McLaren M19C, 1972

Introduction

The M19 represents a modest gem amongst the McLaren Formula One jewels. In 1972, history records one win for Denny Hulme at Kyalami in South Africa, three second placings, seven third placings, one fourth place and four fifth places, the joint effort largely between New Zealander Denny Hulme and American Peter Revson. This brought McLaren third place behind Tyrrell in the 1972 Constructors' Title, Lotus being victorious with their 72D.

Bruce McLaren's death in 1970 was a major blow to the team. However, the development of the M19 kick-started a McLaren revival well into the 1970's, culminating with Championship wins for the McLaren M23 in the hands of Emerson Fittipaldi in 1974 and James Hunt in 1976. From there, the now well established team under management of American lawyer Teddy Mayer was able to develop further, ultimately being taken-over by Ron Dennis in 1981, the rest is history as they say.

Ralph Bellamy proudly presented his new design, the M19A with which McLaren would campaign the 1971 season. The new car was finished in bright McLaren orange and had a distinctly modern look, featuring a full coke-bottle shaped monocoque. Fuel was contained in rubber bag tanks within the bulged monocoque centre, keeping the centre of gravity low, near the middle of the car. In 1972, designer Gordon Coppuck began work on the 1973 M23. Further development of the M19A allowed the car to fulfil its potential, before deformable fuel tank regulations enforced in 1973, rendered the M19's obsolete. The most obvious change for 1972 was in the livery from the usual McLaren orange to that of their new sponsor, Yardley cosmetics. Whilst retaining McLaren orange lower flanks, the Yardley colour-scheme contributed to a very good looking car, making the 1972 cars both distinctive and memorable.

Coppuck replaced M19A's rising rate rear suspension with a conventional arrangement enabling Hulme to win at Kyalami in 1972 (Reference 1). The uprated C specification car debuted at Monaco 1972, with the oil tank moved from alongside the gearbox to a central location between the engine and fuel tank, typical of the later M23's. A larger and more outrigged rear wing and the aforementioned suspension changes transformed the car's handling during 1972, with greater reliability dramatically improving podium placings.

Research

I was blessed with access to M19C/1 under restoration and so the two and a half year project began, eventually commanding about 1000 hours to prepare and build the car in

1/12 scale. This excluded the many hours of travelling and examination of the actual car being restored, photography and book research (see reference list), which brought authenticity to the work.

General Plan

My vision was to have the next best thing to a real M19C, in other words a truly accurate 1/12 scale representation. The ultimate inspiration came when I contacted Ralph Bellamy in Australia, who was thrilled with the interest being taken in his first Formula One car design, which had meant so much to him back in 1971/2. Having started with the monocoque and perfected this shape, it was vital to produce the nosecone, airbox and rear wing to an equally high standard. Then I ensured the engine fitted to the rear of the monocoque correctly, in such a way as to carry loads through to the gearbox and hence into the rear suspension in order to support the model, thus combining robust structural features with engineering accuracy. I approached the suspension pick-up points, engine to monocoque interface, rear wing support in the same way. I felt it important to ensure the bodywork was removable and fitted together, as in the real car. I also wanted to understand and represent every aspect of the engineering I so highly admired. Therefore, within reason, every visible example of wiring and plumbing of the electrics and fluid systems in the car were to be represented, (oil, water and fuel). In addition to using standard materials (aluminium tube, steel and brass rod, plasticard, Milliput and a variety of adhesives), I had access to a number of parts retrieved from Tamiya's 1/12 scale

Texaco Marlboro and Yardley McLaren M23 kits, hereafter referred to as the M23. As a base, I used a superdetailed DFV engine and Hewland gearbox, the wheels and tyres, parts of front and rear suspension and lastly, the front and rear wings, suitably modified.

Monocoque

Undertray and bulkheads

Monocoque construction was truly scratch built, beginning with the flat undertray, using 1mm thick plasticard. At either end of this, the built-up front suspension bulkheads and the rear monocoque panel were attached (figure 1). Specific dimensions enabled a correct alignment of surface bodywork at these points. Within the bulkheads, aluminium suspension pick-up points were incorporated, with exact positioning in relation to each other, observing horizontal and vertical reference planes as accurately as possible (figure 2). These aluminium pick-up points were carefully prepared (in order to accept brass rod pivot points) and then bonded into the bulkheads using epoxy resin, which further boosted the structural rigidity of the 2.0mm square-section plastic stock structure. This system worked well with further rigidity being conferred by the later attachment of surface monocoque panels over these bulkheads.

