

The FD0”X” Fittipaldi Years - Innovation despite the results

by Darren Galpin

When one thinks of the Copersucar Fittipaldi FD cars, the usual reaction is to dismiss them, and to marvel at the fact the Emerson Fittipaldi could waste his last years in F1 in such cars. But as usual, there is more to this tale than meets the eyes, and more than is usually reported.

The build-up

In 1969, Emerson Fittipaldi was in Britain pursuing a career in Formula Ford. Needing a bit of a help with his car, he raised some cash and asked a friend, Richard Divila, to come over and give him a hand.

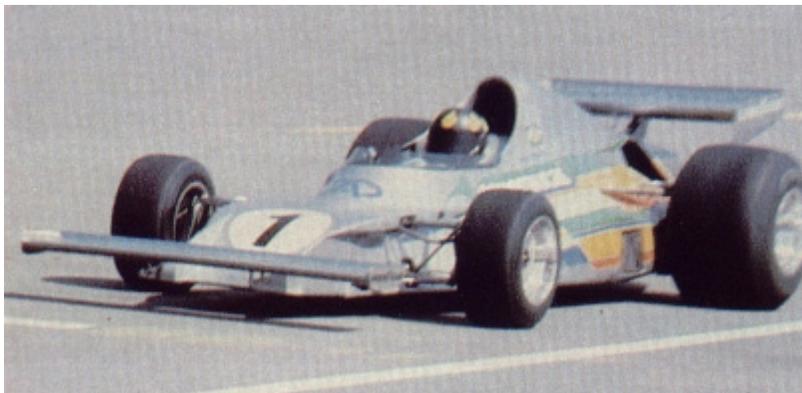
Richard Divila, a Brazilian national who had an English mother, was a technical graduate who was planning to do a PhD in automotive design and had a background in aerospace. He went to England planning to spend two weeks helping out Emerson, and embarked on a lifelong career instead. Emerson’s brother Wilson also moved to England, and together they set up their own team to enter into F3 and F2, Richard becoming “team manager, engineer, secretary, truckie, mechanic, chief cook and bottle washer”, progressing through various F3 and F2 Lotus’s, and acting as Emerson’s private engineer in F1. It was a busy time, as they were running almost every weekend. If they weren’t running in F1 or F2, they ran in sportscars and GT’s instead.

By the time Wilson moved on to Bernie Ecclestone’s Brabham, Divila was busy modifying the Fittipaldi team cars to what they called “Fittipaldi spec”. The F2 Brabham BT38 and Lotus 69 were modified to accept wide noses, new airboxes, new suspension geometry and had other aerodynamic tweaks. However, despite giving large amounts of cash to Ecclestone, Wilson was always second string to teammate Carlos Reutemann, so the decision was taken to build their own cars.

If reading about this era, it can be difficult to find reliable information. Divila himself admits that this is partly his fault. “My attitude was that I didn’t need the press to write about me as I was not searching for sponsors, and quoting G.B.Shaw to them (‘Those who know, do it; those who know a bit, teach it; and those who know fuck-all write about it...’)....Plus my scathing remarks about press people who were working on PR for drivers or sponsors, were to me at least in a serious conflict of interest situation, and I was quite vocal about their bad use of their basic tool, the Queen’s English. The least one expects of a writer is to master his language, and the motor press was appalling, not only in spelling, but in the use of faulty metaphors and the abuse of clichés. It did not endear me to the press in general.....”

The FD01

Sponsored by the Brazilian sugar marketing organisation, Copersucar, the first Fittipaldi car, FD01 (*Fittipaldi-Divila*), was an innovative Cosworth special despite the joke tag applied to it in 1975.



