

# Porsche 936-001

## Restoration & History



Philip Basil



# PORSCHE 936 - 001

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Photography: Nat Twiss & Lee Maxted-Page

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# THE RESTORATION OF 936 - 001



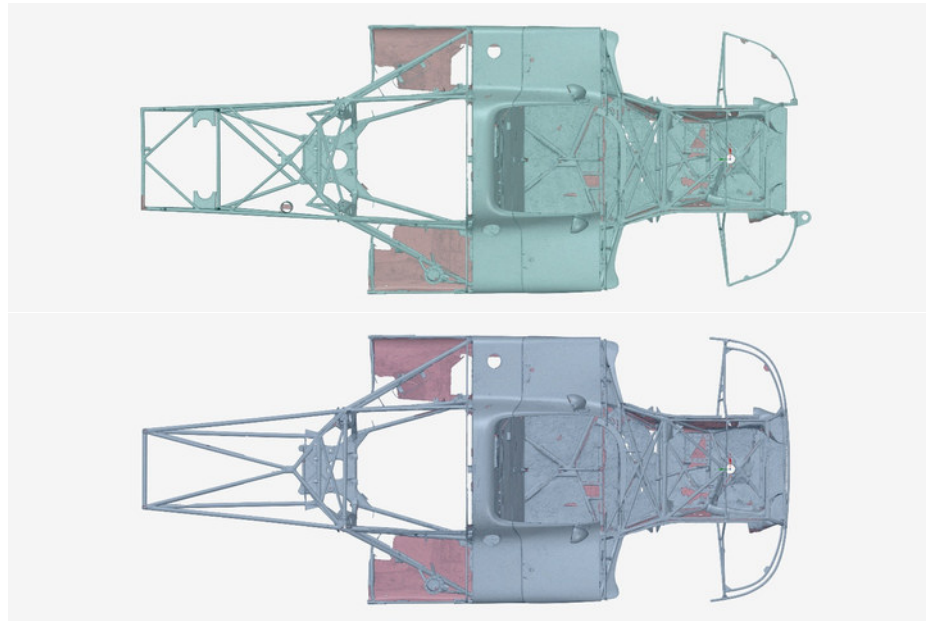


After their racing days were over all three of the works 936s, each one a Le Mans winner, were retired to the Porsche Museum in Stuttgart. 936-001 became the only one to escape into private hands when in the late 1980s American collector Tom Trabue agreed to swap it for his prototype 550 Spyder. It is not clear who pursued who in this transaction, but from Trabue 936-001 travelled through the well-known Porsche collections of David Morse and Julio Palmaz until the current owner bought the car in 2011. It had been on static display for many years and was still wearing its original Jules livery from 1981.

For several years the owner pondered on what he should do with 936-001. It was remarkably original being largely as it last raced, however three decades had since passed and it was no longer fit to be driven in anger. An extensive overhaul was going to be necessary if the car was going to travel at racing speeds again and that would require the car to be completely disassembled. A sense that cars need to be used rather than just looked at argued for rebuilding it. Thoughts turned to using the opportunity to reinstate the car in its victorious 1977 Le Mans form. That race, reckoned by

many to be the best of Jacky Ickx's glittering career, is now a part of both Porsche and Le Mans legend. It seemed that returning 936-001 to this point in its life was the right thing to do.

The car was fitted with a 2.65 litre four-valve 1981 spec engine but fortunately also had a spare 2.1 litre two-valve 1977 version. However, putting the car back to its 1977 state would be much more involved than simply swapping the engines and changing the livery. The 936 was modified extensively by Porsche to accept the more complex partially water-cooled later engine and this would need to be reversed. The aerodynamics were also revised with new front and rear body sections and rear wing. Lee Maxted-Page and his UK based company Maxted-Page Limited, which specializes in historic Porsche race car restoration, gave careful consideration as to the feasibility of the task, and they consulted with Jürgen Barth, erstwhile 936 driver and member of the Porsche race department during the 936 era. In 2017 the decision was made to proceed, and Maxted-Page were given the green light.



**Opposite page, left and above:** 936-001 before restoration and as last raced, in 936/81 specification. The car received continuous updates throughout its racing career, including the installation of the partially water-cooled engine. As a consequence the chassis, body and even the cockpit had been modified. All this would need to be reversed back to the 936/77 spec.

**Above right:** The existing rear chassis section (in teal) had to be rebuilt to 936/77 specification (in blue) using scanned data from 936-002. Fortunately, Porsche made the 1981 tail section removable to aid repair, so no permanent alteration to the original chassis was necessary.

**Right:** Project consultant Jürgen Barth discusses the original factory drawings of the 936/77 with the Maxted-Page team.

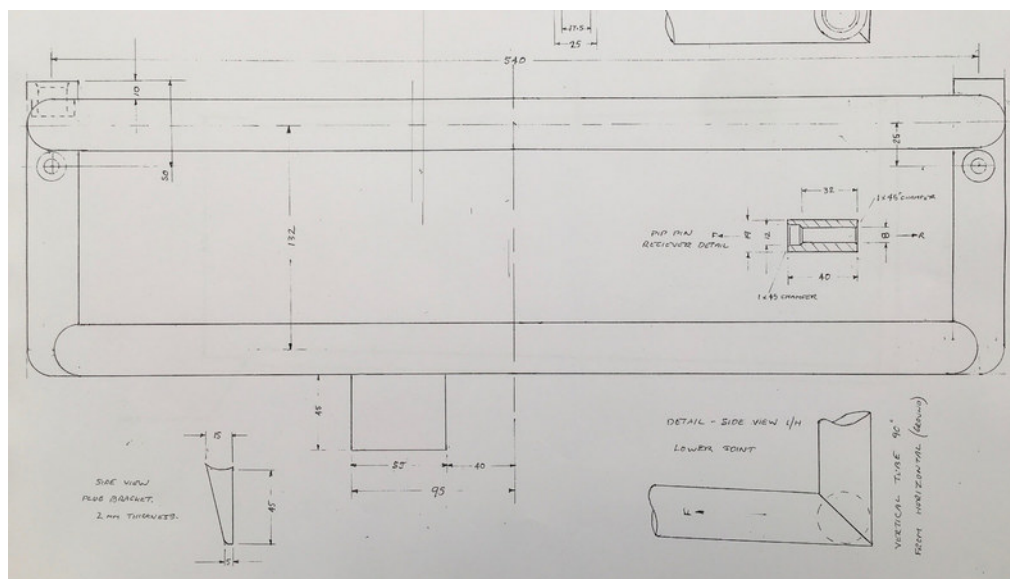


From the beginning of the restoration process the Porsche Museum offered their full support and co-operation. 936-001 is an important part of the company's heritage and they were as keen as anyone to see the car completed as accurately as possible. As anybody who has restored an old car knows, the key is understanding precisely what you have and what you are aiming for. To that end the Maxted-Page team could not have wished for a better reference. 936-002 finished its racing life in 1978 and had sat in the Porsche museum ever since. Porsche never updated it to run the four-valve engine and it was still in its completely original 936/77 specification. Porsche generously gave the team full access to their car, and they spent several days examining, measuring and scanning it in detail.

Porsche also provided Lee Maxted-Page, who led the research side of the project, with sight of the original chassis file for 936-001 held in their archives. This contained all the technical specifications and development upgrades for the whole of the car's racing life. 936-001 has had many different engines and gearboxes installed but the records showed that the 2.1 litre engine now with it had actually been in the car when it was first tested

at Weissach in March 1976. Furthermore, the gearbox was the one that it had used at Le Mans in the same year. "Matching numbers" is not a relevant concept for a racing car such as this, but there is a sense of completeness that emanates from components that were actually on the car at an earlier time in its life.

The first step was to disassemble 936-001 and then catalogue and preserve all the 936/81 parts that were not going to be used in the restored car. Once the chassis frame was exposed it was digitally scanned in 3D so that its exact form was captured for posterity. It was fully inspected and repaired where necessary. The 1981 car had a longer tail than the 1977 version and this was supported by a redesigned bolt-on rear chassis section. Using measurements from 936-002, a chassis jig was constructed so that once this section was removed it could then be re-instated with the correct 1977 layout. The new rear chassis tubes were made from the same gauge of aluminium alloy as had been used originally and were gas welded using the factory technique. Elsewhere on the chassis various brackets, such as the structure holding the fuel filler mechanism in place, had to be moved. The dashboard panel also



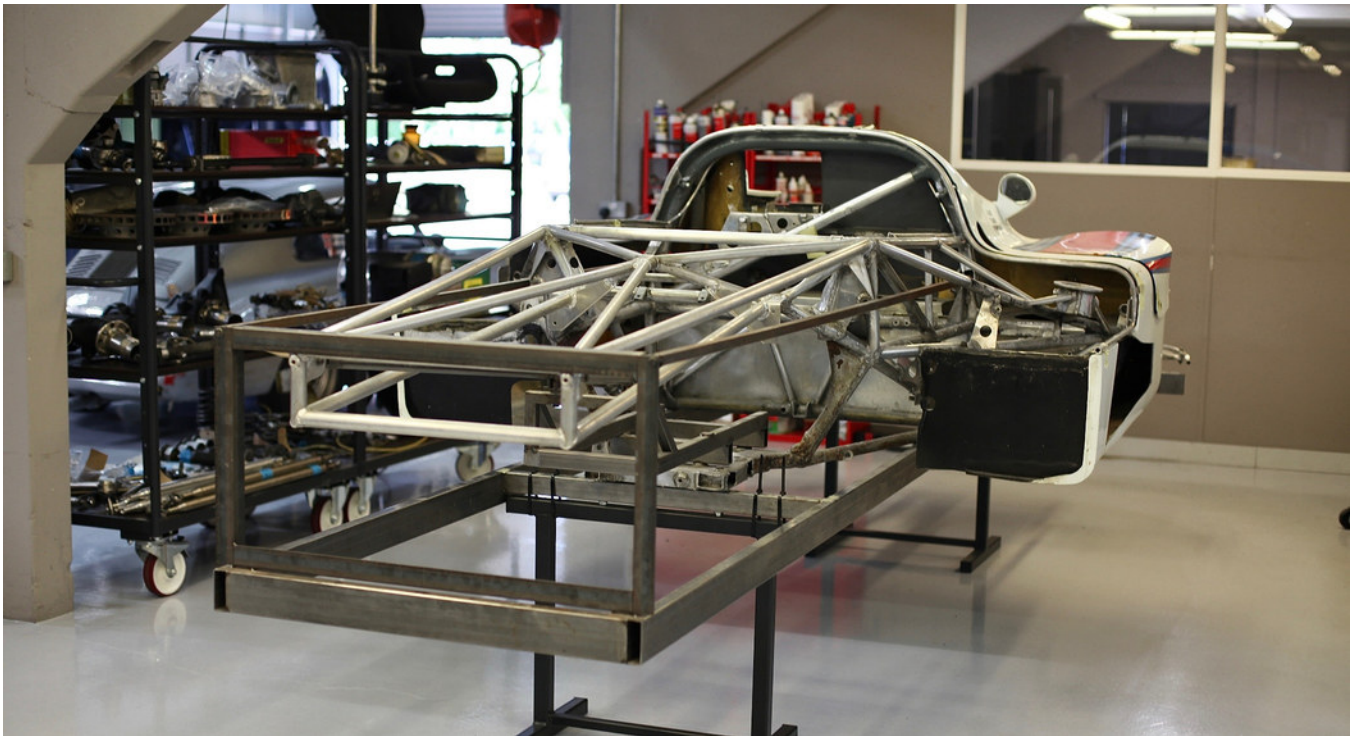
**Left:** One of a set of technical drawings made to aid construction of the new 1981 type tail section.

**Opposite page, top left:** the air cooled and water cooled versions of the 936 had different dashboard layouts. A new dash had to be constructed with reference to period photographs.

**Opposite page: top right:** Paul Machin, who was responsible for much of the work on the chassis.

**Opposite page, bottom:** The new rear chassis section was constructed with the aid of a specially built jig.





had to be replaced as the instruments and layout were different between the early air-cooled and later water-cooled versions of the car. Once the chassis revisions were completed 936-001 was rescanned, allowing comparison between its two forms.

The front and rear sections of bodywork were unique to the 936/81, so the car needed re-clothing in its 1977 apparel. When purchased 936-001 had come with a rough set of spare 936/77 bodywork that had been made from moulds taken off 936-004, also still a 936/77 spec car. These panels were far from finished but were a worthwhile starting point. Specialists EB Motorsport joined the Maxted-Page team to assist with all of the fiberglass related work.

Digital scans of 936-002's body and careful study of period photographs indicated that there were small detail differences between it, 936-001 and

936-004. The cars were all hand made at different times so it would perhaps have been more surprising if they had matched exactly. However, 936-002 did give important information on many details including how the rear wing was constructed. Its adjustment mechanism was reproduced in millimetric detail.

The centre bodywork section of 936-001 was bonded to the chassis and had survived with some modification from the original genesis of the car. The large NACA ducts cut into the sides for the now defunct water radiators needed to be closed up and an access window in the bulkhead created in 1978 similarly had to be covered over.

The entire floor of the car had also been in situ since its creation. Unfortunately, the fiberglass and honeycomb composite it was made from had become contaminated with oil and water over the years which had

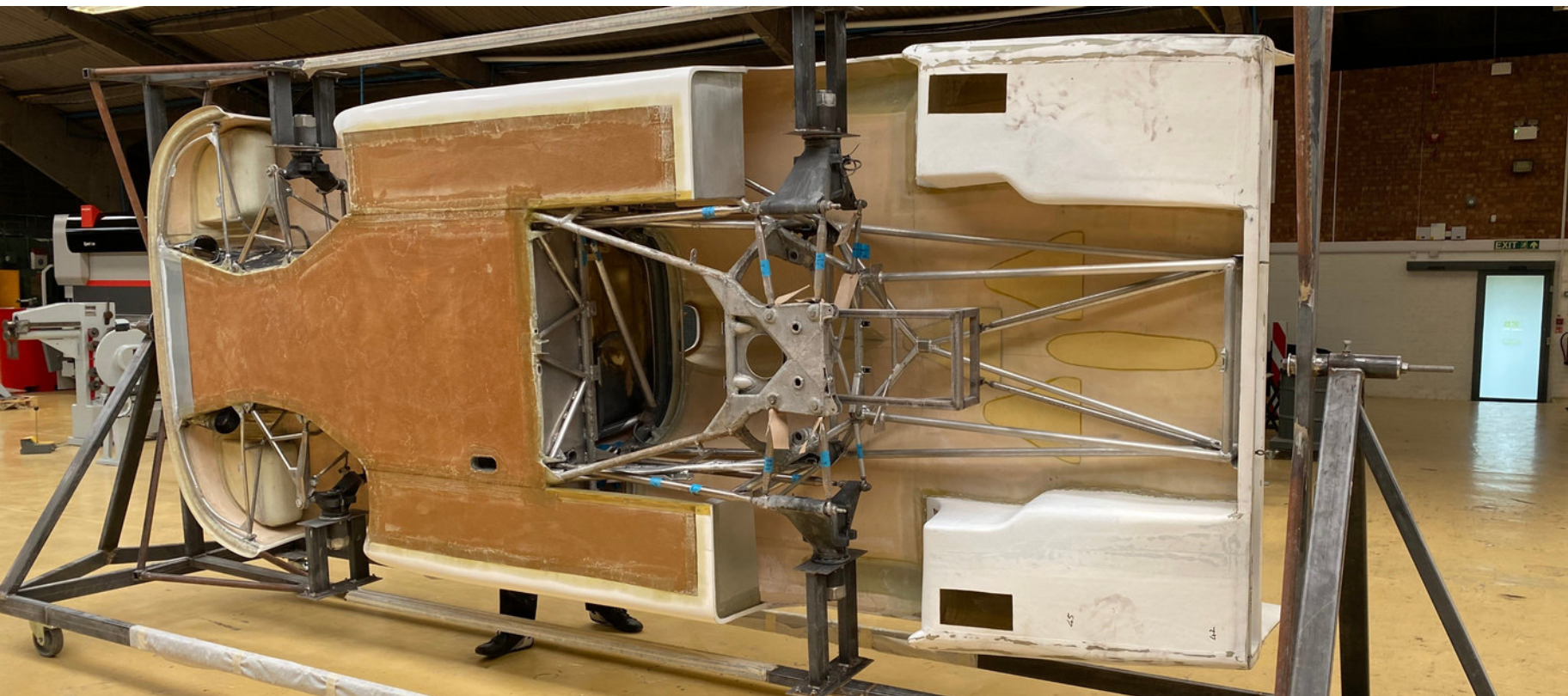


**Opposite page, left:** The NACA ducts that fed air to the side water radiators of the 1981 spec car had to be removed.

**Opposite page, right:** The glass-fibre composite floor was original to the car from its first incarnation as a 936/76. Unfortunately it had suffered from years of oil and water contamination and had lost its structural integrity.