Although the front bulkheads would be largely hidden, the rear bulkhead demanded accurate representation for visual purposes and perfect association with all aspects of the interactive elements of the Cosworth DFV (figure 3).

Outer Monocoque

A monocoque plan view was obtained during restoration of M19C/1 and was transcribed onto paper at 1/12 scale. Next a simple plasticard 'jig' was fashioned in which the maximum extent of the monocoque waistline could be limited. The monocoque vertical curvature at various levels was recorded using a large profile gauge, applying a scaled down template to the model in progress. The details of the cockpit-opening were obtained by measurement and photograph. Knowing the height of this at the front and back, it was possible to make a 'buck' and support it in its correct position as shown in the photographs. Next, the sides of the monocoque were formed from the undertray around the coke-bottle tub sides right up to the cockpit opening, using plasticard strips, cross-bonded to further support them. Milliput resin was carefully added until a whole monocoque was formed around, but not yet bonded to the undertray or forward bulkheads. Towards the rear, the undertray was divided transversely and with the Milliput cured, the two sections of undertray with their attached bulkheads, could be slotted out and replaced as required.

The monocoque in Milliput was repeatedly sanded and filled until the overall look was 'just right', perfecting the cockpit outline, running up into the fuel-tank top where there was a smooth one-piece continuum of the aluminium skin (figures 4 and 5).

Positions were marked and drilled for the rivets, which were derived from aftermarket supplies to aircraft modellers (Grandt Line, 0.032" conical rivets no.152). The line was scored that marked the juxtaposition of two panels either side the cockpit running lengthways.

An access hole to the rearward front suspension radius rod was opened up on each side of the lower forward monocoque. Later, an oblique transverse hole would be drilled from behind. This would allow a section of brass wire to be used to secure the rose-jointed inboard extremity of the rear radius rod of the lower front wishbone (figure 6). In this way, the original engineering was replicated as closely as possible. The shape, dimensions, positions and structure of these access holes was carefully reproduced and then riveted around in sympathy with the hidden indication of steel footings beneath the monocoque skin.

Uniting the monocoque and engine.

Two stout steel rods of 0.9mm diameter, passing from the standard bracket supplied by Cosworth into the rear monocoque secured the engine. This special bracket is visible when any Tamiya DFV is examined at the lower front edge of the block. Reliable fixing here, balanced forces accepted through the bracing plates bolted on the front of each cylinder head cover, into the monocoque. Between these fixed points of attachment, a myriad of hoses, cables and wires would emerge from the back of the monocoque, entering tight spaces, finding their way as efficiently as possible to their destinations around the engine, gearbox and brakes.

Monocoque Paintwork

Grey then white Primer was followed by Appliance Gloss White, masking-off the top bodywork in order to spray the lower flanks McLaren orange (I used Suomen Post Yellow 698, Halfords). Later, a gloss black, a brown (Renault orange) and a gold were applied in characteristic Yardley fashion transforming the otherwise amorphous orange and white form, into one with curves Ralph Bellamy had planned for in his original design (Figures 7, 8 and 9). The multi-curved monocoque flanks precluded the use of a flat roundel decal on which race numbers could be placed. These roundels were therefore hand masked and sprayed as on the real car.

Roll over bar

This was made from 2.5mm annealed brass rod whose exact shape was derived from measurements and photographs of the isolated real item. To anneal such brass rod, I recommend wearing heat resistant gloves, holding the brass rod with forceps/pliers over a gas flame, whilst wearing suitable safety glasses. Once a dull red heat is achieved, the brass is allowed to cool naturally for a few seconds, followed by gentle quenching in water. Forward bracing bars were made and attached and onto these the delicate frame to support the headrest was also afixed using JB Weld (epoxy steel, USA). All of these brass rod components were sprayed with the same Alclad II Chrome, using enamel gloss black as a primer. The main roll over bar was fitted into the two aluminium tubular base supports either side of the tank-top at the rearward edge of the monocoque and glued into position with JB Weld. The other parts were then attached before the plasticard headrest was fitted.

