP pole
Year	1969	1971	1972	1974	1974	1975
Make	Brabham	Tyrrell	Ferrari	Ferrari	Ferrari	Ferrari
Model	BT26A	3	312B2	312B3	312B3	312T
V (L)/CN	3./8	3./8	3./12	3./12	3./12	3./12
Driver	J. Ickx	J. Stewart	J. Ickx	N. Lauda	N. Lauda	N. Lauda
Power PP HP	430	450	464	483	483	488
Data source	2NA/Eg. 47	2NA/Eg. 47	D1252	D1252	D1252	D1252
Dry Weight kg	535	560	560	578	578	580
Dry Weight Ib	1179	1234	1234	1274	1274	1279
Data Source	D938	D938	D938	D938	D938	D938
+ Load Ib**	250	250	250	250	250	250
Total Weight Ib	1429	1484	1484	1524	1524	1529
Total Wgt W Cwt	12.8	13.2	13.2	13.6	13.6	13.7
PP/W HP/Cwt	33.6	34.1	35.2	35.5	35.5	35.6
Lap Speed MPH	110.54	116.36	119.63	122.14	121.39	122.03
Data source	D1251	D1251	D1251	D1253	D1251	D1251
		Re- surfaced,		First lap	Plus turn	Only lap under
		bumps		under	at	7 minutes
		flattened.		7 minutes.	Kallenhard	in race
						meeting.

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<u>NURBURGRING</u> <u>Circuit Records</u>				>			
						E'renne	
Race	GP	GP	GP	GP	GP	n	GP pole
Year	1932	1934	1935	1936	1937	1939	1939
	A.						
Make	Romeo	A. Union	Merc	A. Union	A. Union	Merc	Merc
Model	D2	٨	W25C	C	C	W154/M16	W154/M16
WIDGEI	rJ .	A .	VVZJC	C	C	3	3
V (L)/CN `	2.65/8	4.4/16	4.3/8 Brauchitsc	6./16 Rosemeye	6./16 Rosemeye	3./12	3./12
Driver	T. Nuvolari	H. Stuck	h	r	r	H. Lang	H. Lang
Dry Weight WD							
lb	1543	1786	1786	1786	1786	2005	2005
PP/W HP/Cwt	13.25	16.21	21.81	28.57	28.57	23.08	23.08
Lap Speed MPH	78.57	79.25	80.73	85.57	87.04	86.16	87.5
Wheelbase WB ft.	8.692	9.542	8.917	9.542	9.542	8.942	8.942
SimMolin Z		162614.		162614.	162614.	160318.	160318.
Lb.(Ft)^2	116575	9	142010	9	9	5	5
	0.19850	0.19481	0.21288	0.21993	0.21993	0.21067	0.21067
((PP/W)^0.214)/(Z)^0.186	2	3	3	2	2	1	1

Appendix B continued

		Red cross	Red cross	Red plus					
Race		GP pole	GP	GP	GP pole	Test	GP	GP	GP
Year		1951	1951	1953	1954	1955	1956	1957	1958
Make		Ferrari	A. Romeo	Ferrari	Merc	Merc	Ferrari	Maserati	Vanwall
Model		375/50	159	500/53	W196	W196SW*	D50	250F	
V (L)/CN	`	4.5/12	1.5/8	2./4	2.5/8	2.5/8	2.5/8	2.5/6	2.5/4
Driver		A. Ascari	J. Fangio	A. Ascari	J. Fangio	J. Fangio	J. Fangio	J. Fangio	S. Moss
Dry Weight WD lb		1874	1714	1235	1670	1410	1422	1367	1213
PP/W H	P/Cwt	18.2	20.9	14	14.8	19.32	18.12	18.82	20.23
Lap Spee	d MPH	85.64	85.64	85.61	86.46	89	87.74	91.54	92.9
Wheelba	se WB ft.	7.612	8.2	7.087	7.708	7.05	7.48	7.48	7.521
SimMolin	Z Lb.(Ft)^2	108584.3	115249.4	62028.58	99220.15	70080.53	79561.47	76484.2	68613.88
((PP/W)^0.214)/(Z)^0.186	0.215279	0.219304	0.225865	0.209444	0.236551	0.227885	0.231432	0.239834

