



## Spectacular loss of performance between seasons

There have been several cases in the history of Grand Prix racing where a racing team which has dominated one season has failed badly in the next. Usually this has been for technical reasons, so it is interesting to examine such cases to try to identify the cause(s) of the loss of performance.

### Peugeot 1913 to 1914

Before the Great War 1914–1918 *the* races to win were the Grand Prix de l'Automobile Club de France (hereafter French GP) and the Coupe de l'Auto for light cars.

The double-overhead-camshaft Peugeots of various sizes, designed by Ernest Henri and with a team of drivers led by Georges Boillot, had succeeded in the 1912 and 1913 French GPs and in the 1913 Coupe, Boillot himself being the winner in each event. When they competed in the 1914 French GP the cars were to the new rule of 4½L and had been much improved –in theory – by the fitting of front wheel brakes. Boillot was favourite and was expected to complete a hat-trick.

Daimler, having been absent from the French GP since winning it in 1908, entered with the maximum allowed of 5 Mercedes cars which, in theory again, were not so advanced as the Peugeots and did not have front wheel brakes. However, the company had prepared meticulously for the race, having tried a prototype on the Lyons circuit early in 1914 and made changes as a result of what they learnt.

The result was a crushing victory for the German team, taking 1st, 2<sup>nd</sup> and 3<sup>rd</sup> places. Boillot allowed himself to be drawn into a duel for the lead with an over-driven Mercedes which actually retired at quarter distance with a broken engine. By then the Peugeot engine and brakes were well-worn and there was also excessive tyre wear which his fastest team-mate (Jules Goux) ascribed post-race to poor handling because of double spare wheels carried well-overhung at the rear (see Fig. 1). Although Boillot led for the middle half of the race, neither he nor his team-mates could resist a late charge by the 3 remaining Mercedes (the 5th had retired early with gearbox trouble). Boillot's engine broke on the last lap when he was 2nd.

Teutonic preparation, inadvertently-superior tactics and greater numbers had triumphed over Gallic élan and a design fault.

Fig. 1

1914 Peugeot L45

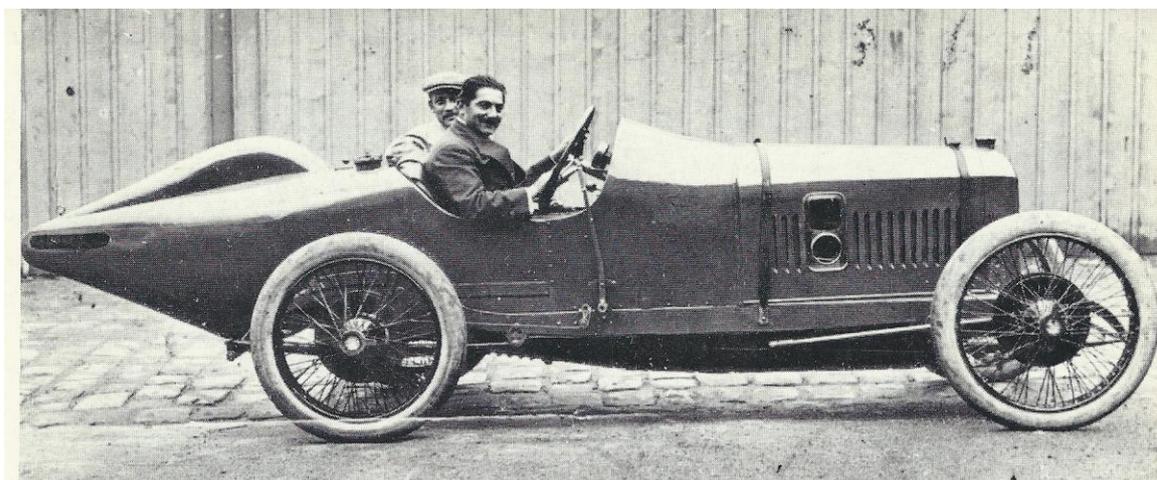
IL4  $92/169 = 0.544$  4,494 cc

Georges Boillot at the wheel before the race.

Showing the new front wheel brakes

and the mounting of dual spare wheels in a boot overhanging the tail.

DASO Profile No. 73 *The Racing Peugeots 1912-1919* W. Court 1967.



### Mercedes-Benz 1935 to 1936

In 1935 the W25C Mercedes-Benz had won 6 out of the 8 races where both of the “New Order” German teams had competed. The mid-engined Auto Union had only 1 win\*.

