= Brabham BT19 =

The Brabham BT19 / ?bræb?m / is a Formula One racing car designed by Ron Tauranac for the British Brabham team . The BT19 competed in the 1966 and 1967 Formula One World Championships and was used by Australian driver Jack Brabham to win his third World Championship in 1966 . The BT19 , which Brabham referred to as his " Old Nail " , was the first car bearing its driver 's name to win a World Championship race .

The car was initially conceived in 1965 for a 1 @.@ 5 @-@ litre (92 @-@ cubic inch) Coventry Climax engine , but never raced in this form . For the 1966 Formula One season the Fédération Internationale de l 'Automobile (FIA) doubled the limit on engine capacity to 3 litres (183 cu in) . Australian company Repco developed a new V8 engine for Brabham 's use in 1966 , but a disagreement between Brabham and Tauranac over the latter 's role in the racing team left no time to develop a new car to handle it . Instead , the existing BT19 chassis was modified for the job .

Only one BT19 was built . It was bought by Repco in 2004 and put on display in the National Sports Museum in Melbourne , Australia , in 2008 . It is often demonstrated at motorsport events .

= = Concept = =

The BT19 was created by Australian designer Ron Tauranac for the Brabham Racing Organisation (BRO) to use in the 1965 season of the Formula One motor racing World Championship . The BT19 , and its contemporary the Lotus 39 , were built to use the new FWMW flat @-@ 16 engine from Coventry Climax . Only one example of the BT19 design was built , and it never raced in its original form . Climax abandoned the FWMW 's development before the end of 1965 , their existing FWMV V8 engines proving powerful enough to propel Jim Clark 's Lotus 33 to seven wins and the drivers ' championship .

For 1966 , the engine capacity limit in Formula One was doubled from 1 @.@ 5 litres (92 cu in) to 3 litres (183 cu in) . It was not feasible to enlarge existing 1 @.@ 5 @-@ litre engines to take full advantage of the higher limit and Climax chose not to develop a new 3 @-@ litre motor , leaving many teams without a viable engine for 1966 .

The new 3 @-@ litre engines under development by competing team Ferrari had 12 cylinders . Jack Brabham , owner and lead driver of BRO , took a different approach to the problem of obtaining a suitable engine . He persuaded Australian company Repco to develop a new 3 @-@ litre eight @-@ cylinder engine for him , largely based on available components ; the engine would produce less power than Ferrari 's , but would be lighter , easier to fix and more fuel efficient .

Brabham cars were designed and built by Motor Racing Developments Ltd . (MRD) , which was jointly owned by Tauranac and Jack Brabham and built cars for customers in several racing series . The Formula One racing team , BRO , was a separate company wholly owned by Jack Brabham . It bought its cars from MRD but Tauranac had little connection with the race team between 1962 and 1965 .

At the end of the 1965 season Tauranac was losing interest in this arrangement , reasoning that " it was just a matter of a lot of effort for no real interest because I didn 't get to go racing very much " and " I might as well get on with my main line business , which was selling production cars . " Although Brabham investigated using chassis from other manufacturers , the two men eventually agreed that Tauranac would have a greater interest in the Formula One team , which MRD eventually took over completely from BRO . This agreement was not reached until November 1965 . Repco delivered the first example of the new engine to the team 's headquarters in the United Kingdom in late 1965 , just weeks before the first Formula One race to the new regulations , the non @-@ championship South African Grand Prix on 1 January 1966 . Rather than build a new car in the limited time available , BRO pressed chassis number F1 @-@ 1 @-@ 1965 , the sole and unused BT19 , into service .