**Right:** New honeycomb laminate was made to match the pattern of the original material.

**Below:** A bespoke rotisserie was built to allow the new floor section to be attached to the chassis.

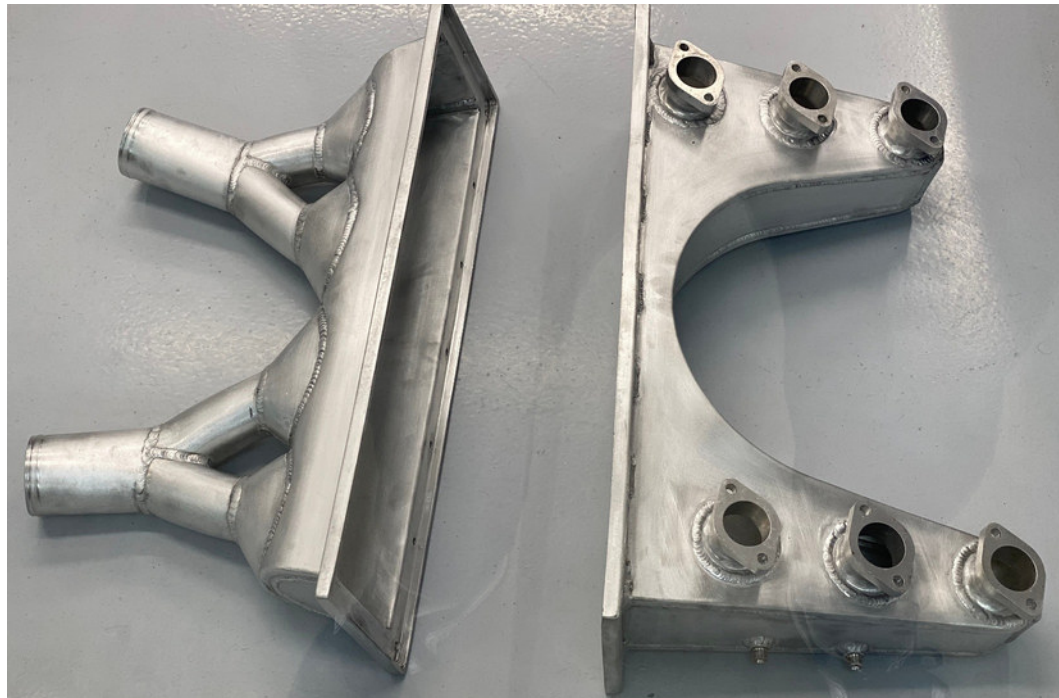




**Above:** Original 1977 spec ducting components were digitally scanned from 936-002. These data files were used to create aluminium moulds from which perfect glass-fibre copies could be made.

**Below:** The 1977 spec intercooler was also re-manufactured exactly, weld for weld, using a 3D scan from 936-002.

**Right:** The disassembled internals from the Typ 911/78 engine were in perfect condition, including the lightweight crankshaft and titanium connecting rods. The rods were replaced as a precaution.



caused it to de-laminate and lose its structural integrity. To produce an exact replacement material, honeycomb with the correct pattern had to be manufactured and then laminated with glass-fibre of the right weave.

A myriad of other glass-fibre parts had to be manufactured to match scans taken from 936-002. These included the turbo air intake ducts, the air-box internal ducting, the rear wing planes and the under-body NACA ducts. Data for the relevant part from the digital scan of 936-002 was fed into a state-of-the-art CNC milling machine. This then created a negative 3D image from a billet of aluminium which then served as a mould for the glass-fibre. Careful attention was paid to the way the fibre was laid and the resin was tinted to match the original glass-fibre still on the car.

The mechanical aspects of the restoration were led by Adam Lichtig, Maxted-Page's workshop director. The condition of the engine was unknown, so it was

decided to fully rebuild it as a precaution. It contained all the rare racing parts that you would hope to find such as a lightened crankshaft, titanium conrods, special cylinder heads and valves, and original pistons and cylinders. Most components were in good enough condition to be re-used, the exception being lifted titanium parts like the conrods which were replaced like for like.

However, the engine did not come with a 1977 induction or exhaust system, which was quite different from the later version already on the car. Again, the team referred to 936-002 and used scan data to fabricate a new intercooler plenum and exhaust system.

When the car was reassembled the Maxted-Page team managed to retain most of the existing running gear. Where they couldn't it is now very hard to tell. The suspension was crack tested with only the aluminium radius links and front suspension arms needing replacement. The fuel tank safety bladders were ancient – indeed one was dated 1976 - so had to be replaced but the tanks



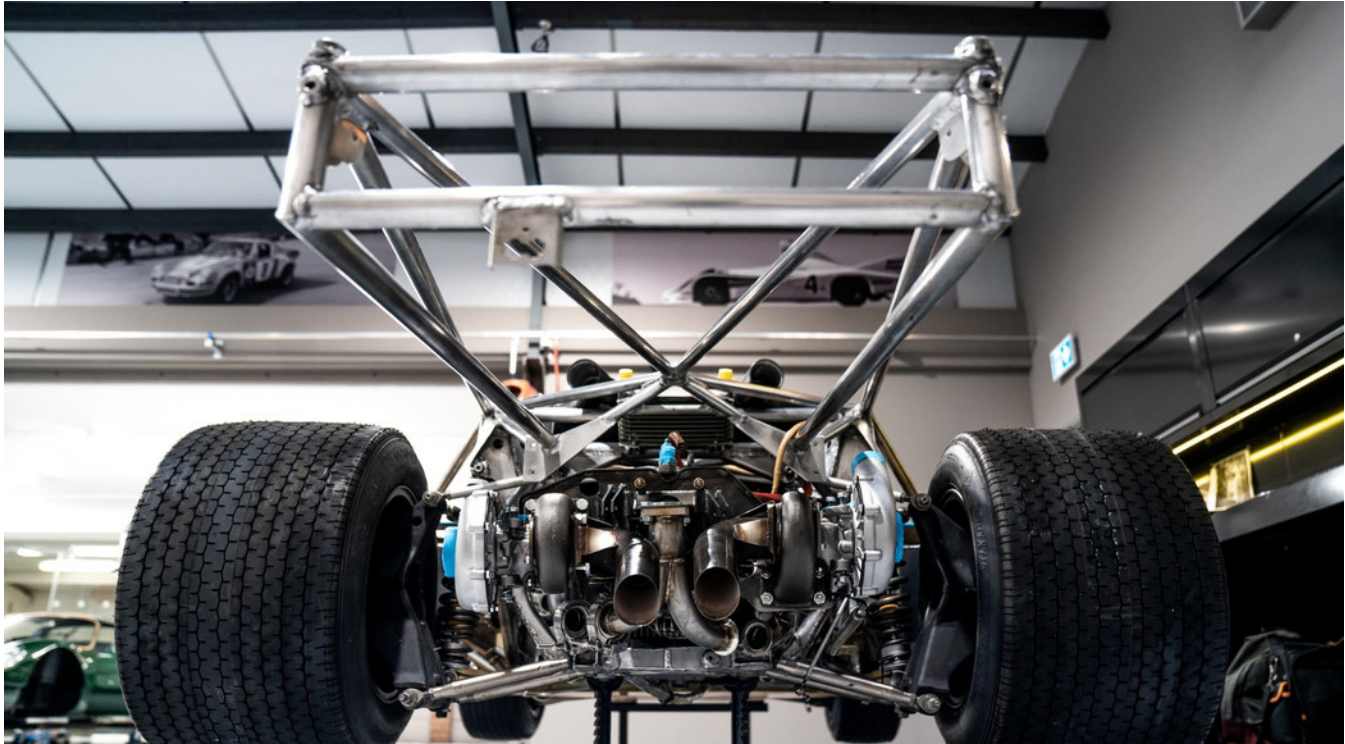
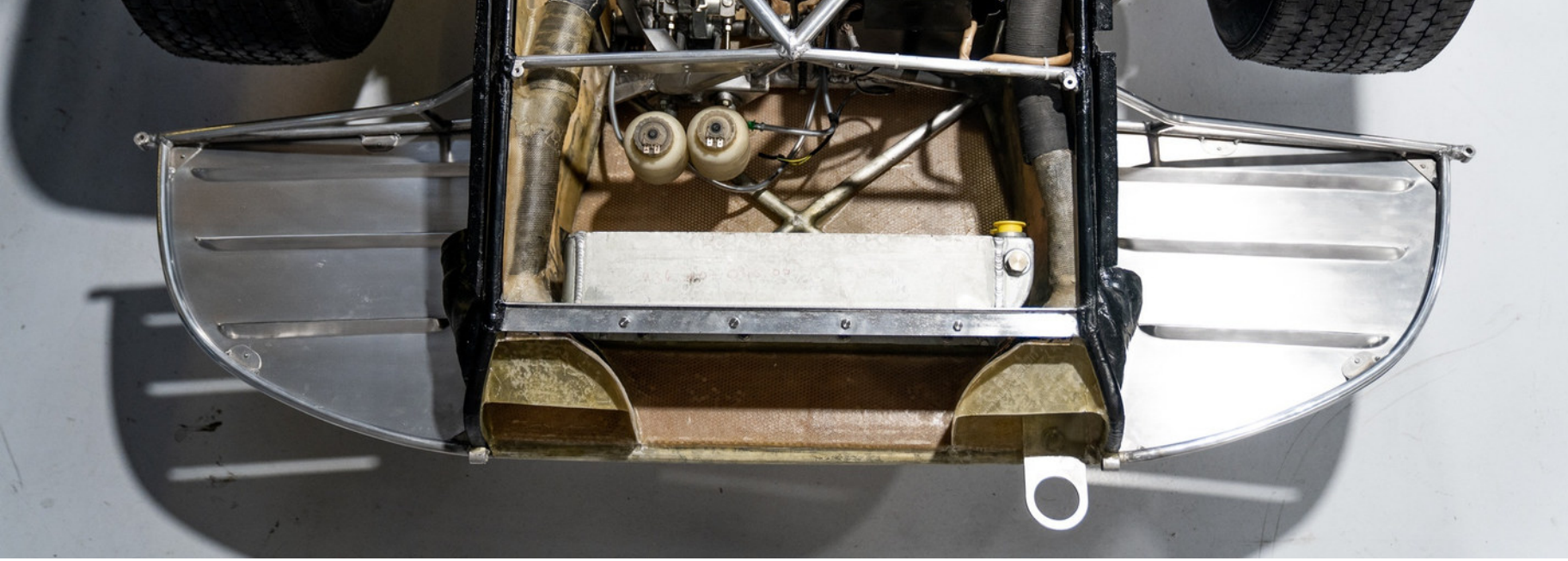


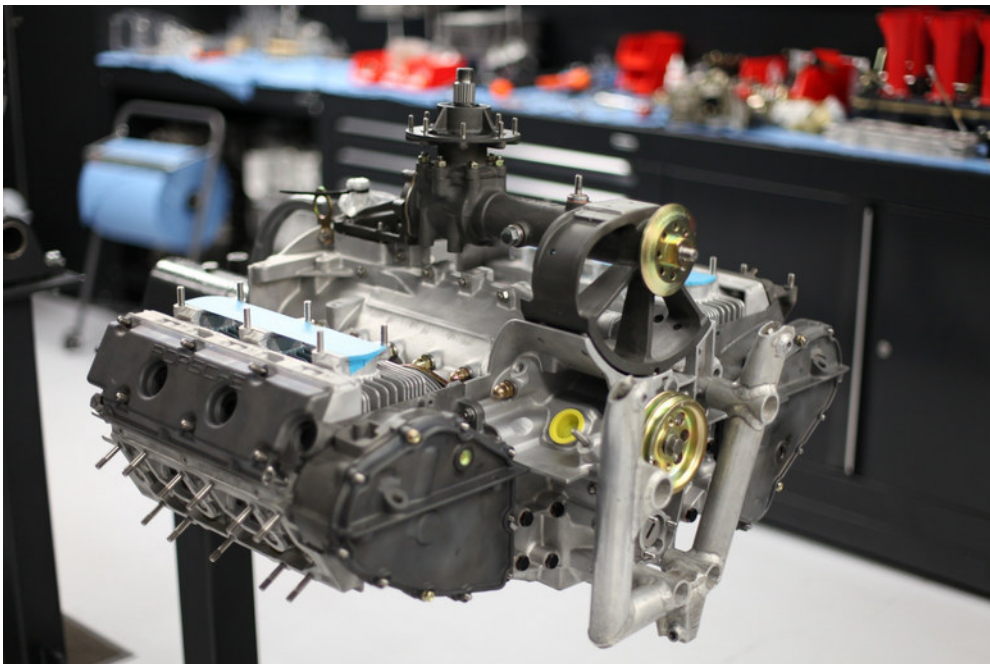
**Above:** The original tail of 936-002 pictured at the Porsche Museum (left) and the newly created tail of 936-001 (right). All of the under-body ducting was reproduced from 3D digital scans .

**Left:** Twin KKK turbochargers.

**Opposite page, top:** The front outriggers and nose section were recreated in 936/77 specification.

**Opposite page, below:** The new rear chassis section carries the down-force created by the huge rear wing. The factory welding technique was faithfully reproduced.