In late 1935 for 1936 the Stuttgart team tried for more power with a V12 5.6L engine, keeping the weight under the rule maximum by shortening the chassis. They found, when the engine was built, that it would put too much weight on the front wheels so that there would be too much understeer (although that term was not then in use in Europe). They had to revert to a further enlargement of the original 1934 IL8 3.4L engine to 4.7L. Theoretically the chassis was improved by a neat de Dion back axle in place of swing axles, but this was fitted to a weak girder frame.

The rival Auto Union team found some more power from a further enlargement of *their* original V16 engine and their new ace driver, Bernd Rosemeyer, hit his peak form.

The short W25 had both handling\*\* and engine problems. Two fine drivers were caught out by the car (see Fig.2). The final 41% capacity enlargement on the original cylinder centres was a step too far.

The result, where both teams competed, was:- A U 4 wins; M-B 2. The latter withdrew their cars from competition after 7 jointly-contested races\*.

\*The single race in each season in these selections not won by M-B or A U was won by Tazio Nuvolari in Alfa Romeos.

\*\*Tests on the Nurburgring by Rudolf Uhlenhaut, appointed head of a new department for racing development (the *Renn Abteilung*), showed him (as neatly summed up by a Wikipedia contributor) that the problems were the consequence of “*too stiff suspension in a too soft chassis*”. In 1934 M-B had fitted all-independent suspension to a general fault of this kind which had applied to all previous GP cars, *except* Bugattis which had stiff frames. This had raised the handling problem threshold to a higher level of Power/Weight ratio and speed but not eliminated it. Uhlenhaut saw that the way forward for 1937, on the bumpy surfaces of that date, was “*soft suspension with a torsionally stiff frame*”. This was done for the W125, which was successful, and then carried over to the 1938/1939 W154 equally successfully.

Fig. 2  
1936 Mercedes-Benz Short W25  
The drivers who crashed one of these cars.  
DASO 468



Louis Chiron, who crashed in the 1936 German GP.



Dick Seaman, who crashed a short W25 in training at Monza in March 1937. Seaman said it was his own fault, and of course he was new then to such Power/Weight ratio, but clearly the car had no tolerance for error.

### Cooper 1960 to 1961

Jack Brabham won the 1960 Championship with the NA 2½L Cooper-Climax T53/FPF, accumulating 5 consecutive wins. Bruce McLaren added a T51 win to give Coopers the Constructors' title with 6 out of 9 races. This followed them winning both titles in 1959. These two years of the "Cooper Revolution" established the ascendancy of the mid-engined chassis, defeating in particular the front-engined Ferraris.

In 1961 the engine formula changed to NA 1½L (effectively, disregarding the 750cc supercharged option). The British constructors had been against this change and had tried to launch a 3L NA "Intercontinental" formula in opposition but this quickly faded out. A consequence was that new British 1½L engines were slow to be started, whereas Ferrari was quite ready for the 1<sup>st</sup> race with new V6 engines in a mid-engined chassis, copying Cooper at last. Until August 1961 only slightly-improved 1957 Formula 2 Climax IL4 FPF Mk2 engines were available to Cooper (see Fig.3). Then, when a new V8 Climax engine was supplied it had a cooling problem which was not cured until winter 1961/1962.

The result was that Cooper fell from 1<sup>st</sup> to 4<sup>th</sup> in the Constructors' Championship, winning nothing.

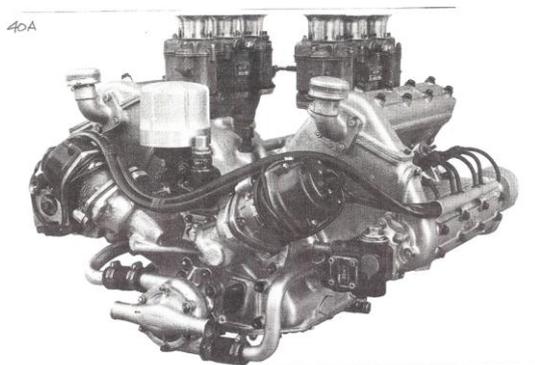
Moral: regulatory decisions are final and have to be acted on with the best grace possible! It came out quite well in the rest of the 1½L formula, British cars taking the Championships 3 years out of 5. Unfortunately for Cooper, after Brabham left them at the end of 1961 and McLaren left after 1965, both to start their own Grand Prix teams, 1960 was their last title.