Appendix B completed

Race		GP pole	GP pole	GP pole	GP pole	GP pole	GP pole	GP pole	
Year		1961	1962	1963	1964	1965	1966	1967	
Make		Ferrari	Porsche	Lotus	Ferrari	Lotus	Lotus	Lotus	
Model		156/120	804	L25	158	L33	L34	L49	
V (L)/CN	`	1.5/6	1.5/8	1.5/8	1.5/8	1.5/8	2./8	3,/8	
Driver		P. Hill	D. Gurney	J. Clark	J. Surtees	J. Clark	J. Clark	J. Clark	
Dry Weig	ht WD lb	1014	1025	1003	1014	992	1036	1124	
PP/W H	P/Cwt	17.45	16.67	17.88	19.09	19.6	21.8	32.9	
Lap Spee	d MPH	95.33	96.78	97.04	98.42	101.5	102.76	105.52	
Wheelba	se WB ft.	7.611	7.546	7.583	7.808	7.667	7.667	7.917	
SimMolin	Z Lb.(Ft)^2	58738.3	58365.67	57674.39	61818.37	58312.63	60899.07	70451.07	
((PP/W)^0.214	·)/(Z)^0.186	0.23918	0.237131	0.241248	0.241515	0.245534	0.249168	0.264833	

<u>Appendix C</u> From "Grand Prix Driver", the biography of Hermann Lang.

(Trans. C Meisl. Foulis 1953)

On P.113 there is an anecdote of interest in several ways, including an instance of 'Mind tricks'.

Until 1939, only Rosemeyer, using a 750-kilo formula car in 1937, had managed to lap the Nurburgring in under 10 minutes, a time considered impossible by everyone. In practice he amazed everyone by putting in a lap at the astonishing time of 9 mins. 46 secs.

Delighted with his achievement he got back to the pits in his boyish way to receive congratulations from everyone. Neubauer, well knowing Rosemeyer to be sensitive in such matters, pretended not to be surprised and said lightly, "Nine mins. 46 secs .- that's nothing, we can do that too !" Rosemeyer, not realizing the leg-pull, blew up and yelled : "I'll give 2,000 marks to the one who betters 9 mins. 50 secs. !" "All right, Lang," continued Neubauer, "here's your chance to earn 2,000 marks !" I played along with him, pretending that all this was deadly serious. We knew perfectly well that there was no possible way to put up such a time. I shot off as if on records bent. A large group of onlookers followed my race against time on their watches. When the wind is in the north, cars on the Nurburgring can be heard long before they are due across the finishing line; often they seem quite close already. Some were saying I had done it, others said I had not, and then I crossed the line. "There you are, Rosemeyer, serves you right you cheeky so-and-so, now you'll have to pay up !" and Neubauer showed him the stop-watch upon which 9 mins. 49 secs. was clearly indicated. Rosemeyer became pale and red-faced alternately. Immediately, two factions were formed, those for and those against him. Rosemeyer ran to the timekeepers and came back boiling with rage : "It was only 9 mins. 52 secs.," he yelled from a long way away. "That's a fiddle, they are sorry for you, my watch is right. Pay up and look pleasant !" Neubauer replied.]

Aside, he said to me : " My watch is quite right, but I stopped it sooner. Let him get a bit annoyed, annoyance is bad for the opposition, it weakens their morale !" [Times were actually:-Rosemeyer Pole for 1937 German GP: 9 min 46.2 sec 87.04 MPH.

Lang, 2nd on grid 9 min 52.2 sec 86.16 MPH 1% slower.]

In the race Rosemeyer reached the lead by Lap 4 (of 22) but then hit a bank and damaged a rear wheel and the tyre, which burst. The necessary pitstop put him 'way behind but he clawed back to 3rd behind the Mercedes of Caracciola (1st, his 5th German GP) and Brauchitsch at the finish.