= = Chassis and suspension = =

Tauranac built the BT19 around a mild steel spaceframe chassis similar to those used in his previous Brabham designs . The use of a spaceframe was considered a conservative design decision ; by 1966 , most of Brabham 's competitors were using the theoretically lighter and stiffer monocoque design , introduced to Formula One by Lotus during the 1962 season . Tauranac believed that contemporary monocoques were not usefully stiffer than a well @-@ designed spaceframe and were harder to repair and maintain . The latter was a particular concern for Brabham , which was the largest manufacturer of customer single @-@ seater racing cars in the world at the time . The company 's reputation rested in part on BRO ? effectively the official ' works ' team ? using the same technology as its customers , for whom ease of repair was a significant consideration . One mildly novel feature was the use of oval @-@ section , rather than round , tubing around the cockpit , where the driver sits . In a spaceframe or monocoque racing car , the cockpit is effectively a hole in the structure , weakening it considerably . For a given cross sectional area , oval tubing is stiffer in one direction than round tubing . Tauranac happened to have a supply of oval tubing and used it to stiffen the cockpit area . The car weighed around 1250 pounds (567 kg) , around 150 lb (68 @.@ 0 kg) over the minimum weight limit for the formula , although it was still one of the lightest cars in the 1966 field . The race starting weight of a 1966 Brabham @-@ Repco with driver and fuel was estimated to be around 1 @,@ 415 lb (642 kg) , about 280 lb (127 kg) less than the more powerful rival Cooper T81 @-@ Maseratis .

The bodywork of the BT19 is glass @-@ reinforced plastic , finished in Brabham 's usual racing colours of green with gold trimming around the nose . Although the science of aerodynamics would not greatly affect Formula One racing until the 1968 season , Tauranac had been making use of the Motor Industry Research Association wind tunnel since 1963 to refine the shape of his cars . Brabham has attributed the car 's " swept @-@ down nose and the upswept rear lip of the engine cowl " to Tauranac 's " attention to aerodynamic detail " . During the 1967 season , the car appeared with small winglets on the nose , to further reduce lift acting at the front of the car .

Against the trend set by the Lotus 21 in 1961 , the BT19 's suspension , which controls the relative motion of the chassis and the wheels , is outboard all round . That is , the bulky springs and dampers are mounted in the space between the wheels and the bodywork , where they interfere with the airflow and increase unwanted aerodynamic drag . Tauranac persisted with this apparently conservative approach based on wind tunnel tests he had carried out in the early 1960s , which indicated that a more complicated inboard design , with the springs and dampers concealed under the bodywork , would provide only a 2 % improvement in drag . He judged the extra time needed to set up an inboard design at the racetrack to outweigh this small improvement . At the front the suspension consists of unequal length , non @-@ parallel double wishbones . The front uprights , the solid components upon which the wheels and brakes are mounted , were modified from the Alford & Alder units used on the British Triumph Herald saloon . The rear suspension is formed by a single top link , a reversed lower wishbone and two radius rods locating cast magnesium alloy uprights . Wheels were initially 13 inches (330 mm) in diameter , but soon upgraded to 15 in (380 mm) at the rear , and later still 15 in at the front as well . These increases enabled the use of larger , more powerful brakes . Steel disc brakes are used on all four wheels and were of 10 @.@ 5 in (270 mm) diameter for the smaller wheels and 11 in (280 mm) for the larger ones . The car ran on treaded Goodyear tyres throughout its racing career .

The BT19 continued Tauranac 's reputation for producing cars that handled well . Brabham has since commented that it " was beautifully balanced and I loved its readiness to drift through fast curves . " Brabham referred to the car as his Old Nail ; Ron Tauranac has explained this as being " because it was two years old , great to drive and had no vices . "

= = Engine and transmission = =

Repco racing engines were designed and built by a small team at a Repco subsidiary , Repco @-@ Brabham engines Pty Ltd , in Maidstone , Australia . Repco 's 620 series engine is a normally aspirated unit with eight cylinders in a ' V ' configuration . It uses American engine blocks obtained from Oldsmobile 's aluminium alloy 215 engine . Oldsmobile 's 215 engine , used in the F @-@ 85

Cutlass compact car between 1961 and 1963 , was abandoned by General Motors after production problems . Repco fitted their own cast iron cylinder liners into the Oldsmobile blocks , which were also stiffened with two Repco magnesium alloy castings and feature Repco @-@ designed cylinder heads with chain @-@ driven single overhead camshafts . The internals of the unit consist of a bespoke Laystall crankshaft , Daimler connecting rods and specially cast pistons . The cylinder head design means that the engine 's exhaust pipes exit on the outer side of the block , and therefore pass through the spaceframe before tucking inside the rear suspension , a layout which complicated Tauranac 's design work considerably . The engine is water @-@ cooled , with oil and water radiators mounted in the nose .