Fig. 3

1961 Coventry Climax FPF Mk. II  
 IL4 3.22"/2.80" = 1.15 91.2 cid  
 (81.788 mm/71.12 1,495 cc)  
 151 BHP @ 7,500 RPM  
 DASO *Autocar* 14 April 1961



[www.race-cars](http://www.race-cars)



1961 Ferrari 156/F1  
 120V6 73/58.8 = 1.241 1,477 cc  
 178 to 192 HP @ 9,500 RPM  
 (the higher power probably after a season's  
 development)  
 DASO 422

### Lotus 1978 to 1979

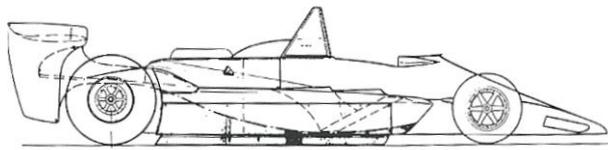
Lotus introduced to Grand Prix racing "ground effect" downforce by means of a venturi underbody whose low-pressure airflow was sealed from ambient leakage by vertically-sliding skirts rubbing along the track. In 1978 the types 78 and 79 cars with this design won 8 races out of 16, Mario Andretti taking the Drivers' Championship and Lotus the Constructors'.

In 1979 Colin Chapman carried the principle to the limit in the type 80, trying to use every square inch under the car to increase downforce sufficiently to dispense with the drag of upside-down wings which had sprouted since 1968. The engine was Cosworth DFV again. The result was a complete failure. The car, even with modifications which reintroduced wings, was only raced 3 times with one 3<sup>rd</sup> place. Although the team went back to the 79 by then most of the competition had copied and improved on this, the 79 had not been developed with revised Goodyear tyres and Ferrari had Michelin radial-ply tyres. Lotus never won a race in 1980.

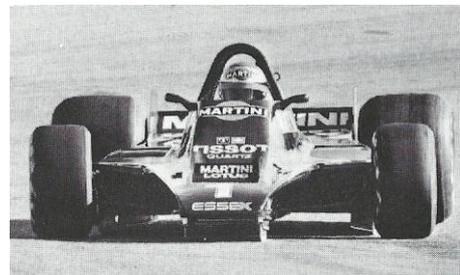
The problem with the type 80 was uncontrollable “porpoising”, the body oscillating between too-close to, and too-far from, the track with consequential unpredictable variation of downforce. It was an original good idea carried to excess. Fig. 4 compares the types 79 and 80. It may be that the extra skirted area had too much moment from the centre of gravity

Lotus never won another Championship.

Fig. 4  
1978 Lotus 79 compared with the 1979 type 80.  
DASO 938



Top:-Lotus 79; bottom and right:- Lotus 80 as first built, without “wings”. The skirts curved round the rear wheels did not slide properly.



### Ferrari 1979 to 1980

The 1979 Championships were won by Ferrari, racing the 312T4 (see Fig.5), with 6 victories from 15 races. Although not able to produce the same ground effect downforce as rivals copying and improving on the Lotus 79, because its flat 12 engine hindered the venturi shape, the use of Michelin radial-ply tyres compensated for that.

The following season with the 312T5 (see Fig. 5), however, saw a complete collapse of results. An index of this was some of the extremely poor qualification positions of Jody Scheckter, the 1979 Champion:- at the British GP only 23<sup>rd</sup>; in Canada, not qualified; in the US GP 23<sup>rd</sup>. His team-mate, Gilles Villeneuve did a little better but the overall position in the Constructors' Championship was 10<sup>th</sup>.

The reason seems to have been that the 312T5 was just an interim car concluding Ferrari's effort with the 11 years old F12 3L NA engine while they developed a turbocharged 1½L V6 to the alternative rule which Renault had taken up first in 1977.

Fig. 5  
1979 and 1980 Ferrari 312T4 and 312T5  
F12 (180V12) 80/49.6 = 1.613 2,992 cc  
Both 515 HP @ 12,300 RPM



312T4

Ferrari: All the cars A Mondadori G.Nada/Haynes 2005



312T5

### Williams 1987 to 1988

With Honda 1½L turbocharged (TC) engines in 1987 (see Fig.6) Williams were dominant, scoring 9 wins from 16 races for both titles (Nelson Piquet the Drivers’).

But Honda took the engines away from the team after 1987, breaking their contract but with Frank Williams accepting some financial compensation. *Possibly* this was because the Japanese were unhappy that the team principal had allowed Piquet and his team-mate Nigel Mansell to race each other and risk otherwise certain 1<sup>st</sup> & 2<sup>nd</sup> places.

The result was that in 1988 Williams had to fall back on the NA 3½L alternative then allowed using V8 engines from Judd (ironically a development from the Judd BV built originally for Honda as a F3000 unit). After the unreliable “reactive” suspension was scrapped Mansell secured 2 valiant 2<sup>nd</sup> places in the season against the practically-unbeatable McLaren cars fitted with the Honda turbocharged engines denied to Williams, but the team could only manage 7<sup>th</sup> place in the Constructors’ ranking.

