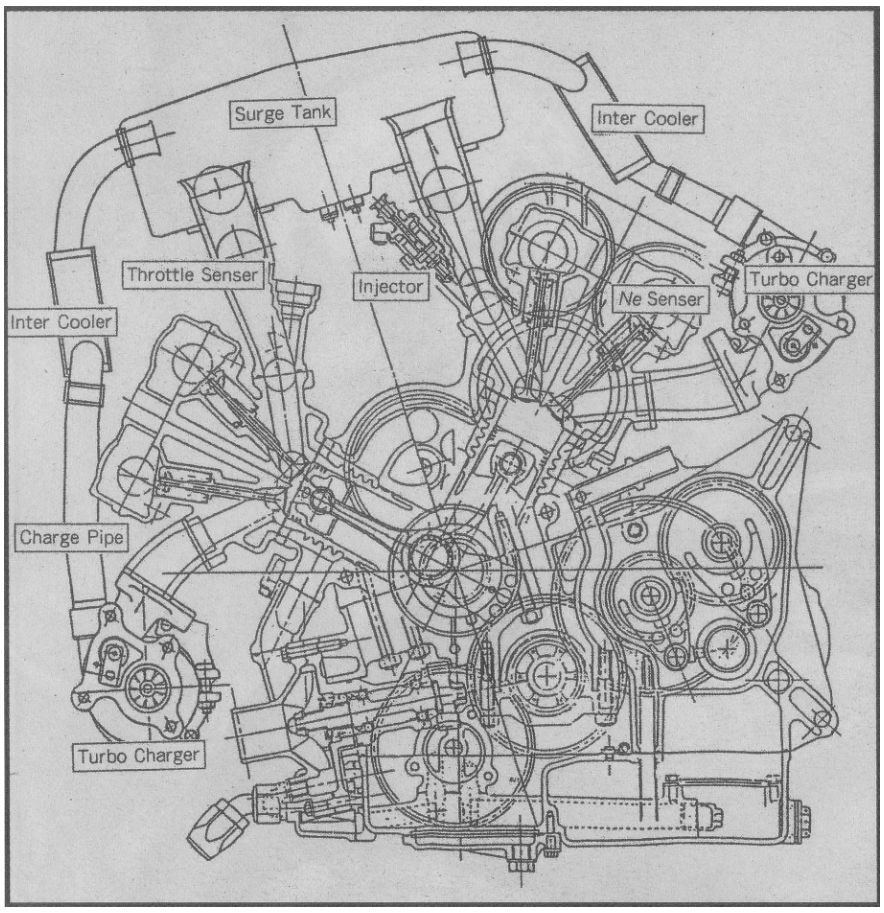
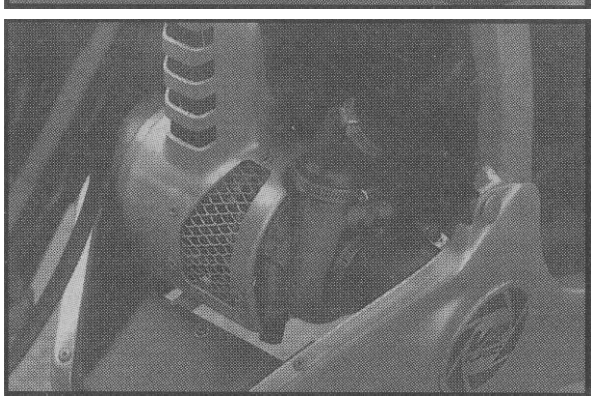
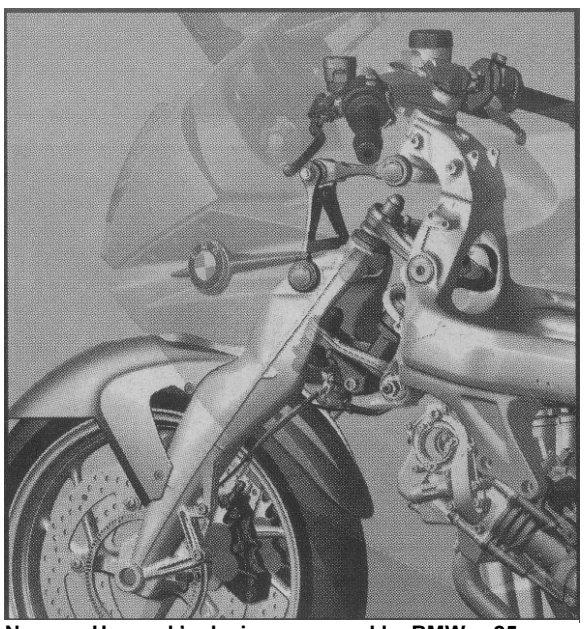
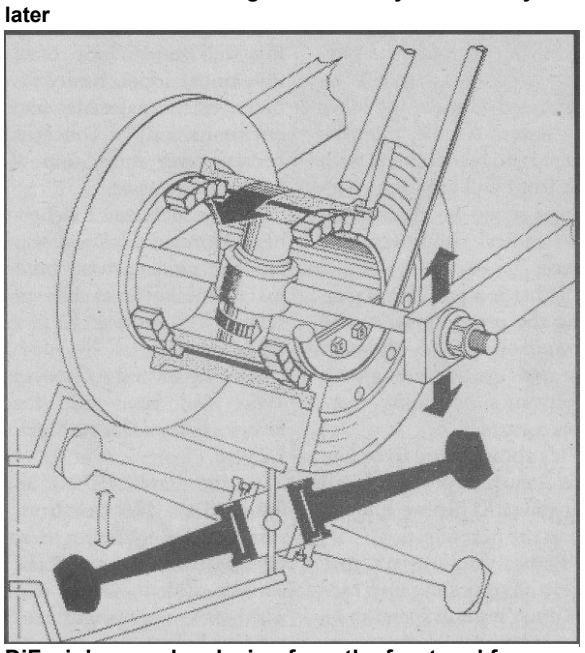




Honda's VT250Turbo, using Takeo Fukui's radical engine design, got this far, but never made production



Norman Hossack's design was used by BMW… 25 years later



DiFazio's complex design from the front and from above

likely anymore because racers don't want to spend their time testing and the more information we build up, the smaller the steps taken.