Wilson Fittipaldi - Fittipaldi FD01 - Interlagos, 1975

Divila says that the first car was “a bit too innovative”. It featured all-round inboard suspension, using acting pull-rod’s, a novelty for the time. The driver sat in the car reclined at 30 degrees, using a yoke type steering wheel to steer the car. It was one of the first cars to have the airbox integrated into the body work, with rear radiators and ejector-stack exhausts (like the chimneys seen on 2002 F1 cars). It was designed using the first F1 computer, the massively powerful HP9825 (featuring a full 12K of RAM and a 16 character LED display - later an HP9845 was used in 1979) and featured data logging for testing. The data logging unit was a 12kg black box which contained a cassette recorder with 12 channels. The airspeed was measured by a pitot tube, and the wheel speed, damper stroke and steering were all recorded. The recording was all analog, and providing the tape hadn’t chattered too much over the recording heads (perhaps due to the driver clattering the kerbs too hard and too often), a 30 to 40 foot long (and one foot wide) strip of paper with squiggly lines was the result. With it Divila could see the cars’ suspension movement and validate the calculations with true car movement as before he had had to rely on “outside timing, photographs or driver comments for car development”. Data logging was only used for testing due to its weight and bulk.

The 30 degree seat back inclination worked reasonably well at Interlagos, which was near-enough Wilson's back-yard, but in the first race in Argentina it proved to be a bit difficult to see the apex points, so for the FD02 the seat inclination was modified to 45 degrees. This required the air intake to be modified into a snorkel arrangement, as the drivers' head and torso now blocked the air intake - this was proven by the data logging.



An HP9825 (left) and HP9845 (right)

The car itself was built in Brazil, using fabricators borrowed from Embraer, the Brazilian aircraft company. This led to its own problems, due to the level of aluminium craftsmanship available. In the UK, most of the fabricators were skilled in using the rolling wheel to shape the metal, with skills having been honed in WW2. Such skills were missing in Brazil. The fabricators from Embraer were used to dealing with 20 to 22 SWG aluminium (0.914-0.711mm), but the side-pods for the car were 16 SWG (1.626 mm), in order to increase the cars torsional rigidity, and to satisfy the regulations which required all panels over bag-fuel tanks had to be a minimum of 16SWG. Divila only knew aerospace procedures at the time, and found that double curvature panels¹ couldn’t be formed. Although it was easy in 20 SWG, 16 SWG wouldn’t form double curvature panels without cracking, unless annealed first. However, annealing a panel softens it, which defeated the object of the exercise. A lot of cars in F1 were slab-sided at this time due to the same problem, but the end result for the FD01 (and the following FD02 and FD03) was a torsionally weak chassis. The deal with Embraer also meant that materials were obtained at a nominal price.

For aerodynamics, Divila used the wind tunnel at the Centro Tecnológico da Aeronautica in Brazil, a word with of of Divila’s university lecturers gaining him access.ⁱⁱ As Embraer also used the complex, the wind tunnel time was also subsidised by the company. The original chassis design was what would later be termed a ground effect chassis, but due to a lack of a rolling road in the wind tunnel, the theory couldn’t be proven. Instead, a slimline chassis was chosen.



Ingo Hoffmann - FD03 - Interlagos, 1976

FD01 to FD03 were evolutions of each other. FD02 was a modified version of FD01, featuring twin rear radiators (a nose radiator was used on FD01) and a stronger rear suspension following Wilson's crash in Argentina. FD03 was produced in time for the 1975 French GP. Emerson Fittipaldi tested one secretly at Interlagos, as he was starting to be irritated with Marlboro contractual issues, and subsequently decided to pursue a dream, joining the team. Divila tried counseling against this, as there wasn't the depth of team nor the experience to field a double world champion, but the dream had to go on.



FD04/2 - Spain, 1976

The FD04 was produced for 1976, and it featured a raft of changes. The torsional rigidity problem was solved by the use of slab sides, coupled with in-line hip radiators. The nose became a chisel nose with a full width aerofoil, and the air intake box was completely reprofiled. It resulted in a slightly better season - 6th place at Long Beach, Monaco and Brands Hatch, but also resulted in a string of DNQ's. As Divila puts it, "[it] taught me that racing drivers should not get involved in the design of cars or managing teams - Prost in 2001 was a carbon copy". Together with Wilson, Divila decided that the team should be reinforced with experienced UK designers - ex-Ensign designer Dave Baldwin was brought in to design the new F5, before leaving abruptly. But that's for another story.