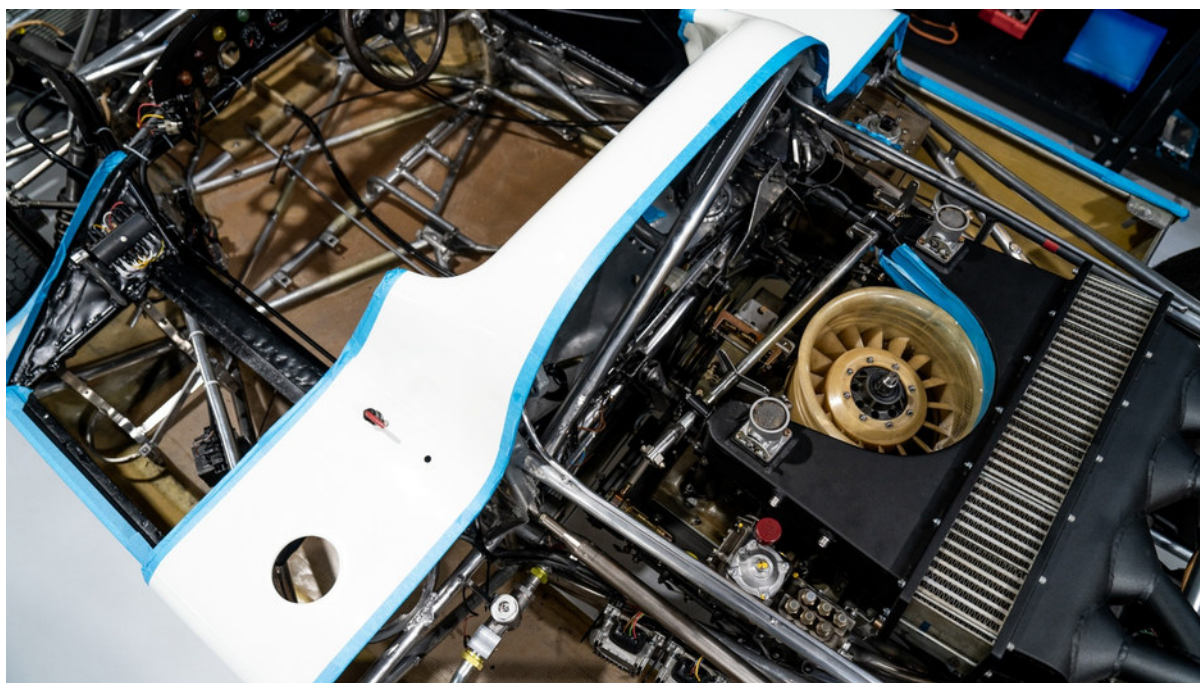


**Left:** The 2.1 Litre single-turbo engine that was used in 936-001 during 1976. The mechanism that cleverly uses the vertical belt to drive the horizontal cooling fan is the most noticeable change from the 911 production unit.

**Below:** The rebuilt engine re-installed into the chassis. The new intercooler, complete with intricate inlet pressure release valves, sits on top of the engine.

**Opposite page, top:** The control wheel used by the driver to limit the maximum turbo boost available from the engine. In 1977 Ickx threw caution to the wind and turned this very control to maximum in his chase for victory.

**Opposite page, bottom:** Neil Melliard and his son Marcus paint the iconic Martini livery by hand in much the same way as it would have been done originally.







themselves were re-used. Similarly, most of the electrical system is still the one that carried the spark to the engines that circulated Le Mans so many times. The oil lines had to be changed but they wear period style fittings perfectly reproduced down to the engraved Argus labelling.

The more you look at 936-001, the more there is to see, for it contains some truly exquisite details. Porsche may have used their old 917 stock to create much of this car – but what a parts bin they had to choose from. There are signatures from the 917 era everywhere, be it the mechanical rev-counter with its attendant gob-stopper warning lights, the titanium driveshafts running through the magnesium uprights, or the drilled wheel hubs with long-distance brakes. Few other manufacturers of that time took such pride in the engineering of every single component of a racing car. The 936's rival, the Alpine-Renault A442, while benefitting from a much larger budget, looked industrial by comparison.





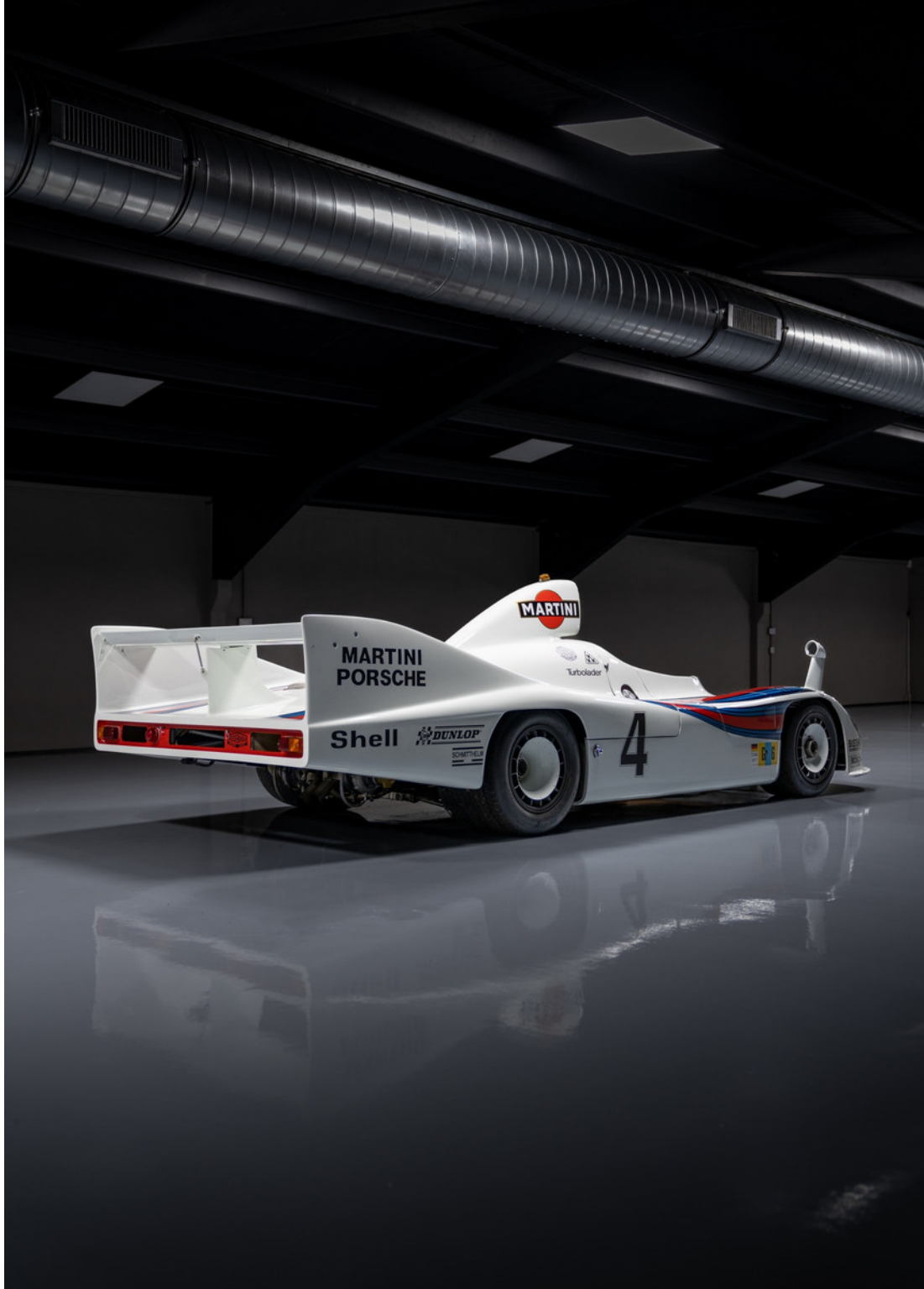
**This page:** The entire Martini livery, including sponsor logos, was hand painted. The brush strokes of the artists are still visible on their rather unusual canvas.  
**Opposite page:** Lee Maxted-Page and Adam Lichtig with 936-001 in its final finished form. The car underwent high speed testing at the Millbrook proving ground.

The final challenge for the Maxted-Page team was the painting of the car. Not so much the Grand Prix White Glasurit that covers most of it, but the famous Martini livery that always seems to enhance the looks of any car it is applied to. Back in 1977, the famous swirling stripes were painted onto the plain white bodywork by hand so that was how it had to be done this time. It seems an impossible task for someone to replicate a complex arrangement of compound curves on such an irregular surface by eye from photographs. But Maxted-Page know a genius in this field, Neil Melliard, who has done work like this for them before. It took many days of careful masking, checking and re-checking but the end result is fabulous and most importantly authentic.

Of all the 936s, 936-001 is the one with the richest past. It was the first one, the most tested and developed, the one that competed at Le Mans more than any other, and the one that scored the most famous victory. Too often restoring something can turn it into a pastiche of what it has previously been. Similar maybe but lacking connection with what has gone before. Not in this case. The finished car still seems infused with history, hinting at stories it could tell. Every part be it untouched, refurbished or replaced, sits comfortably with every other as if they have always been that way. This car bears an air of experience. And that is to the enormous credit of all those involved in its restoration.









# THE RESTORATION TEAM

## **Maxted-Page Limited**

Lee Maxted-Page  
Adam Lichtig  
Paul Machin  
Martin Nichols  
Mark Hazer-Jones  
Patrick Cummins  
Paul Johnson  
Robbie Crowley  
Melanie Sharp

## **Jürgen Barth**

## **Porsche Museum Archives**

Frank Jung  
Alexander Klein  
Jens Toner

## **EB Motorsport Limited**

Mark Bates  
James Bates

## **Competitions Fabrications**

Richie Bensley

## **Melliard's Modern Pinstriping & Lettering**

Neil Melliard  
Marcus Melliard

## **Fica Frio**

Simon Harper

## **ERG Media**

Nat Twiss

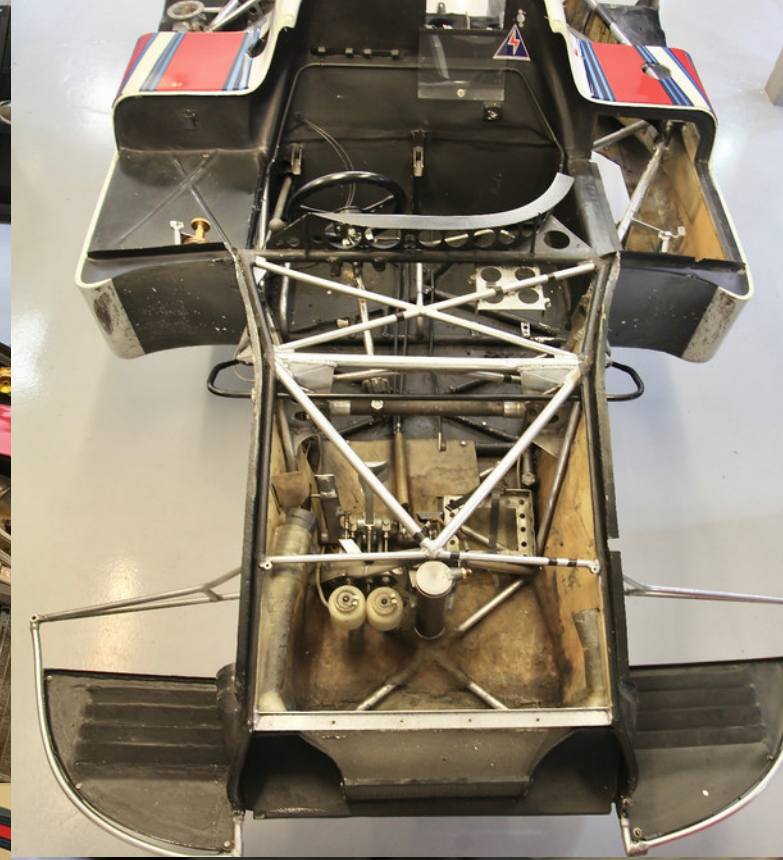
## **Ian Jones Racing**

## **S-Scan**

BEFORE RESTORATION

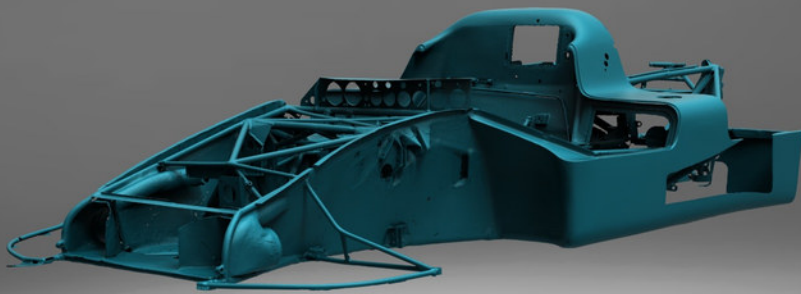
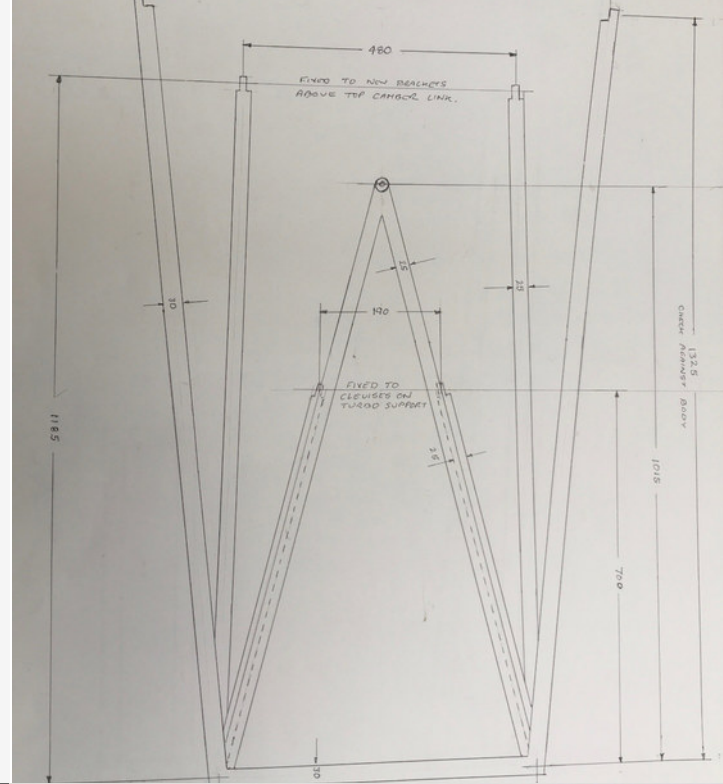
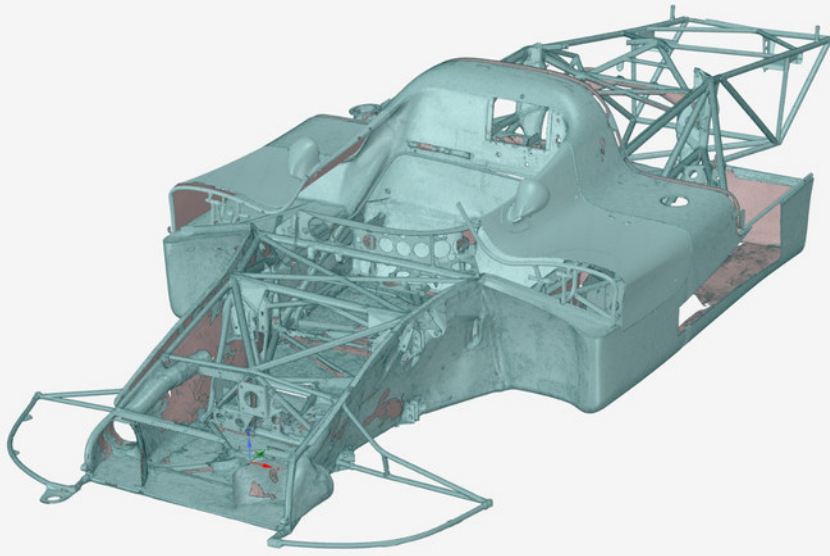