Cockpit

The cockpit was built independently using plasticard and super-detailed with rivets, cut-outs for fuel-tank and fuel breather access, cable routing etc. Details were added for the gear lever and instrument bulkhead and accelerator cable attachment points. The pedals from an M23 were adapted with an adjustable floor rack, the latter being scratch-built from plasticard and riveted, finished in aircraft green primer to resist rust, as in most of McLaren's internal steel fittings. The pedals were then sprayed in Alclad II Polished Aluminium to replicate the shiny nickel-plated originals. These items were then fitted, including a throttle-stop, a clutch rest, push rods and corresponding holes for the brake and clutch mastercylinders on the front of the bulkhead cover. The throttle cable was attached and fed through a cable support attached to the right side of the footwell in front of the throttle, before the cable itself disappeared through an inner cockpit routing hole. It then emerged within the fuel tank top area, finally passing through a specially made tubular tunnel in the right side of the slim-line oil tank, thence to the DFV. The gear lever used, was an uprated version from an M23 kit (figure 10). The gearshift itself and linkage were of stainless steel rod, with plasticard mountings for the gear lever being sprayed with Alclad II chrome to replicate the nickel plating used on the original steel items. This isolated inner cockpit could then be inserted within the outer monocoque shell, secured by the undertray beneath and rear bulkhead behind. Once all these components were together, a strong unit was formed with all the appearance of the original engineering strategies.

Fire extinguisher

An ex-M23 fire extinguisher was placed transversely, below the driver's thighs with the regulator valve and trigger obscured from view within a space between the inner cockpit skin and the left fuel tank bag. I fitted steel tubing of 0.9mm diameter, to replicate the pipes carrying gaseous extinguishant, which emerged from a hole in the side of the cockpit ahead of the dashboard alongside the driver's left knee. This pipe divided in two after emerging in the cockpit, a short section travelling forwards into the footwell area, the longer part moving back towards the dashboard bulkhead through which it passed en-route to the tank-top area. Passing alongside the driver's left arm and body, I marked the tube with regularly spaced black dots to represent a line of carefully drilled holes in the original 1cm diameter pipe, this enabling any flames around the driver to be quenched in the event of the emergency trigger being operated. The open-ended pipes were crimped at either end, to additionally spray gas into the footwell and tank-top areas. The main triggers are the obvious pull-ring on the right side of the monocoque behind the driver and a pull-handle on the left side of the dashboard bulkhead, both being painted bright red. I made the pull-ring from 0.5mm wire bent round a former until the required shape was achieved, this then being bonded with Araldite Rapid and the end fitted into a 0.9mm diameter tube section to give the impression of a cable operated system. The finished item having been painted bright red was fitted within the purpose-made rectangular housing, which prevented accidental operation. Pulling either of these, would have operated a two-into-one device on the fuel tank top (figure 11), just ahead of the fuel filler. If either cable is pulled by driver or marshal, the *one* cable leading from this device via the tank-top area will pull the live-earth system above the battery, disconnecting live supply to the engine whilst simultaneously triggering the fire extinguisher. To supply power, a battery was scratchbuilt with appropriate wiring to the master-switch immediately above and from this the live supply was fed to the dashboard, fire extinguisher, the ignition box, rear light, starter motor and external power supply (jump-plug). An earth wire from the negative terminal was painted blue and secured to the chassis simulating the bolted-on original. A battery support tray (plasticard) with associated fabric retaining strap (Tamiya tape) and wire clip were fashioned to appear, as in the real car.

Seat

I hand-crafted the seat in Milliput to fit the inner chassis perfectly. This was achieved by placing a layer of cling film within the finished cockpit and pressing-in a thin layer of Milliput. Once cured, this was lifted out, trimmed, then the seat-surface was sanded and filled until perfectly smooth, before spraying gloss black (figures 12 and 13). The seat belt slots were opened up, holes drilled for large securing-rivets and then the friction-surface was added. I masked off the area for the friction-surface, lightly dusted this with icing sugar (or fine flour), before re-spraying with Halfords satin black. An aftermarket seat belt set was prepared and fitted. Gloss and satin black acrylic spray paints were used.

Dashboard

The steering wheel was essentially that from an M23 model attached to a piece of 2mm diameter stainless steel rod to improve the appearance of the steering column. I made a detachable boss on the end of the steering column, as in the M19C I had access to. The dashboard was small and neat with complex wiring. Apart from the wiring, the dashboard and its electrics switch box on the right, required seventy hand made pieces to faithfully reproduce (figure 14). Once brought together, the appearance of an M19C dashboard was magically restored. Plastic card, aluminium tube, brass rod all of various sizes were crafted to replicate in miniature the exact appearance and character of this particular Formula One 'office'. The electric switch-box on the right had three switches controlling the rear bad-weather light (LITE), the ignition limiter facility (LIM) and the electric fuel pump (PUMP). This switch-box was fashioned from plasticard, utilising tiny lengths of wire for toggle-switches within short aluminium tube sections, topped off with tiny PC reproductions of the switch labels as above. On top, a photo-reduced copy of the chassis identification plate was placed. The orange light on the dashboard was made with a drop of Araldite Rapid into a short section of aluminium tube, the latter representing the bezel surround. Finally, an angled bar linked the top of the dashboard with the robust dashboard bulkhead, to which the dashboard panel itself was bolted. This stabilised the dashboard in the original car, vibration being the enemy of instrumentation function and visualisation.