The FD04 ran in to 1977 before it was finally replaced, four different chassis being produced in total, construction being split between São Paulo in Brazil and Reading in the UK. Results still weren't coming, and the FD series of cars came to an end.

The Cars



Oil radiators (both sides)



Exhaust ejector, aerofoil shaped outer shroud with tailpipe blowing through, pulled air from side oil radiators, and exited into low pressure area behind tyre.





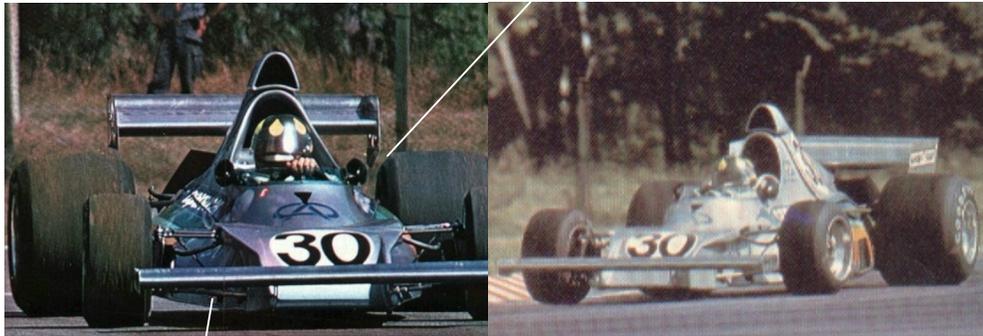
These shots from a model , but pretty much to Argentine GP spec , with added cooling , only used at Argentina



Brazil GP 02 version , still with single plane ft wing, but already with conventional side radiators , and "bobbed tail", also with raised seat back and high snorkel air-intake. 03 version would have flat headrest fired into a more aerodynamic shape, as seen on Ingo's Brazil GP version. Divila says that the "03 version is much uglier, lost original cars lines....".



Original Brazilian GP wide nose 04 , with overhung ft wing , note rear wheel deflectors..



FD02 with additional air scoop when first tested with raised seatback, still with rear radiator, but added intake for tropical summer was too draggy...

The FD Race Statistics

{PRIVATE}Race	Car	Driver	Result
Argentinian GP Buenos Aires no.15 - 12 January 1975	Fittipaldi FD01 - Cosworth DFV V8	Wilson Fittipaldi	Q23. Retired/Accident - destroyed tub.
Brazilian GP Interlagos - 26 January 1975	Fittipaldi FD02 - Cosworth DFV V8	Wilson Fittipaldi	Q21. 13th.
South African GP Kyalami - 01 March 1975	Fittipaldi FD02 - Cosworth DFV V8	Wilson Fittipaldi	Q27. Retired - reserve entry
International Trophy Silverstone - 13 April 1975	Fittipaldi FD02 - Cosworth DFV V8	Wilson Fittipaldi	Retired
Spanish GP Montjuich Park - 27 April 1975	Fittipaldi FD02 - Cosworth DFV V8	Wilson Fittipaldi	Q21. Retired - withdrew
Monaco GP	Fittipaldi FD02 - Cosworth DFV V8	Wilson Fittipaldi	Did not qualify