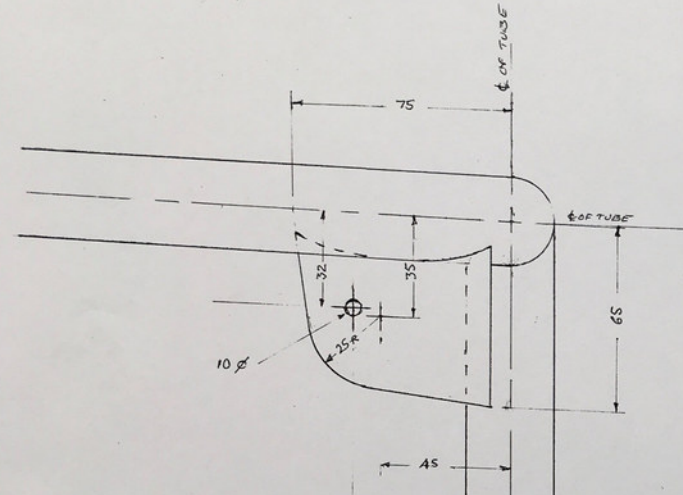
## PLANNING AND DISASSEMBLY



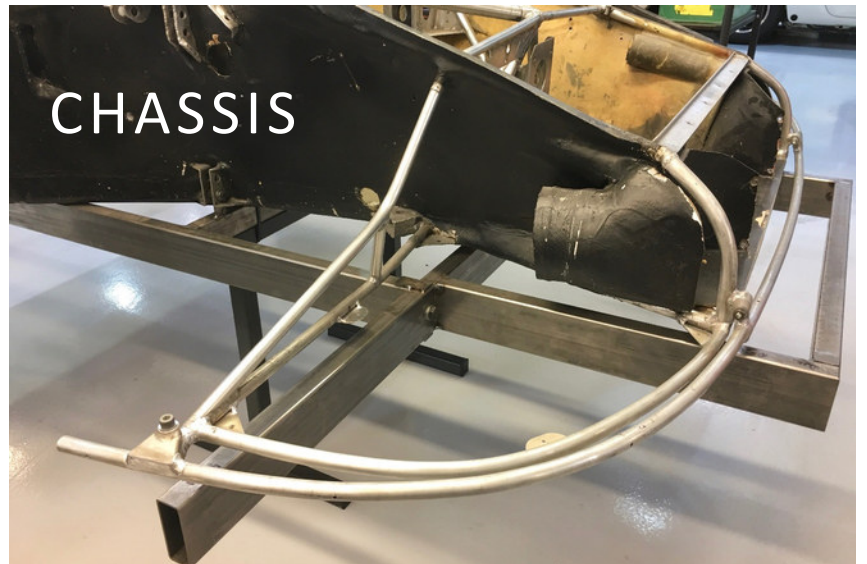
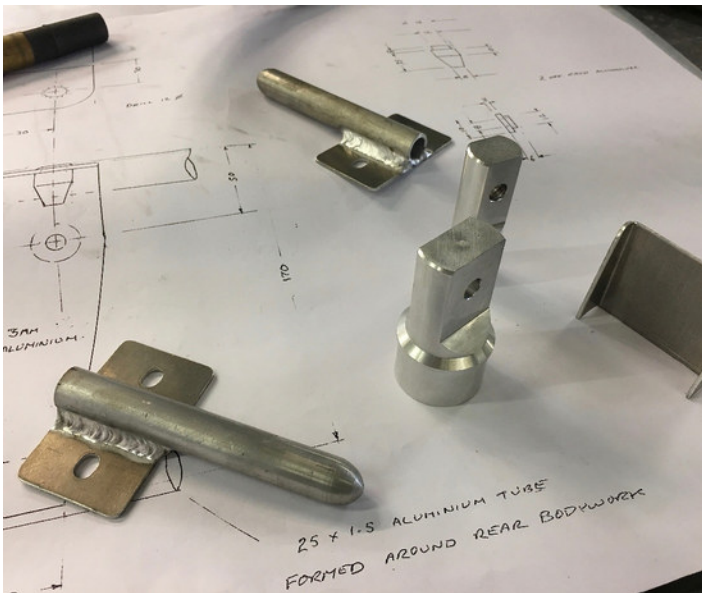
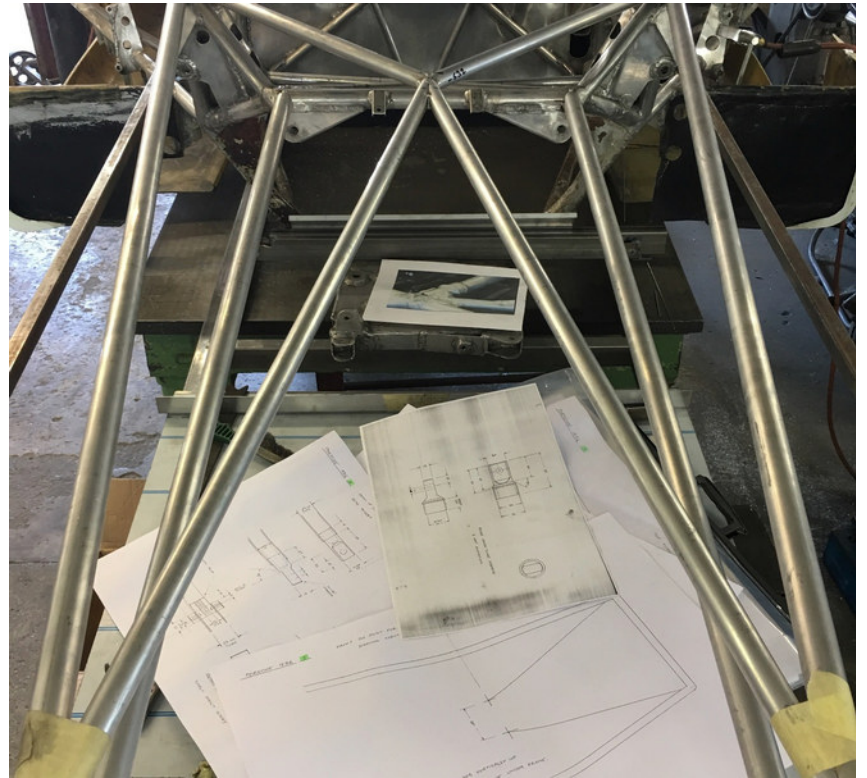


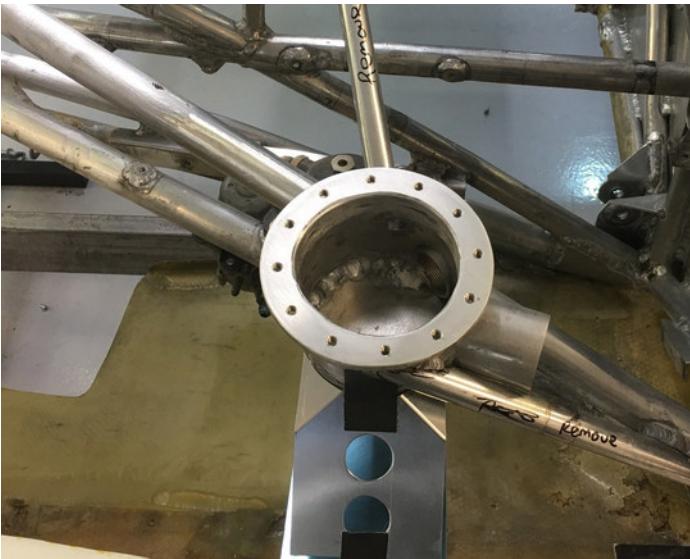
PORSCHE 936 4

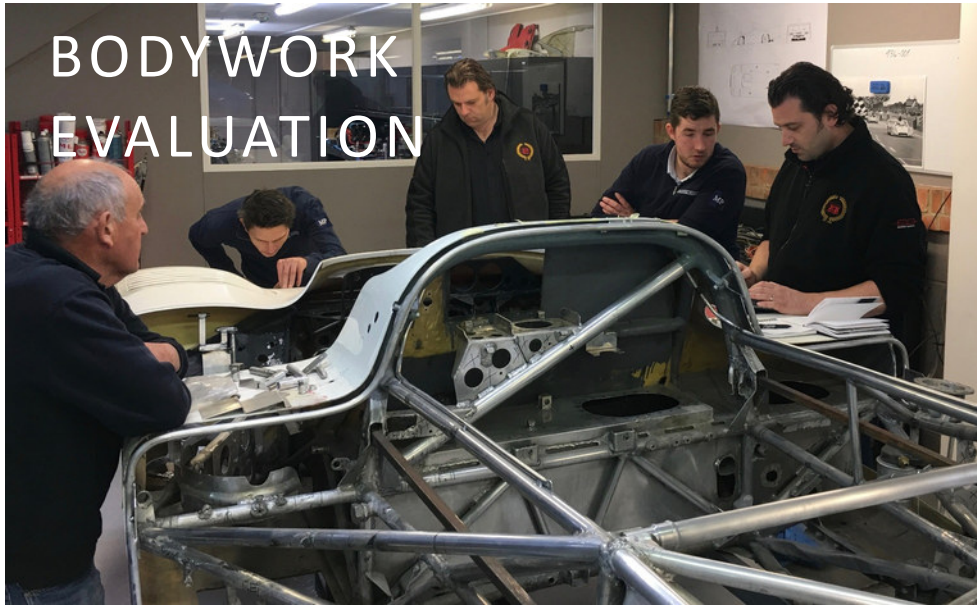
DETAIL OF DIAGONAL TUBE  
BRACKET. 3MM MATERIAL THICKNESS



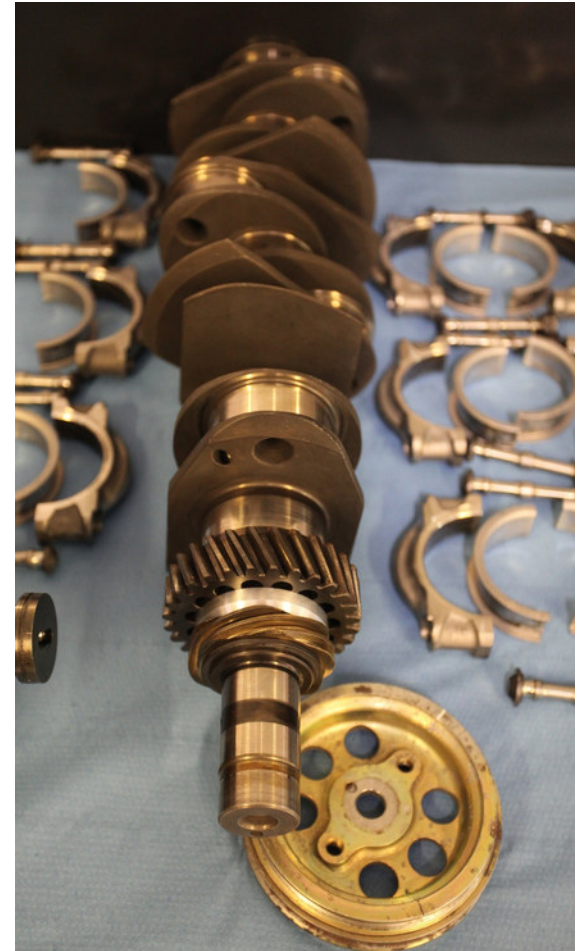
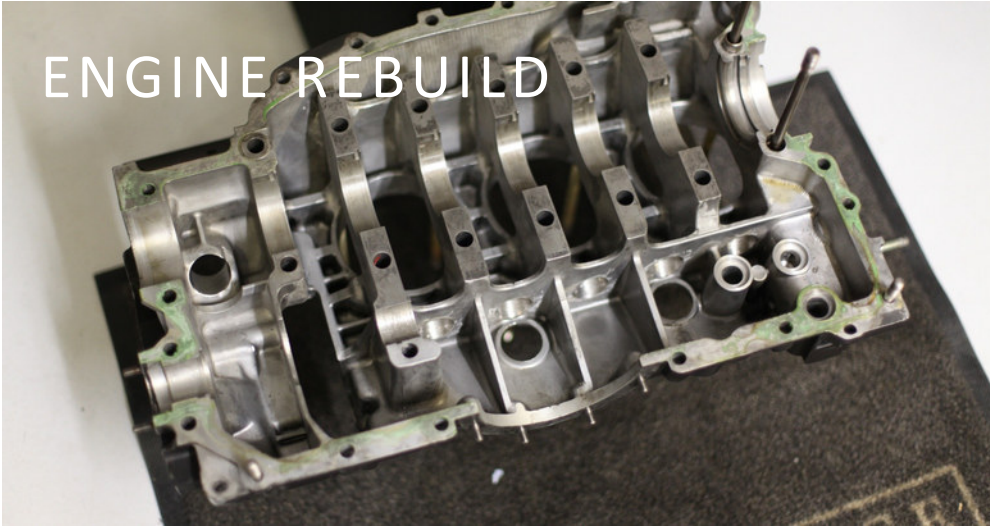
3D SCAN & TECHNICAL  
DRAWINGS