The 620 engine was light for its time , weighing around 340 lb (154 kg) , compared to 500 lb (227 kg) for the Maserati V12 , but in 3 litre Formula One form only produced around 300 brake horsepower (220 kW) at under 8000 revolutions per minute (rpm) , compared to 330 ? 360 bhp (250 ? 270 kW) produced by the Ferrari and Maserati V12s . However , it produced high levels of torque over a wide range of engine speeds from 3500 rpm up to peak torque of 233 pound feet (316 N · m) at 6500 rpm . Installed in the lightweight BT19 chassis , it was also relatively fuel efficient ; on the car 's debut Brabham reported that the BT19 achieved 7 miles per gallon (40 L / 100 km) , against figures of around 4 mpg (70 L / 100 km) for its " more exotic rivals " . This meant that it could start a Grand Prix with only 35 gallons (160 L) of fuel on board , compared to around 55 gallons (250 L) for the Cooper T81 @-@ Maseratis . The engine had one further advantage over bespoke racing engines : parts were cheap . For example , the engine blocks were available for GB £ 11 each and the connecting rods cost £ 7 each .

The 740 series unit used in the three races for which the car was entered in 1967 has a different , lighter , Repco @-@ designed engine block . It also has redesigned cylinder heads which , among other improvements , mean that its exhausts are mounted centrally and do not pass through the spaceframe or rear suspension , unlike those of the 620 series . It produced a maximum of 330 bhp (250 kW) .

The BT19 was initially fitted with a Hewland HD (Heavy Duty) gearbox , originally designed for use with less powerful 2 @-@ litre engines . The greater power of the 3 @-@ litre Repco engine was more than the gearbox could reliably transmit when accelerating at full power from rest , with the result that Brabham normally made very gentle starts to avoid gearbox breakages . The HD was later replaced with the sturdier DG (Different Gearbox) design , produced at the request of both Brabham and Dan Gurney 's Anglo American Racers team . It later became a popular choice for other constructors .

= = Racing history = =

Although regarded by its designer as a " lash @-@ up " , BT19 had a very successful Formula One racing career , almost entirely in the hands of Jack Brabham . BT19 was entered in several non @-@ championship Formula One races before the beginning of the 1966 world championship season . At the non @-@ championship South African Grand Prix at East London on 1 January , BT19 was the only new 3 @-@ litre car present . It recorded the fastest time in the qualifying session before the race ? therefore taking pole position for the start of the race ? and led the majority of the event before the fuel injection pump seized . Similar problems stopped the car on the second lap of the Syracuse Grand Prix in Sicily , but at the International Trophy at the Silverstone circuit , Brabham set pole position , a new lap record , and led the whole race to win ahead of 1964 champion John Surtees in a 3 @-@ litre works Ferrari .

The 1966 world championship season opened with the Monaco Grand Prix . Brabham was affected by a cold , and qualified poorly before retiring when the BT19 's gearbox failed . Surtees led the race in his Ferrari before his differential failed on lap 15 ; the race was won by Jackie Stewart in a 2 @-@ litre BRM P261 . At the following Belgian Grand Prix at the Spa circuit , Brabham survived an enormous 135 miles per hour (215 km / h) slide in the rain on the first lap . The shower eliminated half the field , including Stewart , who would miss the next race with his injuries . The BT19 , using Goodyear tyres that were not suited to the conditions , came home fourth of five classified finishers .

Surtees won the race for Ferrari , the last before he quit the Italian team .

At the French Grand Prix , held at the high speed Reims @-@ Gueux circuit , Brabham followed race leader Lorenzo Bandini closely from the start of the race , using the slipstream of Bandini 's more powerful Ferrari to tow him to up to 8 mph (13 km / h) faster down the straights than the BT19 could manage on its own . This allowed Brabham to consolidate his lead over Ferrari 's second driver , Formula One novice Mike Parkes . After 12 laps Bandini pulled away from Brabham , eventually by over 30 seconds , but when the Italian car was delayed by a broken throttle cable on lap 32 , Brabham cruised to the finish to win from Parkes and become the first man to win a Formula One World Championship race in one of his own cars .