It was Rosemeyer's last race at the 'Ring. On 28th January 1938 the two German teams ran in attempts on the straight line Class B (5 to 8 Litres) records on a road. The new Frankfurt to Darmstadt autobahn was closed for the runs. When trying to better a new record of 269 MPH set by Caracciola in a Mercedes in the calm early morning, Rosemeyer, using an R-type 6.3 litre engine in a fully-bodied Auto Union, and in windy conditions, lost control at over 260 MPH. The car may have been deflected by a sudden side gust (the official explanation) or it could have had a body-panel failure -there is a detailed study of that possibility in <u>www.kolumbus.fi/leif.snellman/zana</u>. Rosemeyer died on the spot, at only 28 years old, leaving a wife and small son.



wikipedia Bernd Rosemeyer, his wife Ellie and Ferdinand Porsche



autoevolution.com

Hermann Lang and Alfred Neubauer

P.S. Additional evidence for Fig. 4

After completing Figs. 3 and 4 it was thought worthwhile to check how other, generally non-GP, cars would relate on the basis:- Lap Speed v. Function (PP, W, Z). The result, for 7 extra examples, is given on Fig. 5 below:-



The agreement with Fig. 4 is good. The data is tabled below.

Race		E'R FL	E'R FL	E'R practice	E'R practice	GP F2 FL	GP practice	GP F2 Pole	E'R practice
Year		1932	1935	1936	1936	1958	1958	1967	1951
Make		Bugatti	ERA	Delage	Maserati	Porsche	Cooper	Matra	Kieft
Model		37A	A	Up-dated	6CM	718 RSK	T45	MS5 FVA	500
V (L)/CN		1.5/4	1.5/6	1.5/8	1.5/6	1.5/4	2.2/4	1.6/4	0.5/1
Driver		L. Hartman	R. Mays	D.Seaman	C. Trossi	E. Barth	R. Salvadori	J. Ickx	S. Moss
Power PP	P HP	90	150	185	155	142	194	220	48
Data sou	rce	D308	D1229	Аррх 5	D938	IN	D33	D583	D32
Dry Weig	ht kg	720	738		650	530		420.5	
Dry Weig	ht lb WD	1587	1627	1770	1433	1168	1119	927	510
Data Sou	rce	D308+IN	D1229	D4	D938	IN	D32+D33	IN+ DST	D32
+ Load Ib)	220	220	220	220	200	220	220	180
Total We	ight lb	1807	1847	1990	1653	1368	1339	1147	690
Total Wg	t W Cwt	16.13	16.49	17.77	14.76	12.21	11.96	10.24	6.16
PP/W H	P/Cwt	5.58	9.10	10.41	10.50	11.63	16.22	21.48	7.79
Lap Spee	d MPH	66.01	71.27	73.31	73.52	87.55	88.69	103.4	72.63
Data sou	rce	D1219	D446	D1221	D1221	D1020	D1020	D1253	D32
Wheelba	se WB ft.	7.874	8	8.208	8.169	6.89	7.417	7.546	7
Data sou	rce	IN	IN	D4	IN	IN	DST File	IN+ DST	D1037
Z Lb.(Ft)^	2	98393.8	104128	119247.1	95627.76	55447.41	61558.3	52785.34	24990
((PP/W)^0.214)/(Z)^0.186	0.170248	0.187038	0.187725	0.195956	0.221652	0.233425	0.255086	0.235956
4054 14. 0	F00								

<u>1951 Kieft 500 cc</u>

Just to illustrate that *"There's an exception to every rule!"* and to avoid complacency, the 1951 Kieft 500 cc is plotted – and does not fit at all! Perhaps the car was *too light* for the bumpy Nurburgring. In years to come the experience of Vanwall between 1957 and 1958 was to show how the bumps could completely upset even a 13 Cwt car, let alone one weighing lightly-loaded 6 Cwt. <u>Further DASO</u>:- 4,33,308,446,583,1020,1037,1219,1221,1229.

Illustrations. Some of the cars which raced at the Nurburgring are shown on PP.PS 2 - 3

P.S. P.2 of 3

Bugatti Type 37A



The earliest type of car plotted

Representing Hartman's 37A of 1932, this is Simons' car which won the 1500 cc class of the 1928 German Grand Prix. This was held on the full North plus South loops.

pinterest.co.uk

1967 Lotus Type 49/Cosworth (Ford) DFV, Jimmy Clark illustrating the effect of the worst bump on the Nurburgring circuit, probably Brunnchen, which was flattened - out in 1971.