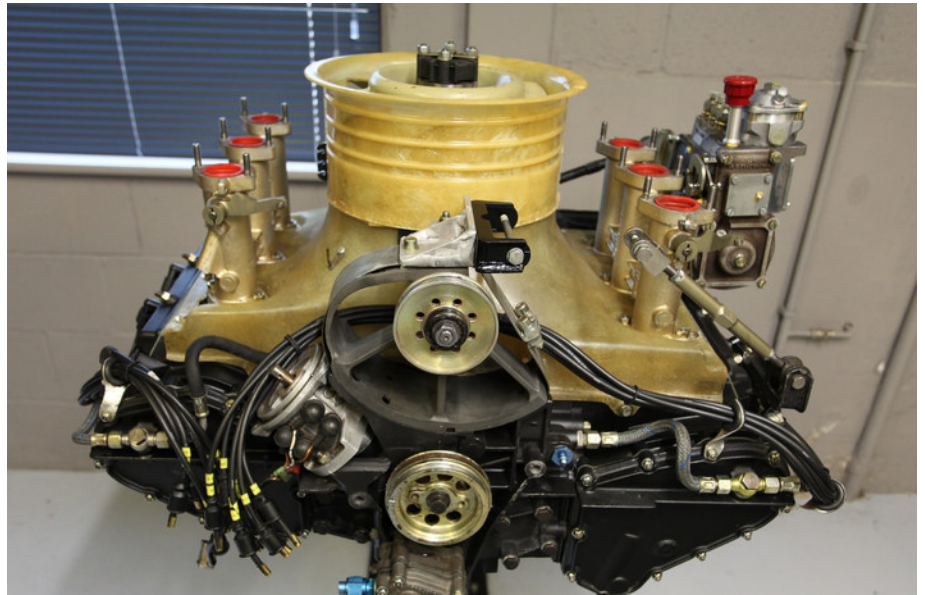
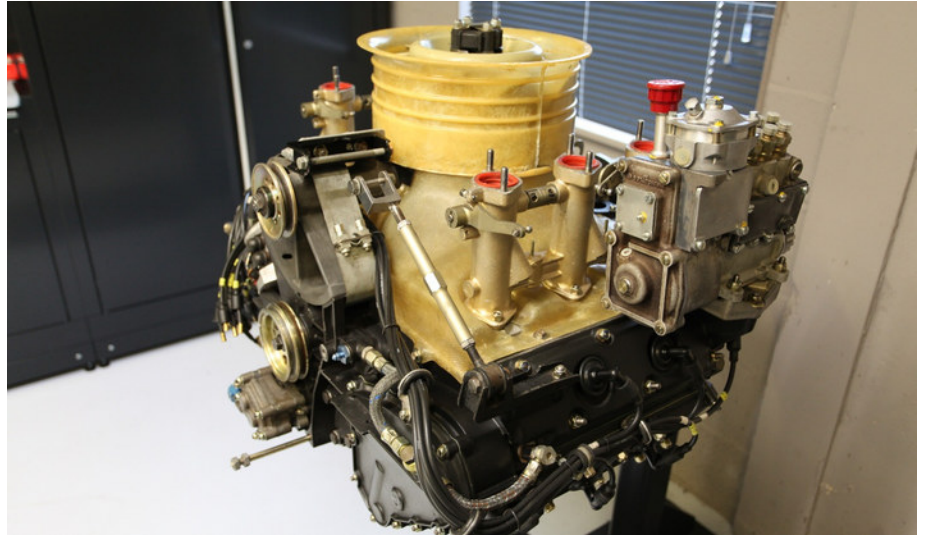
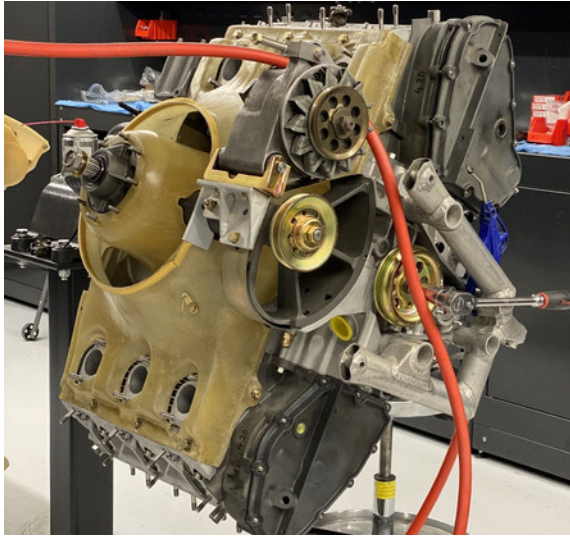


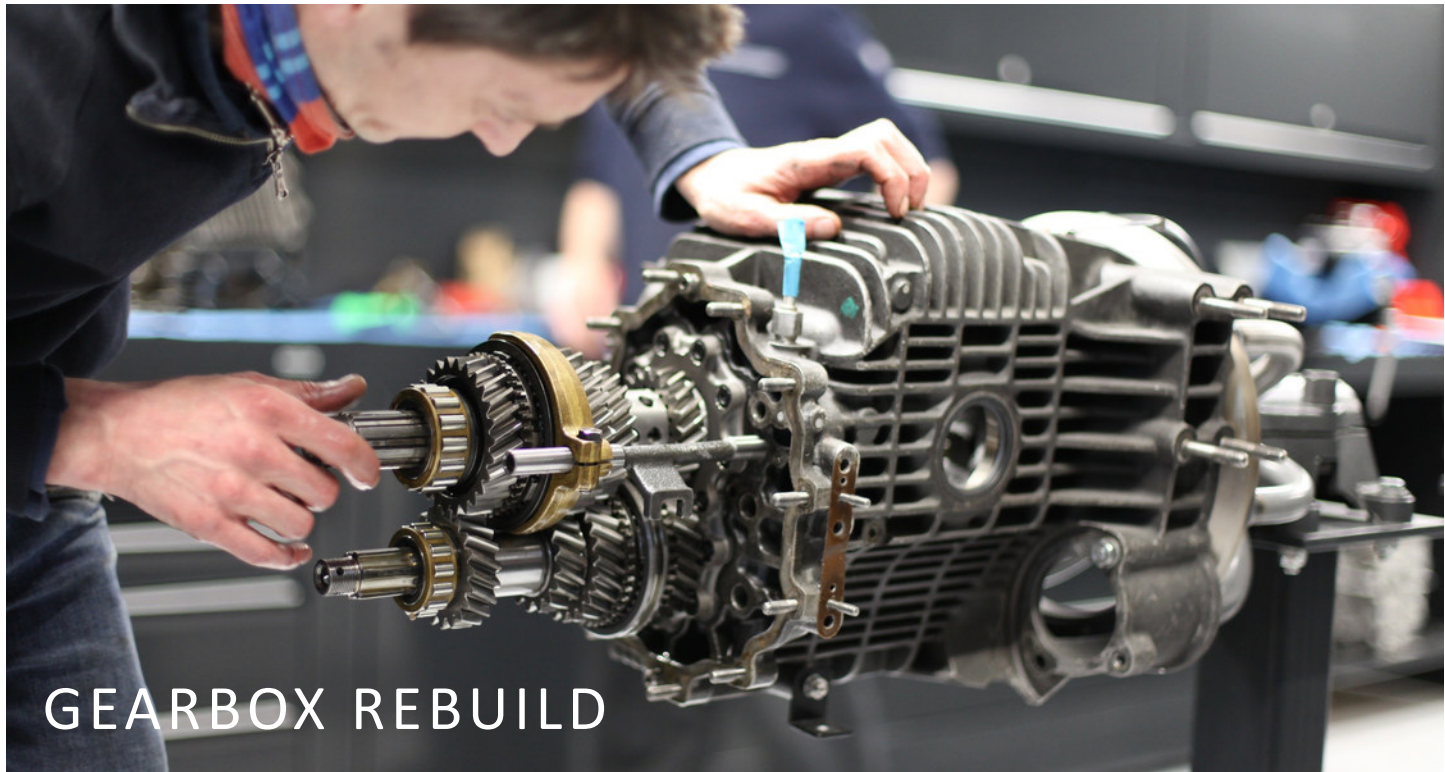




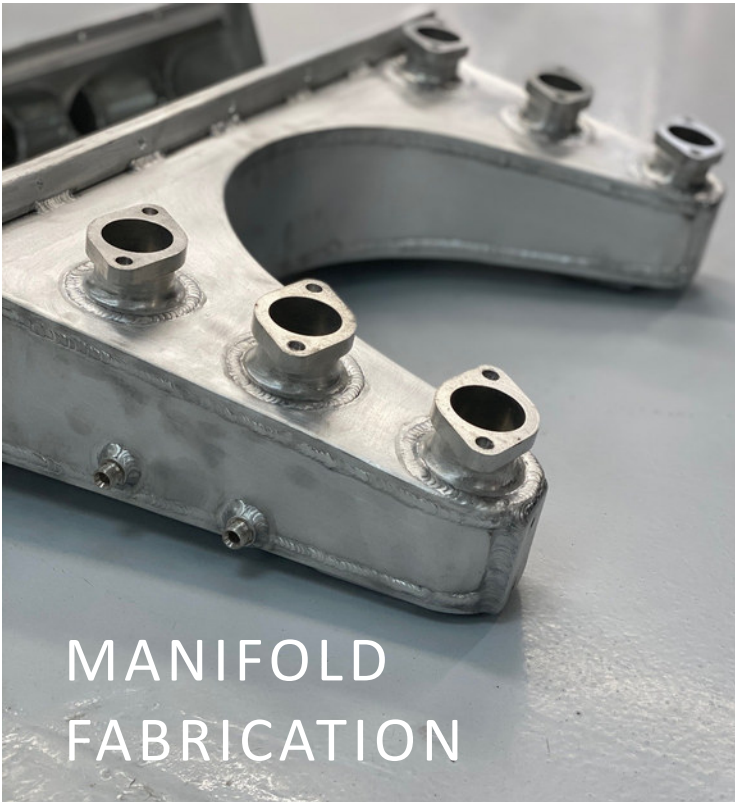
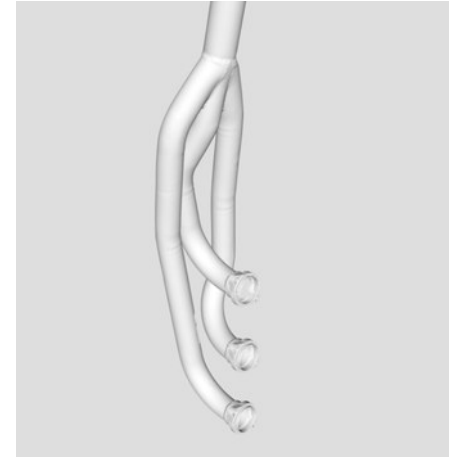
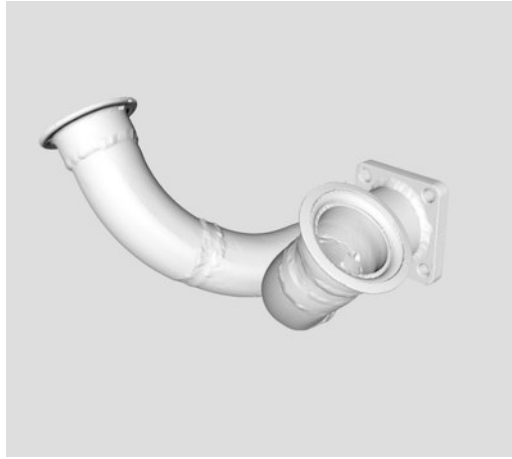
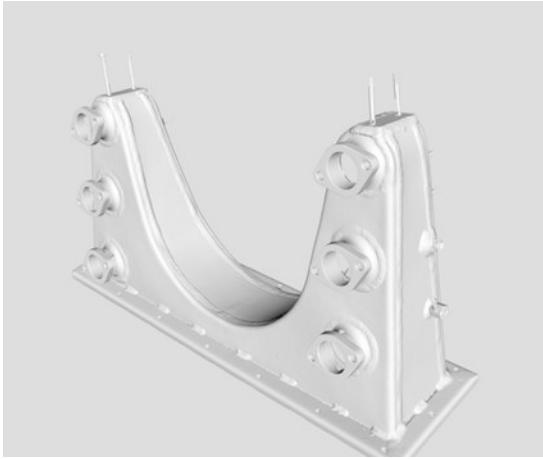
# ENGINE REBUILD









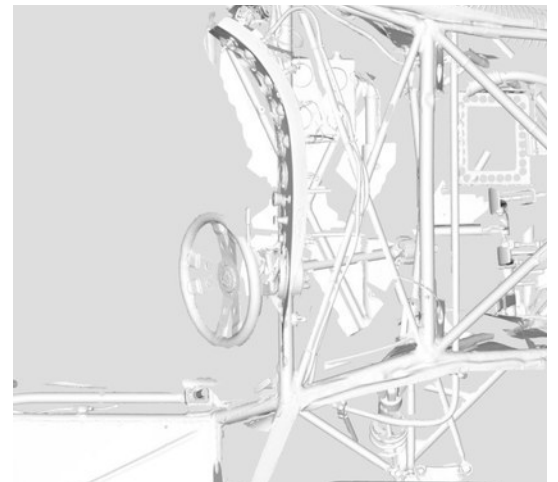
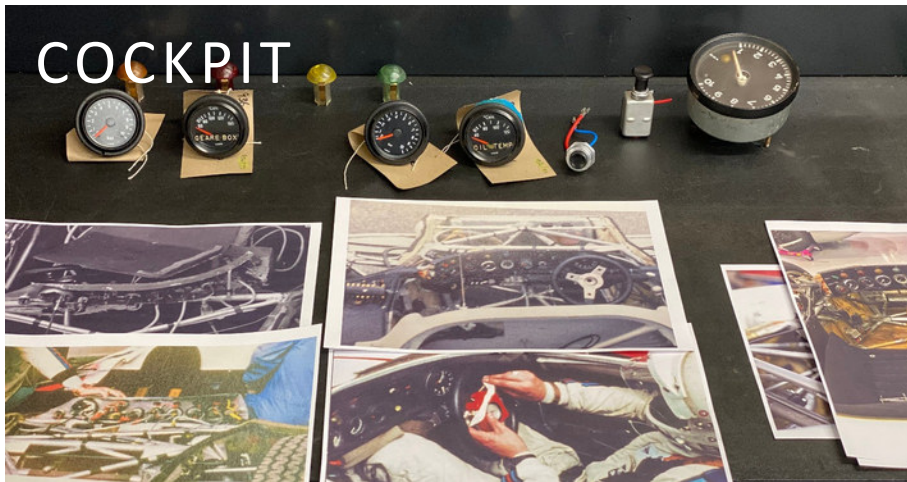
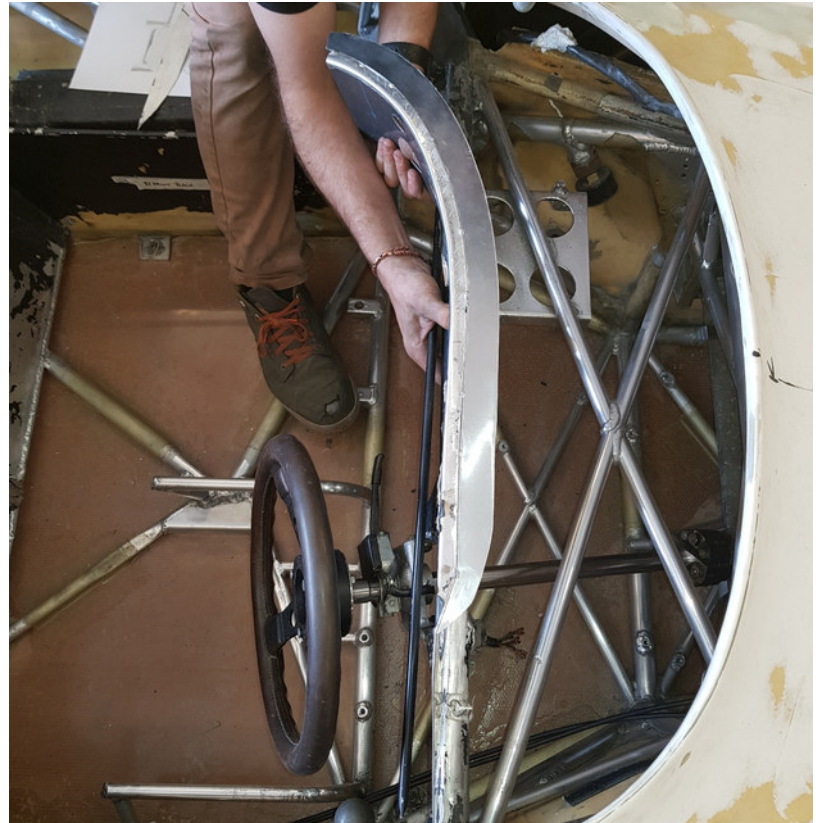