Monte Carlo - 11 May 1975			
Belgian GP	Fittipaldi FD02 - Cosworth DFV V8	Wilson Fittipaldi	Q24. 12th.
Zolder - 25 May 1975			
Swedish GP	Fittipaldi FD02 - Cosworth DFV V8	Wilson Fittipaldi	Q25. 17th.
Anderstorp - 08 June 1975			
Dutch GP	Fittipaldi FD03 - Cosworth DFV V8	Wilson Fittipaldi	Q24. 11th
Zandvoort - 22 June 1975			
French GP	Fittipaldi FD03 - Cosworth DFV V8	Wilson Fittipaldi	Q23.
Paul Ricard - 06 July 1975			Retired/engine.
British GP	Fittipaldi FD03 - Cosworth DFV V8	Wilson Fittipaldi	Q24.
Silverstone - 19 July 1975			19th/accident.
German GP	Fittipaldi FD03 - Cosworth DFV V8	Wilson Fittipaldi	Q22.
Nürburgring - 03 August 1975			Retired/engine.
Austrian GP	Fittipaldi FD03 - Cosworth DFV V8	Wilson Fittipaldi	Did not start -
Österreichring - 17 August 1975			accident/injury
Italian GP	Fittipaldi FD03 - Cosworth DFV V8	Arturo Merzario	Q26. 11th.
Monza - 07 September 1975			
US GP	Fittipaldi FD03 - Cosworth DFV V8	Wilson Fittipaldi	Q23. 10th.
Watkins Glen - 05 October 1975			
Brazilian GP	Fittipaldi FD03 - Cosworth DFV V8	Ingo Hoffman	Q20. 11th.
Interlagos - 25 January 1976			
Brazilian GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q5. 13th.
Interlagos - 25 January 1976			
South African GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q21. 17th/engine
Kyalami - 6 March 1976			
US West GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q16. 6th.
Long Beach - 28 March 1976			
US West GP	Fittipaldi FD04 - Cosworth DFV V8	Ingo Hoffman	Did not qualify
Long Beach - 28 March 1976			
Spanish GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q19. retired/gear linkage
Jarama - 2 May 1976			
Spanish GP	Fittipaldi FD04 - Cosworth DFV V8	Ingo Hoffman	Did not qualify
Jarama - 2 May 1976			
Belgian GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Did not qualify
Zolder - 16 May 1976			
Monaco GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q7. 6th.
Monte Carlo - 30 May 1976			
Swedish GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q21.
Anderstorp - 13 June 1976			retired/handling
French GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q21. retired/fuel pressure
Paul Ricard - 4 July 1976			
French GP	Fittipaldi FD04 - Cosworth DFV V8	Ingo Hoffman	Did not qualify
Paul Ricard - 4 July 1976			
British GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q21. 6th.
Brands Hatch - 18 July 1976			
German GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q20. 13th
Nürburgring - 1 August 1976			
Austrian GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q17.
Österreichring - 15 August 1976			retired/accident
Dutch GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q17.
Zandvoort - 29 August 1976			retired/electrics
Italian GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q20. 15th.

Monza - 12 September 1976	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q17.
Canadian GP			retired/exhaust/wi
Mosport Park - 3 October 1976	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	ng bracket
US East GP			Q15. 9th.
Watkins Glen - 10 October 1976			
Japanese GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q23.
Fuji - 24 October 1976			retired/withdrew
Argentinian GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q16. 4th.
Buenos Aires - 9 January 1977			
Argentinian GP	Fittipaldi FD04 - Cosworth DFV V8	Ingo Hoffman	Q19.
Buenos Aires - 9 January 1977			retired/accident
Brazilian GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q16. 4th.
Interlagos - 23 January 1977			
Brazilian GP	Fittipaldi FD04 - Cosworth DFV V8	Ingo Hoffman	Q19. 7th
Interlagos - 23 January 1977			
South African GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q9. 10th.
Kyalami - 5 March 1977			
US West GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q7. 5th.
Long Beach - 3 April 1977			
Spanish GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q19. 14th.
Jarama - 8 May 1977			
Monaco GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q18.
Monte Carlo - 22 May 1977			retired/engine
Swedish GP	Fittipaldi FD04 - Cosworth DFV V8	Emerson Fittipaldi	Q18. 18th.
Anderstorp - 19 June 1977			
Total Constructor Points: 14.			

The author would like to express his thanks to Richard Divila for his help with this article.

ⁱ Double curvature - consider a wok. It starts off as a flat sheet of aluminium which gets stretched and formed, with curves on intersecting planes. This forms an extremely stiff shape, and can be seen on the Tyrrell 001 or the BRM P153.

ⁱⁱ Centro Tecnológico da Aeronáutica - The equivalent in the USA or Europe would be MIT or the Cranfield Institute.'