The latest type of car plotted



pinterest.co.uk

The car which probably did not like the bumpy Nurburgring circuit



Stirling Moss driving the 1951 Kieft to win the "Festival of Britain" 500 cc race at Goodwood on its first appearance.

In the 1951 Eifelrennen race on the 'Ring, while leading, the car had a steering arm break. This *could* have been a low-cycle fatigue failure due to the vibro-massage received.

goodwood.com The first of the "Super-drives" at the 'Ring

Tazio Nuvolari winning the 1935 German Grand Prix in the teeth of nine "Neu Ordnung" German cars on their home circuit – and despite losing much time at his pitstop when the fuel pump handle broke! Alfa Romeo P3B, slightly modernised.



pinterest.co.uk

The second of the "Super-drives" at the 'Ring



Juan Fangio's 1957 winning drive against the Ferraris of Peter Collins and Mike Hawthorn.

Picture taken in practice – race car had a yellow nose-band.

Place is the banked Karussel, which was originally a ditch into which the faster drivers put their inside wheels!

autosport

Stirling Moss in his 1960/'61-re-bodied Lotus Type 18

German Grand Prix in the teeth of the more powerful Ferrari team. He was much helped by using Dunlop D12 "Wet" tyres with better grip and making them last. The identifying Green Spots had been ground off.

with Climax FPF Mk 2 engine winning the 1961

The Ferraris were on Dunlop R5 "Dry" tyres It was Moss' last major Grand Prix victory. The third "Super-drive at the 'Ring.



theguardian

A car designed to have low Polar Moment of Inertia (PMI)



The 1937 C-Type Auto Union development of the 1933 Porschewagen, deliberately designed by Ferdinand Porsche to have a low PMI. Bernd Rosemeyer driving.

Picture made at the 1937 Eifelrennen, which he won (his last victory at the 'Ring).

worthpoint.com

Caracciola in the 1937 Mercedes-Benz W125, a car built by the firm to eliminate the stigma of their very-poor 1936 season with the W25 *Kurz* (which it did).

A car designed to have a high PMI



diecastXchange.com

A PPS has been added to discuss the Kieft 500

The Kieft 500

There must be more to the anomaly of the Kieft 500 cc Nurburgring lap speed on Fig.5 than the effect of a bumpy circuit. It seemed possible that the car, with a low Power (PP)/ Frontal Area (AF), could have come to an aerodynamic limit. Laurence Pomeroy used to favour that factor in his correlation of lap speeds. DASO 32 "Design and Behaviour of the Racing Car" by Stirling Moss and Pomeroy provides the necessary data for the cars driven by Moss, and this has been used to create the chart below as Fig. 6.



This chart shows that the Kieft is entirely consistent with the series of cars driven by Moss at the Nurburgring up to 1956 when examined from the aerodynamically-limited view.

Pomeroy found from his available data that the exponent of the correlation curve was 1/6 i.e. 0.167. The data here find it to be 0.1317 i.e. 1/7.6.

The data are tabled below.

		Red cross				
Year	1951	1953	1954	1955	1955	1956
	Practice	Practice	Practice	Test	Test	GP
Make	Kieft	Cooper	Maserati	Merc.	Merc.	Maserati
Model	500 cc	2L Alta	2.5L 250F	W196MB	W196SB	250F
PP - HP	48	150	230	290	290	250
Data Source	D32	D32	D32	D32	D32	D32
AF - Sq. Ft.	8	13	12	10.5	10.5	12
Data Source	D32	D32	D32	D32	D32	D32
PP/AF - HP/Sq.Ft.	6	11.54	19.17	27.62	27.62	20.83
Lap Speed - LS MPH	72.63	78.7	84.94	87.79	88.63	87.17
Data source	D32	D1020	D1020	D32	D32	D1020



Laurence Pomeroy

Stirling Moss



charles lytle

hulton archive