MANIFOLD  
FABRICATION

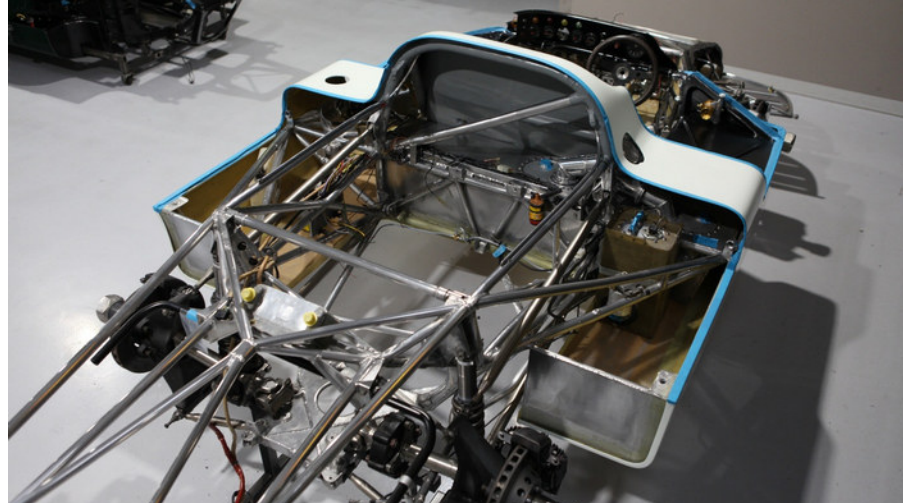


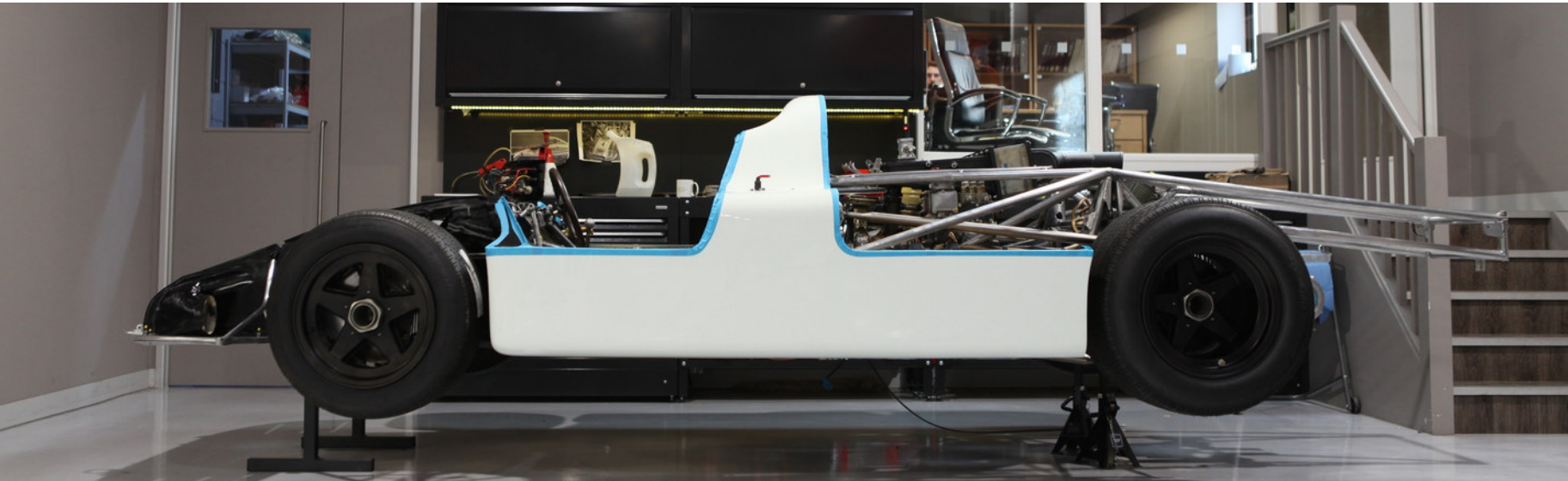
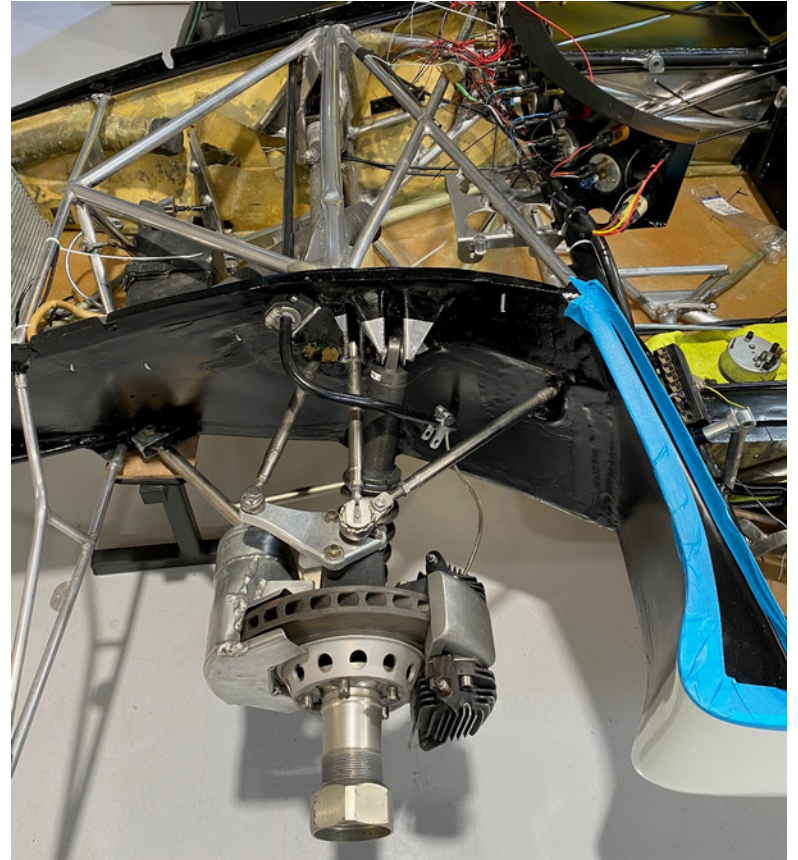


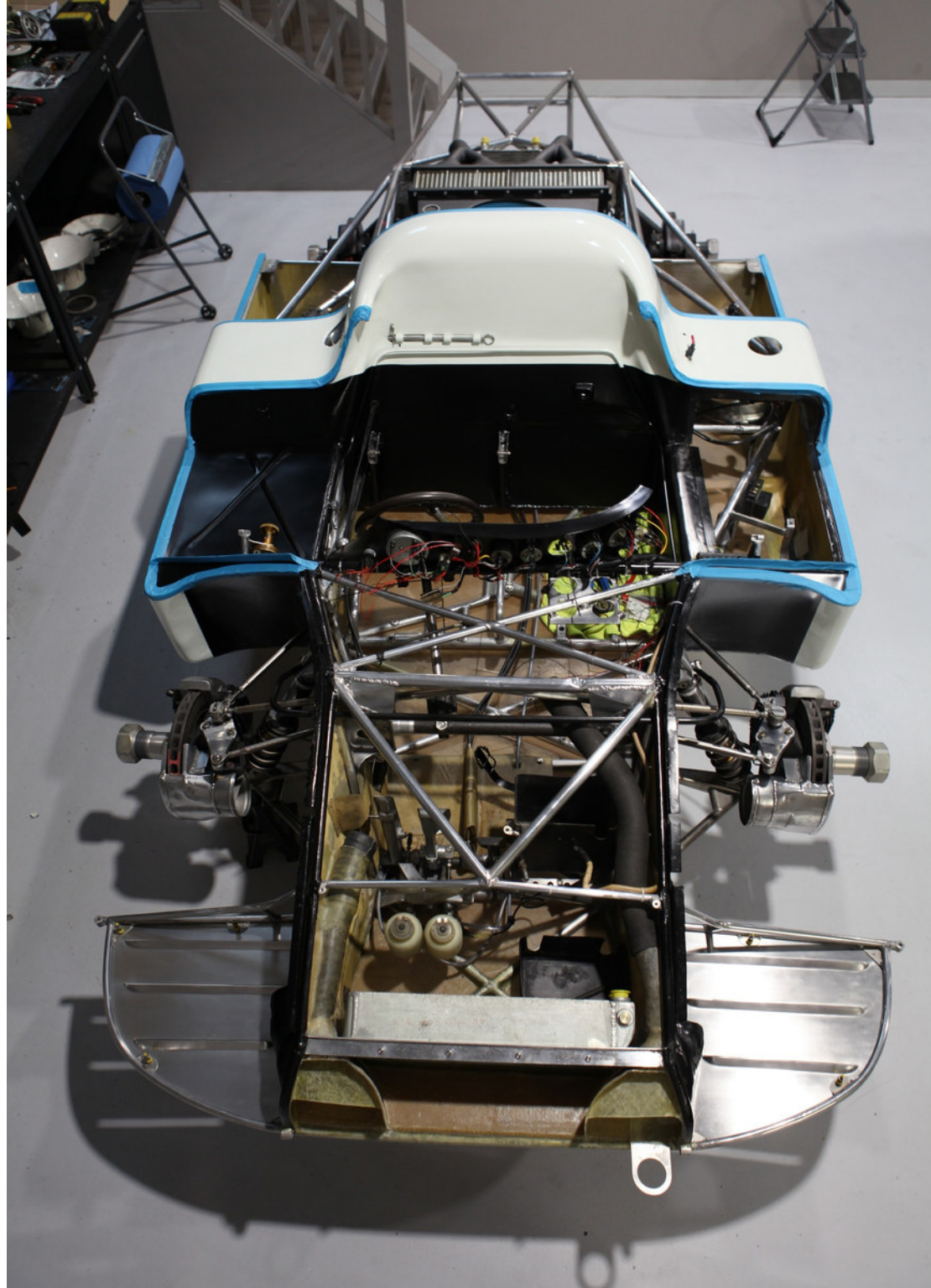
BODYWORK

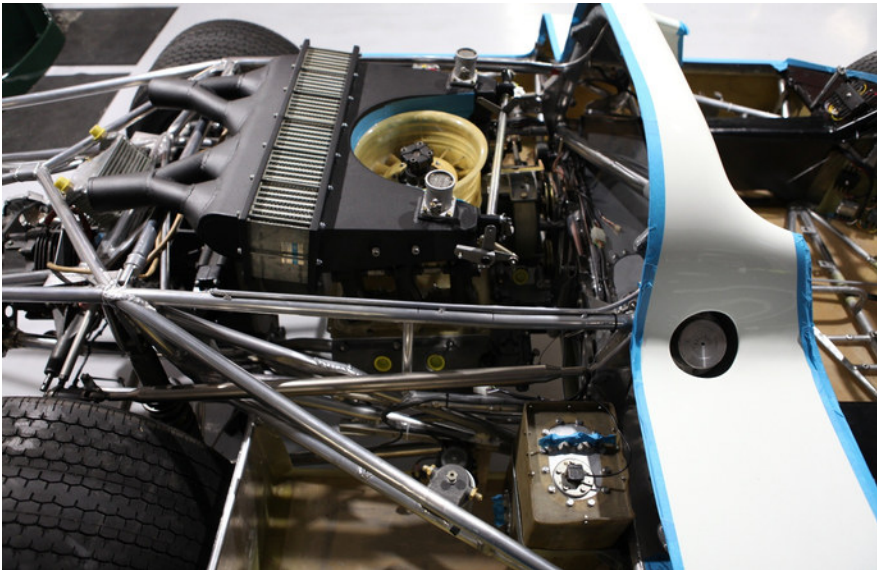
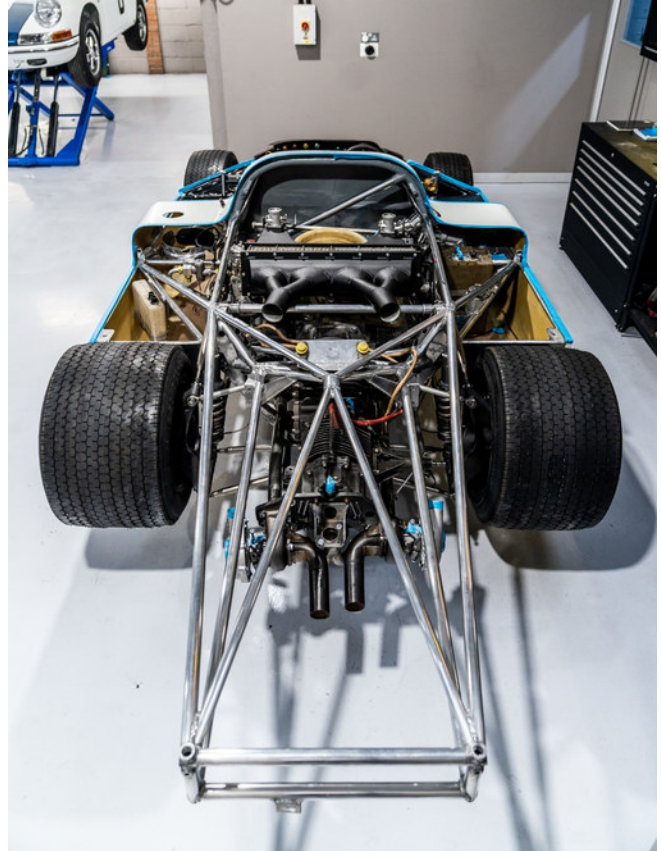
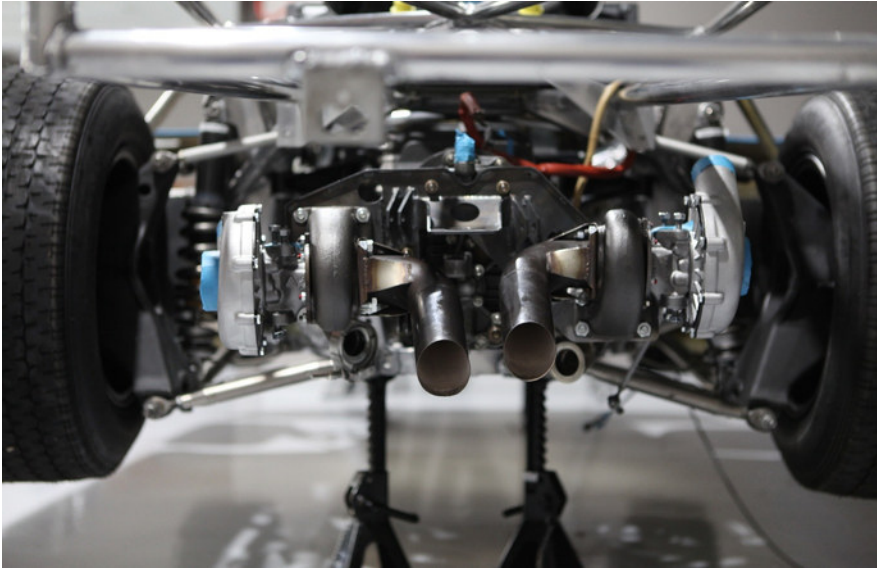