Williams had to wait 5 years to secure another Championship, this time in engine partnership with Renault after TC was banned from 1988. They had the satisfaction of taking the titles from Honda-powered McLarens!

Fig. 6

1987 Williams FW11B/Honda RA167E  
 80V6  $79/50.8 = 1.555$  1,494 cc  
 Qualification rating 995 BHP @ 12,200 RPM  
 DASO 20



[www.autoevolution.com](http://www.autoevolution.com)

1988 Williams FW12/Judd CV  
 90V8  $94/63 = 1.492$  3,498 cc  
 603 BHP @ 10.750 RPM  
 DASO 47 B. Lovell letter to DST 18 April 1992



[www.allf1.info](http://www.allf1.info)

### Brawn 2009 to Mercedes-Benz 2010

With a chassis intended originally for Honda but fitted with a Mercedes-Benz engine after Honda withdrew at the end of 2008, Ross Brawn had a great success in 2009 after buying the team himself. Honda did give help with the seasons running costs. Jenson Button won 6 out of the first 7 races of a 17 race programme with 2 more wins later by Rubens Barrichello. Although others caught up, notably Red Bull/Renault with the advantage of Adrian Newey's aerodynamics, Button's and Brawn's leads in the Championships could not be overtaken.

At the end of 2009 Brawn sold a controlling interest in his team to Mercedes-Benz, retaining the position of team principal and with the cars built as before at Brackley (the engines were also British-built in the ex-Ilmor plant at Brixworth).

Despite this management and manufacturing continuity there were no victories in 2010 and the new owners obtained only 4<sup>th</sup> place in the Constructors' Championship.

It seems that Brawn had secured his early 2009 advantage with the best solution to a double-diffuser under-car venturi (see Fig. 7) – others had double diffusers from the start but no success. As usual the idea was copied generally and presumably better. It became normal in 2011 – and, also as usual with most innovations, it was banned by the FIA subsequently!

A complete change of drivers may not have helped in 2010. Nico Rosberg (from Williams) and Michael Schumacher (after a 3 year layoff from F1 driving) supplanted Button and Barrichello. Presumably Mercedes wished to employ German drivers (Rosberg had dual Finnish and German nationality). Unfortunately Schumacher did not return to his previous 7 Championship form.

Fig. 7  
2009 Brawn BGP01  
Double diffuser  
DASO [www.crash.net](http://www.crash.net)



### Mercedes slow recovery to success, 2011 - 2014

As recent history it is interesting to describe how the great pioneering German firm recovered from the very poor 2010 position.

The team (bought completely in early 2011 and officially re-named "Mercedes AMG Petronas" after its sporting subsidiary and its major sponsor) had results in 2011 equally as dismal as in 2010; no wins and 4<sup>th</sup> in the Constructors' Championship. The following year:- 1 win and 5<sup>th</sup> place.

In preparation for the new 1.6L TC Hybrid formula forthcoming for 2014, Ross Brawn then brought in technical talent from outside:-

- Bob Bell from Renault;
- Geoff Willis from Red Bull;
- Aldo Costa from Ferrari.

Schumacher retired again and Lewis Hamilton was persuaded to join from McLaren and partner Nico Rosberg. In 2013, the last year of the 2.4L NA formula, Mercedes rose to 2<sup>nd</sup> place in the Constructors' title with 3 wins, although far behind Red Bull.

The new formula 2014 result has been an outstanding success for Mercedes:- 16 wins out of 19 races, the Constructors' Championship and Hamilton won the Drivers'!

According to Daniel Johnson in the D. Telegraph 15 October 2014 this result has come from a rising trend of expenditure:- 2011 £120M; 2012 £140M; 2013 £184M and surely more in 2014.

The management credit is due to Brawn but he departed from the team at the end of 2013 when a new senior man was brought in without his knowledge. Bell also left at the end of 2014.

Whether the remaining team can maintain the position of Mercedes against a new McLaren-powered-by-Honda challenge *plus* more competition from developed engines now to be permitted from Renault (for Red Bull) and Ferrari, time will tell.

Fig.8

Mercedes-Benz PU106A Hybrid  
90V6 80/53 = 1.509 1,598 cc

Compressor mounted at the front of the engine, shaft-driven by the exhaust turbine at the rear. It *may* be that this novelty, of separating more widely the usual Turbo-Compressor components, has provided cooler air and more power.

Note the very simple exhaust manifold.

The triangular part over the cambox probably reinforces the beam stiffness of the engine, which carries chassis loads.



DASO Racecar Engineering April 2014