Using varying grades of black tubing, twisted wire and other aftermarket cable simulations, the application of the tachometer cable, fuel pressure line, water and oil temperature sensors was straightforward, each being directed to its intended target on and around the engine and the coolant system. The electrical wiring of the dashboard from behind, was more tricky. I made sure the major looms on the right and left of the dashboard bulkhead, were as faithfully represented as possible, in so far as their contributions from the dashboard are concerned. These wires were then routed through appropriate access holes to find their way back to the battery and master-switch from where the 'live' was picked up.

Tanktop

The fuel tank top surface, was enclosed and lay beneath the roll-over bar and within the silhouette of the monocoque in both plan and side elevations, hiding it completely. It was covered by a removable panel acting as the aerodynamic top surface.

The aluminium cover incorporated a smaller hinged hatch directly above the fuel filler (figure 15). This spring-loaded hatch could flip open to enable location of the fuel-churn, with its long nozzle passing between the left roll over bar support stay and its associated headrest frame. The panel and hatch were made from plasticard with a very narrow lip on which the fuel filler hatch could rest without falling inwards. Using 0.5mm steel tube sections and 0.25mm wire, a working hinge was made. Spring-loading the hatch was not an option I considered, but the hatch can be raised and lowered straightforwardly.

Within this enclosed tank-top area, a significant hub of vital cables, plumbing, fuel venting and other safety equipment, was located in typical Formula One neat efficiency. All this is represented in the model using a variety of normal modelling materials and aftermarket wires/tubing etc. Herein lies an incredible concentration of vital systems keeping a racing car functioning normally. Necessarily, all these components were scratch-built except for the aviation-style quick-fill M23 fuel-filler opened by insertion of the fuel-churn nozzle.

Bodywork

Nosecone.

The nosecone was made from plasticard and covered with a thin a veneer of Milliput in order to confer lightness and maximal internal volume with reasonable tolerances between inner surface and the radiator carried on the front subframe. The exact outer dimensions were known and multi-angle photos of the real item enabled an accurate rendition of the nosecone. The general shape of the whole nosecone without top-exit ducts, was corrected through several applications of the minidisc to sculpture the surface and perfected by detailed sanding and filling. When satisfied, the internal shape was modified and the airtight inner air channel was made, which directed air through the nosecone opening onto the radiator surface for maximum efficiency. I made a temporary buck for the nosecone aperture, moulding the Milliput around this. A mesh stone guard was made and fitted behind the aperture to protect the water radiator.

The nosecone was made up of two parts, the second smaller part comprising the removable hot air exit ducts slotting down behind the radiator (figure 16). This was achieved by marking and cutting out the required part and completing the ducts. Locating pins and Dzus fastener sockets were fashioned from brass rod and plasticard respectively. The top exit-ducts were removable, as in the real car, which revealed the cooling hoses in position and the radiator/subframe. The main nosecone could then be drawn off forwards, after the hoses had been pulled out of their side openings.

The winglets were modified versions from an M23 kit and included stout brass rods to affix them into a transverse aluminium tube within the nosecone.

<u>Airbox</u>

Here, perfection in dimension and every nuance of appearance was vital. This was made possible by photographing the shiny white airbox without flash. The airbox incorporated a small air duct fed via a mesh covered aperture approximately half way up the front edge below the main opening. This directed cooling air onto the midline alternator and fuel metering unit; McLaren thought of everything it seems! A plasticard basis for the airbox was built-up with Milliput, sanded, filled and finally sprayed with primer and Appliance Gloss White acrylic paint. The main air inlet was protected by a mesh insert, which in the real car served to prevent foreign material being ingested via the carburettor trumpets. The alternator cooling duct was also replicated. Four short sections of stainless steel rod acted as the pegs, onto which the scratch-built airbox clips would be secured.