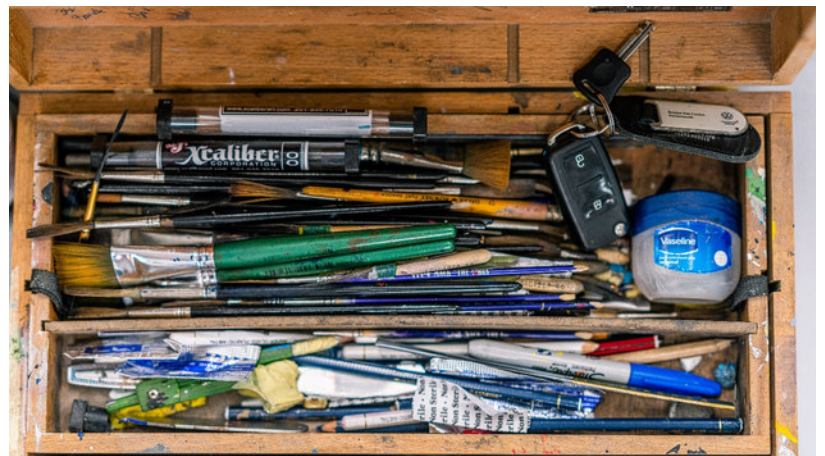


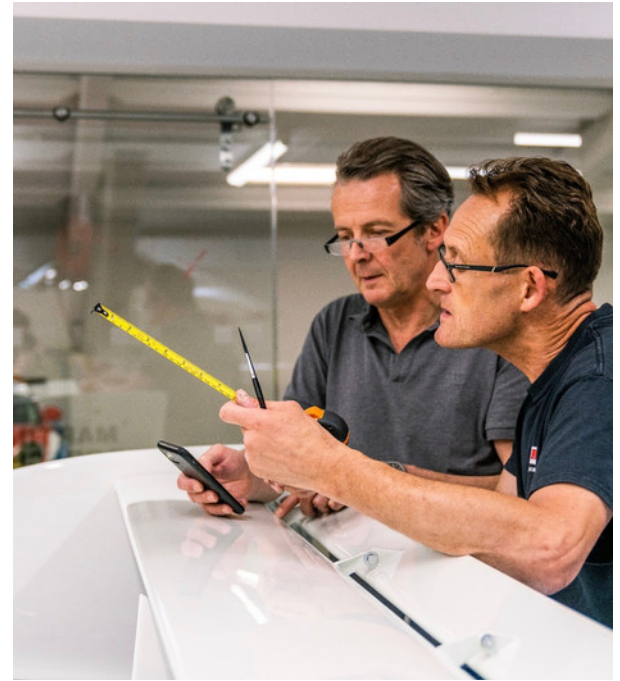














# THE EVOLUTION OF 936-001



4th April 1976 Nurburgring 300km #1 5th Stommelen

## Typ 936/76 Prototype

The development car in its initial "Black Widow" Martini livery. Driven by Rolf Stommelen at its first race at the Nurburgring. The low tail was revised after a rule clarification.



13th June 1976 Le Mans 24 Hours #18 DNF Joest / Barth  
5th September 1976 Dijon 500km #6 1st Mass / Ickx

## Typ 936/76

Driven by Joest and Barth at Le Mans in 1976. It was running second behind 936-002 when it suffered engine failure.



12th June 1977 Le Mans 24 Hours #4 1st Barth / Haywood / Ickx

## Typ 936/77

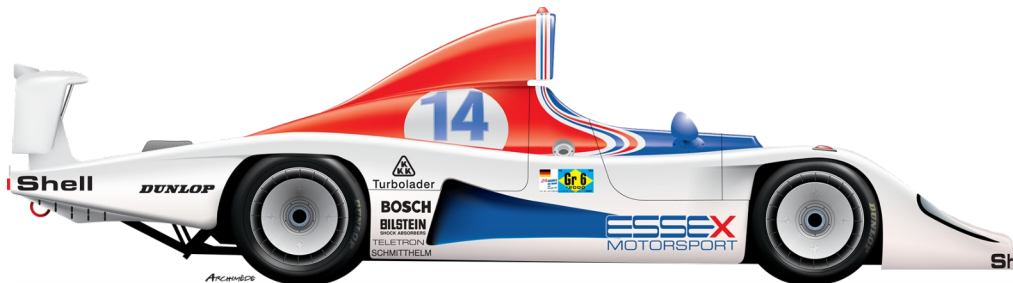
Fully revised for the 1977 season, it was driven by Ickx, Barth and Haywood to one of the greatest recoveries in Le Mans history, eking out a victory on five cylinders.



11th June 1978 Le Mans 24 Hours #6 2nd Wollek / Barth / Ickx

### Typ 936/78

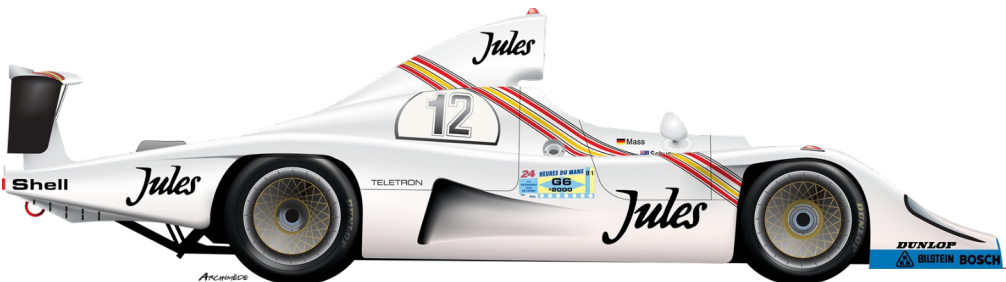
The 936 was revised again for 1978 with a partially water-cooled four-valve engine, side mounted water radiators and new aero tail. Driven by Ickx, Barth and Wollek at Le Mans in 1978, it finished a close second.



6th May 1979 Silverstone 6 Hours #1 DNF Redman / Mass  
10th June 1979 Le Mans 24 Hours #14 DNF Wollek / Haywood

### Typ 936/78

Wollek and Haywood qualified the car at Le Mans in 1979 on pole, but it suffered persistent engine problems and didn't finish.



14th June 1981 Le Mans 24 Hours #12 12th Mass / Schuppan / Haywood

### Typ 936/81

The new 2.65 litre Indy engine increased power for Le Mans 1981, but Mass, Haywood and Schuppan would suffer reliability issues and finish well down the field.



**This page:** Moment of truth - Le Mans 1977. Ickx is given the instruction to "win or bust". What followed was probably the greatest drive of his career.



# STRESSED FOR SUCCESS

## PORSCHE'S TURBO-CHARGED RETURN TO LE MANS

Speed. And as much of it as possible. For engineering director Ferdinand Piech, this was the key to Porsche's battle for its first overall win at Le Mans. His laser-focused vision, coupled with the racing team's strong determination and a sprinkling of luck, would ultimately result in Porsche's initial victory at La Sarthe in 1970 with 917-023.

As Porsche had long understood, the key to increasing top speed was a small frontal area combined with a low drag coefficient. The original 917 design was famously extreme in that regard, to the extent that it became aerodynamically unstable when approaching its maximum velocity. The engineers tamed this to some degree with the shorter, more upswept *Kurzheck* body, but even that can only be considered the minimum necessary to keep the car reliably attached to the ground.

Porsche's next Le Mans contender, the turbocharged 936, would appear five years after changes to the rules resulted in the 917's early retirement. When viewed side-by-side, it's easy to see how the 936 evolved out of the 917—hardly surprising, considering that both were designed specifically to win that most famous of races. Naturally, travelling as fast as possible down the four-mile-long Mulsanne straight hour after hour was integral to that aim. While both the 917 and 936 are low, wide, and flat machines designed to cleave through the air at over 200 mph with the least atmospheric disturbance possible, the immediate question that leaps to mind is this: Why did the 936 receive that enormous drag-inducing air-box? Such an appendage seems to contradict everything that Piech famously instilled in the race department during his tenure.

The answer can be found in the copious testing records for 936-001, still held by the Porsche factory archive. These contain a wonderful stream of engineering consciousness and reveal that there was still much to be learned at the dawn of the turbocharged era in motorsport. That air-box was merely a

clue to the challenges that Porsche was trying to overcome at a time when technical excellence would matter more than ever.

**The story of the 936** begins in the early 1970s, after Porsche had already established itself as the dominant force in international endurance racing with the 917. The once insurgent team had become the incumbent team—and the rule makers were keen to prevent Porsche's domination from discouraging rivals from entering the sport. Pushed out of front-line European sports car racing by the switch to a 3-liter formula for 1972, and then out of the American Can-Am series by late rules changes at the end of 1973, the company was determined not to be outwitted by the regulations once again.

The FIA had been indicating that the newly-christened World Championship for Makes was going to move away from prototypes and into a production-based formula, albeit one that would allow wide-ranging modifications. This would become known as Group 5 or the "silhouette formula," whereby cars had to maintain the basic outline of a production model but little else. The FIA's hope was that this would be more commercially relevant to manufacturers and therefore encourage greater participation, which was music to Porsche's ears: They were already spending plenty of effort on the 911 Carrera RSR, the leading car in its class and the obvious platform to develop into a Group 5 contender for 1975.

Porsche decided to prepare for the likely arrival of Group 5 by entering an experimental version of the 911 in the prototype class for the 1974 season. Though it would have no chance of outright victory against much lighter purpose-built prototypes, the car would at least provide an invaluable test bed for both the engineers and drivers.



**Left:** The 2.1 litre turbo engine was first installed in the 1974 911 Carrera RSR Turbo. A rather crude intercooler was placed directly into the air-stream below an enormous rear wing.

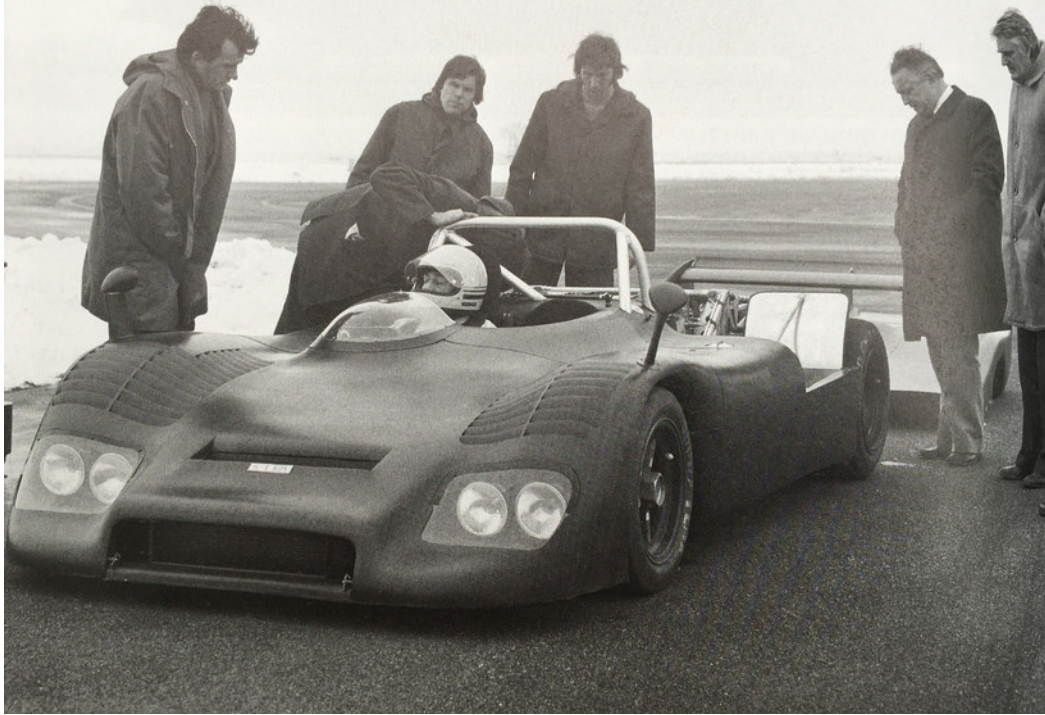
**Opposite Page:** 936-001 at its first shakedown test at Paul Ricard. Despite Porsche's best efforts to keep a low profile the car was caught on camera by a curious French journalist.

Once released from the limitations of the GT rulebook, there was certainly much that could be done to the 911's chassis. However, it was the engine that showed the most potential. Porsche had learned a lot about turbocharging from the Can-Am program and was already busy developing a production application for the road-going 911. The FIA used an equivalence factor of 1.4 to determine the allowable size of a turbocharged engine versus its naturally-aspirated counterpart, and to Porsche this appeared generous. The turbo engine also had the side benefit of being a cost-effective way of obtaining competitive power outputs from production-derived machinery, thus avoiding the need for expensive purpose-designed racing units.

In 1974, the prototype class was still racing under the 3.0-liter capacity limit that had been invoked two years earlier. With the equivalence factor applied, this meant that Porsche could use a turbocharged version of its six-cylinder engine with a displacement of no more than 2,142 cc. The old two-liter magnesium crankcase engine, with its 66-mm crankshaft and titanium

connecting rods, was chosen as the starting point. The heads, valve gear, and ignition were all recognisable from previous iterations of racing 911s, while an 83-mm bore provided a capacity very close to the mandated limit. The big change, of course, was the installation of the KKK turbocharger itself, but here the engineers opted for what they knew and used what was effectively the system that had fed one bank of the flat-12 in the Can-Am 917/30.

The pioneering nature of Porsche's development work on their Can-Am engines shouldn't be underestimated. Leading this effort had been their resident genius, Hans Mezger, along with Valentin Schäffer, who did most of the experimental work. Between them, they found effective ways of managing boost pressure on both the induction and exhaust sides of the turbocharger system, which in turn allowed the use of a smaller turbine with less lag-inducing inertia. The pair also had the benefit of input from legendary driver and qualified engineer Mark Donohue. Accounts vary slightly, but it seems that it took all involved both efforts to work out how

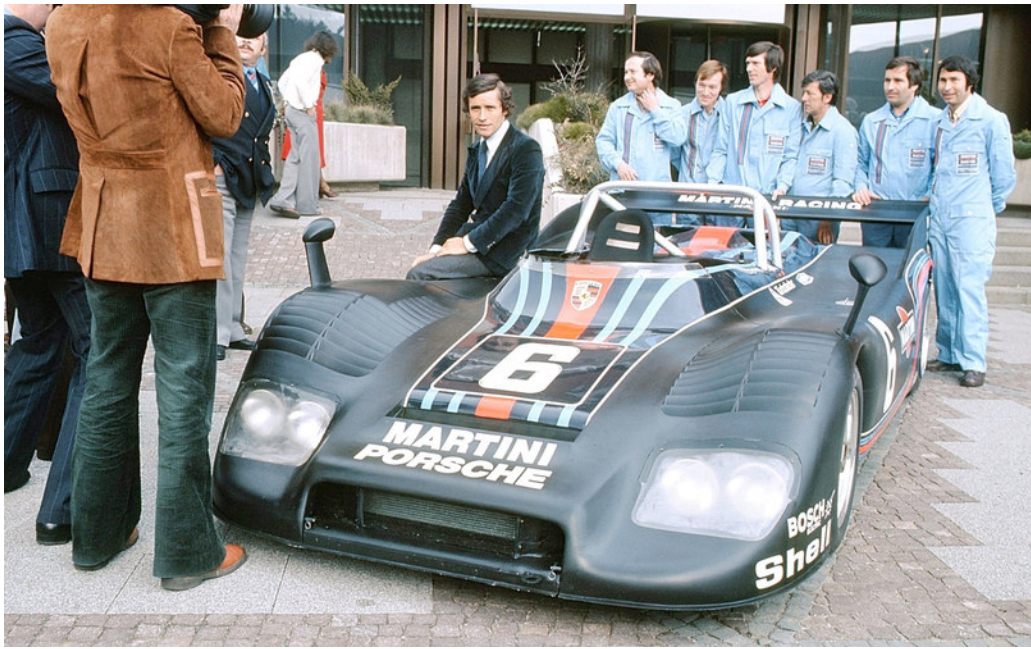


best to tune such an engine for the track.