Although the first Brabham BT20 , the definitive 1966 car , had been available at Reims , Brabham continued with the BT19 and used it to win the next three championship races . Ferrari , competitive in all three championship races to that point , were not present for the British Grand Prix . The race was held on the tight and twisting Brands Hatch circuit , the track made slippery by oil leaking from other cars and by drizzle . Brabham set pole and led the entire race . At the next championship round , the Dutch Grand Prix , Brabham reported the low speed Zandvoort circuit to be " even more oily and treacherous than Brands . " Brabham won the race after Jim Clark 's less powerful 2 litre Lotus 33 @-@ Climax , which had passed Brabham for the lead mid @-@ race , was delayed by overheating problems . The German Grand Prix was held at the Nürburgring Nordschleife , which Brabham described as " Brands Hatch on steroids " . On the opening lap Brabham took the lead from Surtees , now driving a Cooper @-@ Maserati . Brabham won after a race @-@ long fight with the Englishman in the rain . With four wins and more finishes than any of his championship rivals , Brabham had a 22 @-@ point lead in the drivers championship and could only be caught in the championship by Surtees or Stewart if one of them won all three of the remaining races .

Jack Brabham used BT19 again at the Italian Grand Prix at Monza , another high speed circuit . A second BT20 was completed at the Italian track and Brabham tried it in practice for the race , but decided to race his Old Nail , which he felt was fitted with a stronger engine . As at Reims , Brabham successfully slipstreamed the race leaders early on , but an oil leakage stopped the car after 8 laps . Neither Surtees nor Stewart finished the race and Brabham clinched his third world championship .

Brabham used the BT19 once more that season to take pole position and victory at the non @-@ championship Oulton Park Gold Cup , before using a new BT20 for the final two races of the championship season . The BT19 was used again at three of the first four championship races in the 1967 Formula One season , debuting the new Repco 740 engine at the Monaco Grand Prix , where it took pole position , and finishing second at the Dutch Grand Prix .

Commenting on the reasons for the unexpected competitiveness of the 1966 Brabham @-@ Repcos in Formula One , motorsport historian Doug Nye has suggested that they " could score on weight over the more powerful Ferrari , BRM , Cooper @-@ Maserati , Eagle @-@ Weslake and Honda in their undeveloped forms , and on sheer ' grunt ' over such interim stop @-@ gap cars as the nimble 2 @-@ litre Climax and BRM V8 @-@ engined Lotus 33s and BRMs . "

BT19 also competed in the final two races of the 1965 / 66 Tasman Series in Australia , which was run to the pre @-@ 1961 Formula One regulations , including an engine capacity limit of 2 @.@ 5 litres . Tasman racing was the original purpose of the Repco engine and Brabham 's involvement was supposed to promote the 2 @.@ 5 @-@ litre version . Frank Hallam , head of the Repco @-@ Brabham organisation responsible for designing and building the Repco engines , has said that the smaller version " never put out the power per litre that the 3 litre engine produced " , which itself was not a powerful unit . Fitted with the 2 @.@ 5 @-@ litre engine BT19 recorded one retirement and a third place in the series .

= = Demonstrations = =

The BT19 was not raced in serious competition after 1967 . Brabham retired and moved back to Australia at the end of 1970 . He retained ownership of the car until 1976 , when it passed into the hands of Repco and was restored by the Repco Engine Parts Group . In 1986 , Automotive Components Ltd . (ACL) was formed by the management buyout of Engine Parts Group , which

included the transfer of the BT19 to the new company . Since its restoration , the car has frequently been demonstrated at events , including the 1978 Australian Grand Prix at Sandown where Brabham was involved in a spirited demonstration with Juan Manuel Fangio driving his Mercedes @-@ Benz W196 . Brabham and the car also appeared at the first Australian Grands Prix to be held on the Adelaide (1985) and Melbourne (1996) street circuits . It also appeared at the 2004 Goodwood Revival meeting in the United Kingdom . ACL sold the car back to Repco in 2004 . In 2008 the car was installed in the Australian National Sports Museum at the Melbourne Cricket Ground , on loan from Repco .

In 2002 , at the inaugural Speed on Tweed historic meeting at Murwillumbah , Brabham , then 76 , commented : " It 's been a wonderful car over the years and it 's been very well looked after and it 's a pleasure to come and drive it . Coming to Murwillumbah was a really good excuse to get back in the car and drive it again and I 'm afraid that 's something I 'll never ever get tired of . "

= = Complete results = =

= = = Formula One World Championship = = =

(results in bold indicate pole position)

= = = Non Championship results = = =

? This race was a support to the 1966 Surfers Paradise Trophy , 14 August 1966