Rear Wing

An M23 rear wing was adapted, with new plasticard endplates and additional aluminium fences on the undersurface (plasticard) to clean up air-flow under the wing centrally. Underneath, fittings for the attachment of the widely spaced rear wing stays, which originated at the gearbox final cover, were made.

On the M19C, the rear wing pillar was a fixed size/angle device with a limited amount of height adjustment made possible through the post hole at the top, immediately under the wing surface. The rear wing pillar is an asymmetric structure, which could not be reproduced simply by measuring. The model was placed accurately on a grid and the wing post supporting the rear wing itself was positioned in exact alignment, re height and distance from the rear monocoque surface (figure 17). Lengths of brass rod were superglued between the post and the attachment points on the rear gearbox cover. Plasticard segments spanned the areas between the brass rods, being strengthened with

Epoxy resin on the inner joints (figure 18). The lightening holes were drilled and the whole structure tidied-up (figure 19), before spraying satin black.

Engine and Gearbox

A Tamiya Ford Cosworth DFV was recovered from an M23 and super-detailed. The standard engine has vast potential for super detailing and this was taken full advantage of. The main areas for special treatment included the aluminium water pipes out of each cylinder head which then combined to form the single LHS external water pipe circulating water forwards to the radiator (figure 20). The water system was filled via the water header tank, which was attached to the right rear cam cover. Into the water header tank, narrow tubes from the right cylinder head water pipe and the forward radiator bleed pipe were fitted. The radiator bleed pipe originates on the right side of the forward water radiator (figure 21) and can be followed through the car, emerging from within the tank top recess via an elbow fitting, just inboard of the right leg of the roll-over bar.

The standard Hewland gearbox from an M23 was improved with clutch fittings, oil pumps, circulation pipes and the rear brake cable which splits under the gearbox. A satin black finish was applied to replicate the original chromated magnesium casting. A Hewland decal was applied on the rear case. The external clutch mechanism was supplemented by a simulated hydraulic clutch cable routed through the car from the clutch mastercylinder on the front bulkhead. Attached to the rear oil cooler frame on the left side of the gearbox, a semi-opaque Ford Transit van windscreen washer bottle served as an oil catch tank receiving overflow oil from the oil tank (figure 22). This was secured to the frame by a Jubilee Clip system. These items were scratch-built adding realism to the model. The starter motor was enhanced by adding a live input with an earth wire to the nearby gearbox case. Additionally, a stainless steel rod section improved the input shaft from the starter motor to the flywheel on the back of the DFV. A rear light was made, affixed on the oil cooler frame and wired into the electrical system.

The fuel-system was upgraded to include all the fuel-lines (1mm braided hose) between the mechanical and electric fuel pumps incorporating a scratch-built fuel-valve attached to the bottom left surface of the monocoque in close association with the fuel pumps.

The oil system required a scratch-built oil tank and oil-pipes from the first-feed to the engine (LHS), via the scavenge pumps (RHS) and rear oil coolers, back to the tank. Various sized braided hoses and after-market hose-ends sufficed. Some were rubber sheathed in reality, to prevent vibration chaffing. The oil coolers were scratch-built from plasticard and curtain-net (core) (figure 23). Fine mesh within a rectangular metal frame was used to replicate the stone-guards ahead of each cooler. An oil pressure line and temperature sender were secured on the oil pipe fittings, closely associated with the oil pump (LHS engine) and routed forwards to the oil pressure sensor (within tank top area) and dashboard oil pressure and temperature gauge respectively.

The two water pipes were made from 3.5mm brass rod, annealed and then formed to the lower chassis sides. These were then dry-fitted to the monocoque to assure comfortable connection to the water radiator and engine (figure 24). Later, these were sprayed with aluminium paint and secured to the monocoque via stout wires bonded into them. The plasticard and curtain net front water radiator was built-up and attached to a plasticard crafted subframe, to link into the crossbar within the nosecone. These parts needed to be robust in the real car to convey aerodynamic loads through the nosecone and winglets via the radiator subframe into the monocoque itself.

The water temperature sender can be seen on the water pipe shortly before entering the radiator on the left side. The temperature was relayed via a capillary tube to the dashboard water temperature dial and this is represented by the presence of a fine twisted wire cable in the model.