"Ideas that were previously not cost efficient to develop may well become more of an investment opportunity as fuel costs, materials and environ-mental concerns become ever more important and expensive."

Former McLaren F1 engineer Norman Hossack was another - pioneer who built his first bike from bits of scrap when he was 12 - a BSA Bantam.

Later he owned a Greeves 196cc and later still, his favourite bike, a Ducati Mach 1 250cc.

In the late 1970s he designed the Hossack front suspension system that replaced conventional forks with a system using two wishbones, an upright and steering linkage.

Similar components are found on the front of all racing cars, the only significant difference being in the upright which has its geometry rearranged.

It took another 25 years for the bike world to realise the system would work - and infuriatingly for Hossack it was just long enough for his patent to lapse. BMW were good enough to credit him with the design - but didn't feel like paying him any royalty money.

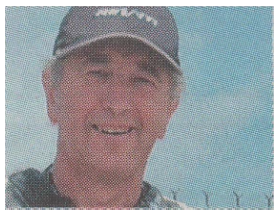
Hossack said: "I set out to bring some new thinking to motorcycle design. I had left McLaren with a wealth of experience, seeing how racing cars developed and how Formula 1 addressed their technical problems. I was only a spectator in the motorcycle industry and had no connections with it.

"Back in the mid 70s, from where I stood, motorcycle design problems were obvious and easily solved. Just improve the rigidity, lower the weight, lower the polar moment, and kill stiction. So I did that and it worked, and it won races and then it won again and again.

"So the fundamentals are there for discussion and challenge. But whether I managed to get it right first time with only my meagre resources is in question. Though as a comment on my design it is worth noting that Hossack1 won its last championship in 1988 at which point it was 10 years old. Could I have done better? I never built a bike with a real race engine and never found funding to do it the way it should have been done.

"So my attempt to revolutionise motorcycle design was a non-starter in the environment it was born in and I had to wait nearly quarter of a century to see the idea reach production with the BMW K1200S.

"I wonder when the next manufacturer will take it up and exploit the areas that BMW didn't?"



'Problems get solved and we move on to the next one'

TONY FOALE

Hub-centre steering has been a long-standing area of development, as seen on the Elf Honda 500 raced by Ron Haslam in 500GPs for three GP seasons.

Haslam told us: "Some of the early bikes were really strange – one had the front and rear swingarms meeting almost in the middle of the bike. It felt like a hinge and there were loads of times that I thought the front tyre was sliding. It wasn't; it just felt like that.

"I loved being part of the project and it was a shame it had to be ended. At least some of the bits of the bike were able to go on to being used on other Hondas - like the single-sided rear swingarm which was used on lots of road bikes. In the end the weight penalty was too much to make the benefits enough to carry on."

Hub-centre steering was also developed by, British engineer Jack DiFazio to answer the question posed by the new breed of superbikes that were increasing in power but weren't improving in terms of chassis or suspension design. Difazio spent a decade working on the idea and got to the point where it was working perfectly. But still it didn't catch on past the 50 or so machines made in Frome, Somerset.

The system came about after a Eureka moment while Jack was out for a Sunday drive with his wife. After scribbling the design down on a scrap of paper he got to work building a twin sided front swingarm which also allowed the wheel to turn from side to side.

Inside the wheel there were two hubs with ball races and the swingarm spindle attached to a king pin located inside the inner hub. The outer hub carried twin disc brakes - at the time a massive leap forward that even brake manufacturers Lockheed thought were too much.

Jack's son Richard worked with him for many years and raced several, versions of the system on a variety of machines.

He said: "You only have look at motorcycle design to see the compromises.

If single track vehicles didn't exist and someone was tasked with designing a motorcycle now, there is simply no way it would look anything like the ones we ride.

"Bicycles came first and set in stone the basic design have today - telescopic forks only work as well as they do because their compromised design has been worked on and incrementally improved for 100 years.

"Hub-centre steering is a better design and works better than forks. It's a feeling of resignation rather than frustration that it didn't become more commonly used.

"At the time, people were reluctant to try anything new - the inherent conservatism of the motorcycling world was as strong then as it now. Even though our system worked perfectly it still didn't gain widespread support."

It was the DiFazio system of hub-centre steering that was used on the Nessie Endurance racing bikes.

The Nessie bikes were a series of unconventional endurance racers built and raced between 1974 and 1982 by the UK-based dealership, Mead and Tomkinson.

The Nessie nickname was first applied to the next Kawasaki-engined version, which carried its fuel tank beneath the engine while exhaust system was routed over the top.

One key part of these impressive and innovative designs is that nothing is dead in terms of engineering and design.

In the same way Leonardo Da Vinci is credited with drawing the basic design of a helicopter but was unable make it work because of limitations of materials, the same may be the case for motorcycles.