Exhausts

Reproduction of the unique character of the M19C exhausts, was achieved by using a suitable flexible tubular material through which 1mm copper wire was threaded, enabling the bends in the primary segments to be replicated. Mirror-image pairs were made and attached to the four-into-one sections ahead of the 5mm aluminium tail pipes. After dry fitting, exhaust clamps were made from plasticard and each pair of exhausts sprayed in matt black, with a pale grey colour inside the open tail pipe to represent normal appearance of a healthy DFV. These were finally fitted once the engine, gearbox and rear suspension were in place and the tail pipe securing loops were present. The exhausts correctly represented, are one of the main features giving the model the right 'look'.

Suspension

Front suspension parts

The upper wishbones from an M23 were adapted by altering the shape and position of the fulcrum for the concentric coil/damper units. The lower wishbones were essentially scratchbuilt items based on photos and measurements from the real car in the workshop (figure 25). For these, 1.6mm diameter aluminium tube was used, being ideal for the rearward radius arm, the broader forward part being constructed from aluminium tube and plasticard, finished in Milliput and detailed with bolt heads. Inboard rose joints were fashioned producing an appearance of mechanical authenticity. These articulated by means of 0.9mm brass rod into the aluminium pick-up points originally incorporated into the front bulkheads. In this way, the suspension was robust and behaved naturally. The front uprights were modified from those of the M23 and superdetailed with respect to trackrod attachment plates and brake fittings. The stub axle system was enhanced over the usual Tamiya screw, which secured each wheel. Wheel nuts were made from Milliput resin and colour-coded left and right as threads were 'handed' to prevent rotational unwinding. Scratchbuilt brake ducts were made from plasticard and Milliput then sprayed gloss black to represent the fibreglass original.

Rear suspension parts

The crossbar above the gearbox, was scratchbuilt from brass rod (JB welded together) and plasticard, retaining a sturdy functional role (figure 26 and 27). These had very complex contoured surfaces underneath to allow for a range of movements for the top links and damper attachment points. The crossbar was therefore similar in concept to that of the later M23, but the different geometry was a challenge to reproduce. The rear uprights, subframe under the gearbox, coil/damper units and A-frame lower wishbones were all taken from the M23, however finer and more pleasing antiroll bar and links, radius rods etc were derived from aluminium/steel tube, being sprayed semi-gloss black.

Wheels

Fortunately, M19C wheels were essentially carried over to the M23 in 1973. Unpolished cast black magnesium wheels were treated to an appropriate selective polishing in 1972. For this model, the polished effect was achieved by selective spraying of the M23 wheels with a mixture of Alclad II Chrome and Magnesium lacquers.

Finishing Details

The 2-D acetate windscreen is temporary, with a 3-D version intended in the future. This 2-D screen was made using trial runs with light card, before committing to acetate. In

1972, chrome plastic mirrors were used and so early 1974 M23 mirrors were harvested from the spares-box. These were accentuated using 'Mirror-glass' (thanks to Richard Hewer) and supported on Alclad II Chrome lacquered supports. Small dark fittings either side of the cockpit to enable the driver to push himself up and out of the cockpit were replicated and fitted. Four airbox retaining clips were carefully constructed and attached to tiny rings fixed on the top edge of the cam-covers. The airbox was further prevented from lifting up and off by merit of a stout rod on the underside of the forward opening. This located in a welded fitting on top of the roll-over bar. Flexible hoses were made to attach securely to the front bulkhead panel. These conducted cockpit cooling air from the otherwise ambiguous ears on the nosecone perimeter. The water pipes had their aluminium retention straps replicated and riveted into the monocoque sides, greatly improving their look.

Decals came from a variety of sources, namely the spares box, Mike Hailwood's 1974 M23 and others were photographed digitally from the actual car and reproduced on a PC and printed on inkjet decal paper (thanks to a good friend, Pat). Race numbers posed a problem, his winning car at Kyalami, being an M19A rather than the M19C as modelled here, so I chose Watkins Glen (USA), car number 19 appropriately, where Denny finished third in 1972.

<u>Conclusions</u>

This was an immensely satisfying project, which relied on prolonged access to a real car, understanding and patience from former F1 mechanics for whose generosity of spirit, I am very grateful. A great deal of commitment and application over a two-year period was required. Inspiration and encouragement was very much appreciated at various points along the way; from Ralph Bellamy and Gordon Coppuck, modellers from the UK and abroad and from my wife Rosalind. Though each part was very carefully scaled-down, it was always necessary to keep sight of the car as a whole to preserve the right 'look' and allow just a little flexibility here and there. Both Ralph and Gordon have seen the car and my good friend Leo Wybrott who built the first chassis in 1971. All have greatly enjoyed the nostalgic opportunity to recall their earlier years in F1.

References

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