It was with this critical knowledge that Porsche tackled the challenge of creating a turbocharged engine that would prove durable enough for the six-hour endurance races that made up the 1974 World Championship of Makes, not to mention the 24 Hours of Le Mans, which remained the top prize. The first 2.1-liter Typ 911/78 turbo flat sixes were soon showing dyno results that were competitive with the best naturally-aspirated 3.0-liter engines from Alfa Romeo, Matra, and Cosworth. However, these tests were also showing the engines to be highly sensitive to boost pressure, with a change of 0.5 bar (7 psi) resulting in a roughly 125-hp difference to the overall power output. Of course, the higher the boost pressure, the higher the thermal stress on the engine, and it was soon discovered that its Achilles heel was the joint between the cylinder and cylinder head. Once the temperature rose above 260C, then engine failure was inevitable. The problem was exacerbated by the fact that the turbocharger also superheated the induction airflow, thereby reducing its density and ultimately sapping the engine of power. Managing heat was going to be key to extracting the full potential of the turbo.

To this end, Porsche borrowed a solution from the aircraft industry and employed an intercooler for the first time. The hot induction air was passed through an aluminium matrix that simultaneously allowed a separate flow of cooler ambient air to cross at right angles without interference. This matrix was rather clumsily located directly in the path of the airflow as it passed under the rear wing. It was effective, though, and resulted in a halving of the intake air temperature. This enabled a higher boost to be run without hitting critical engine temperatures, while also allowing more power to be extracted for any given level of boost. Engine temps were further managed by the use of a horizontally-mounted fan, as found on the 917. Attention was further paid to all the aspects of the oil cooling circuit, with components uprated to deal with the greater demands of the turbo.

After a couple of development iterations, the 2.1-liter engine was reliably producing 450 hp in endurance race trim by mid-season. Power increased to 470 hp for shorter races and up to 500 hp in qualifying, with the boost turned up to 1.5 bar. This gave the turbocharged RSR a worthwhile advantage over its rivals in the 3-liter prototype category and made up for



**Left:** Jacky Ickx, Porsche's lead driver, posing at the press launch of the 936 in March of 1976. The mechanics christened the car the "Black Widow" though it would not remain painted black for long. Note the lack of the 936's trademark high-mounted air-box, which would soon arrive.

**Opposite page:** Porsche obeyed the new maximum height rule imposed on Group 6 for 1976. The result was a very slippery and modern looking shape. After Alpine-Renault exploited a loophole and turned up for the first race with a much more effective high rear wing, Porsche would quickly follow suit.

some of its unavoidable weight handicap that resulted from its production-based chassis. Indeed, it proved to be among the fastest entries at Le Mans in 1974, managing to finish second overall behind the far more exotic Matra-Simca MS670.

Towards the end of 1974, the FIA announced that it would be postponing the introduction of its new Group 5 regulations by one year. There wasn't much upside in continuing to campaign the 911 against purpose-built prototypes, so Porsche decided to skip the 1975 season entirely. The field was therefore left wide open and into this void stepped a full works effort by the French state-owned automotive giant Renault. Renault had been successfully competing in the 2-liter prototype category of the European Championship using their V6 race engine, which had a similar architecture to Cosworth's DFV and produced an impressive 300 hp at 11,000 rpm. With an eye on winning Le Mans, Renault had been mulling a step up to the 3-liter class and had come to the very same conclusion as Porsche: turbocharging their existing and proven V6 unit was clearly the way to go. The A442 turbo

arrived by mid-season, a car with which Porsche would become very familiar in the coming years.

Though Porsche's factory efforts were quiet in 1975, several privateer teams had been continuing to run the venerable 908/3, which was still eligible in the 3-liter class of the World Championship. Its relatively simple two-valve engine couldn't be coaxed to produce much more than 370 hp, but the car was light and agile, and it remained a competitive car on twisty tracks like the Nürburgring. Porsche decided to offer these privateer teams the use of its 2.1-liter turbo and so four 908/3s ended up being converted at the factory to accept this engine. Officially, these turbocharged 908s were not factory supported, however Porsche assigned none other than Norbert Singer himself to assist in their development. While they ultimately didn't have the outright pace of the more modern Alpine-Renault or Alfa Romeo designs, these boosted 908s put up a good enough effort to score several podium positions. More importantly, they gave Porsche some experience in running the little turbocharged engine in a prototype chassis—knowledge that was



about to become extremely useful.

**By the middle of the 1975 season**, the FIA had finalised the regulations that would apply to sports car racing from 1976 onwards. As expected, the new Group 5 rules required entries to retain only the basic shape and dimensions of a production car, with everything else being relatively open. Engines could be as large as you liked but at the penalty of a sliding scale of minimum weights. The concept was to create a cutting-edge racing category that maintained an illusion of road worthiness. The FIA expected Group 5 to attract plenty of interest, but the response from most manufacturers was underwhelming. Perhaps because Porsche was so well positioned with its new 935—the ultimate evolution of the RSR and 934—anticipated entries from Ford, Ferrari, Mercedes, and Jaguar never materialised. Only BMW initially took up the challenge and so Group 5 was now in danger of looking like a Pyrrhic victory for Porsche that would be of little marketing value.

Equally troubling for Porsche was the fact that the FIA had created a new Group 6 category for the old 3-liter prototypes. Alpine-Renault was the only

manufacturer entry, but there were also plenty of privateer teams using Cosworth and BMW powerplants. With their significant weight advantage, the Group 6 cars were likely going to be faster overall than the Group 5 “silhouette” racers.

In an effort to save some embarrassment, the FIA decided to keep the two categories apart. They created a separate world championship for each and tried to further force a distinction by making all Group 5 events six hours or longer, while Group 6 races were limited to a maximum of four hours. The reality of this new scenario put Porsche’s racing department at a kind of crossroads: Would Group 5 be stillborn? Was the FIA giving Alpine-Renault a free run at the more prestigious series? And what would happen at Le Mans, which lay outside the FIA’s control and where the organisers would likely allow the two racing categories to co-exist?

Porsche’s chief executive Ernst Fuhrmann raised his fears at a meeting of the race department in July of 1975. Not only was it too late to abandon the two years of R&D that the company had already put into its Group 5 car, but Porsche had just launched its range-topping 911 Turbo and wanted the

publicity of a racing counterpart to succeed on the track. However, the task of readying their works-prepared 935s for Group 5 *and* a privateer version of the 934 for Group 4 was proving to be all consuming. Fuhrmann was nonetheless undeterred by the department's lack of resources, for he had a sense that they could build a Group 6 car quite efficiently using work that had already been completed. To the surprise of those assembled, he announced that they had a month to work out how to do it and tasked Helmut Flegl, one of the key development engineers on the 917, with leading the project. The project number assigned was initially Typ 926, but this was soon changed to Typ 936, as it dovetailed neatly with the 934 and 935 already in the pipeline.

Flegl knew he didn't have the time or resources to start with a blank sheet of paper, so he was going to need to improvise. Prior experience with the turbocharged 908s provided a useful start, but a simple upgrade to a set of underpinnings that were already seven years old was not going to cut the mustard. The 908 had nervous high speed handling traits and lacked aerodynamic efficiency. Furthermore, Alpine-Renault was using a very light F1-style aluminium monocoque design and its turbocharged 2-liter engine was already rumoured to be producing 500 hp.

With so much of the development work already completed on the 2.1-liter Turbo RSR, plus the fact that Porsche still held a back stock of the Typ 911/78 motors, the engine choice seemed obvious. Mezger and Schäffer had continued to work on a 2.8-liter version for the 935 and already had ideas as to how they could improve its little brother. While most of the 917 parts inventory had been sold off after the Can-Am program was abandoned, Porsche still had plenty of suspension components, electrics, fuel systems, and gearboxes—everything they needed apart from a chassis and a body. By the end of August, Flegl and Singer had budgeted the project and worked out a timetable, whereby the first car would be

**Below:** Rolf Stommelen in discussion with the Porsche pit crew in practice for 936-001's first race at the Nurburgring 300 km. Despite the handicap of less down-force than the Alpine-Renault A442, he managed to split his French rivals on the grid.

**Opposite page:** The race was run in atrocious conditions. A veteran of the circuit, Stommelen would have walked it were it not for a faulty throttle cable.





ready for testing by the following February. Fuhrmann duly gave the green light and set the clock ticking on a five-month deadline to produce the very first car, 936-001 itself.

The initial step was to determine its layout. From the 904 through to the 906, 908, and even the 917, Porsche's race cars had always used the same wheelbase of 2,300 cm. This dimension had almost become sacrosanct in Stuttgart and formed the starting point of every design. However, in the final iteration of the 917's development, Porsche experimented with an extended 2,500-cm wheelbase and found worthwhile improvements with high-speed stability. Given the handling problems encountered with the 908, it was decided to split the difference and go with 2,400 cm. Once this dimension was set, it was then simply a matter of positioning the main components—engine, gearbox, driver—to the best effect.

The only suitable available gearbox was the five-speed unit from the 917. This was over-engineered for its application in the 936 and therefore much heavier

than it needed to be. However, the only other gearbox that could handle the torque output from the turbocharged engine was the one used in the 935, which only had four ratios. The smaller 2.1-liter engine had quite a narrow power band, so five gears were going to be essential, particularly for Le Mans.

The additional weight of the 917 gearbox tipped the balance of the car rearwards, as the six-cylinder engine was substantially shorter than the flat-12 monster in the 917. In an effort to counterbalance this shift to the center of gravity, Porsche inserted a 23-cm-wide aluminium housing that acted as a spacer between the engine and gearbox. It then placed the main 120-liter fuel tank between the engine and cockpit bulkhead. This pushed the driver forward so that, much like in the 908/3, the pedal box was placed well ahead of the front axle.

The compressed development time frame meant that Porsche couldn't develop a cutting-edge monocoque structure such as the one used by the Alpine-Renault A442, so it was decided to use the proven aluminium space-frame construction

that had served them well. The new engine required a completely new frame design, though it did bear a close resemblance to the aluminium frames that had preceded it. Porsche also attached the engine directly to the chassis via solid mounts, thereby making it a stress bearing member for the first time. This increased its torsional rigidity and resulted in the 936 having the stiffest chassis that Porsche had yet built up to that point.

The Group 6 rules allowed for open cockpits. This was the favoured approach by most teams, as it resulted in less weight, reduced frontal area, and better ergonomics. Porsche couldn't afford the luxury of weeks testing models in a wind tunnel and so it relied on its experience to fabricate a full-scale mock up, from which moulds were taken and the fiberglass body laid up. Once constructed, the body was installed onto the first fully functioning chassis, which utilised driveshafts, wheel hubs, steering, uprights, and brakes taken straight from the 917 parts shelf, along with a freshly updated version of the 2.1-liter turbo engine. Mezger and Schäffer had by then revised the intercooler arrangement, dedicating individual units to each bank of cylinders, and with further work on exhaust back pressure and valve timing they were now liberating close to 520 hp with 1.4 bar of boost.

The team then headed off to wind tunnel facility in Wolfsburg for aerodynamic evaluation and optimisation. At this stage, the body looked very attractive, much like a sleeker version of the 917/30, with a low drag rear end that had been dictated by a maximum height stipulation in the regulations. Various modifications to the tail were tested, as were cooling ducts for the intercooler and ventilation for the front fenders, but the final design was not greatly altered. There was certainly no sign of a large air-box.

Fuhrmann was keen to keep his cards close to his chest. Thus, before 936-001 headed off for initial testing at Paul Ricard in February of 1976, he had the car painted matt black, thinking it would attract less attention. Looking at images of that car now, it seems highly unlikely this would have worked. Already one of the most striking spyder designs that Porsche had

yet come up with, the black paintwork merely gave it an added air of menace. It's no wonder that the mechanics nicknamed it the "Black Widow."

Unfortunately, 936-001's first track test was disappointing, with the car performing some way off the predicted lap times. Worryingly, the engine was suffering from the high cylinder wall temperatures already known to directly impact its reliability. Mindful of the demands of Le Mans, the car was run for several thousand miles over two weeks of testing. While the engine remained troublesome, the rest of the systems performed without incident. Then 936-001 was taken back to Weissach, where it was submitted to Porsche's "destruction track" to determine if it could complete 1,000 kms without breaking a major structural component. It passed with flying colours, vindicating Porsche's decision to use the tried and tested chassis technology from the 917.

At this point, Helmut Flegl was called away by Fuhrmann to finish development of the Typ 928 road car, so he handed over the reins of the 936 project to Wolfgang Berger, who had previously been leading the development of the 934.

**Porsche had still not decided** whether to enter the 936 in the entirety of the 1976 Group 6 season, otherwise known as the World Sports Car Championship. Running the 935 simultaneously in the Group 5 World Championship of Makes was going to be a stretch, so the company initially committed only to running two works cars at Le Mans, with 936-002 having been completed by April. According to contemporary reports, Alpine-Renault and Alfa Romeo encouraged long-time Porsche sponsor Count Rossi of the Martini beverage empire to approach Porsche with the idea of entering the full championship. Porsche's Group 6 competitors, who dismissed its hastily thrown together effort as far from a competitive threat, thought an additional manufacturer entry would add prestige to the series. Porsche ultimately agreed to enter one car in every round and 936-001 was soon adorned with those iconic Martini racing stripes.





**Above:** Porsche entered both the Group 5 and Group 6 World Championships in 1976 with the same number one driver pairing of Jacky Ickx and Jochen Mass. They stand next to 936-001, with Rolf Stommelen and Manfred Schurti behind 935-002 and team manager Manfred Jantke in the centre.

The first Group 6 race was the Nürburgring 300 kms on April 4th. While the field was fairly thin, it did include Porsche's main rivals for that year's Le Mans, the full works effort of Alpine-Renault. The opening race was a sub two-hour sprint, so only one driver per car was needed and Renault gave Formula 1 stars Patrick Depailler and Jean-Pierre Jabouille the nod for their two entries. Porsche had ambitiously decided to use the pairing of Jochen Mass and Jacky Ickx to lead both their Group 5 and Group 6 campaigns, as the two championships largely did not overlap. However, the Nürburgring race was an exception. With Mass and Ickx already occupied at Vallelunga, Porsche called up Rolf Stommelen, who had recently returned to sports car racing from

Formula 1. Stommelen was renowned for his courageous driving style and was fondly remembered at Porsche for having qualified the almost undrivable 917 on pole at Le Mans in 1969.

Courage turned out to be a rather important commodity that weekend, as the weather on race day was atrocious—a mixture of rain and fog that resulted in very limited visibility. After making several aerodynamic trim adjustments, the 936 had performed well in qualifying and Stommelen had split the two Alpine-Renault A442s on the grid. This was even more promising than it looked, as the French team had aggressively interpreted the regulations and taken

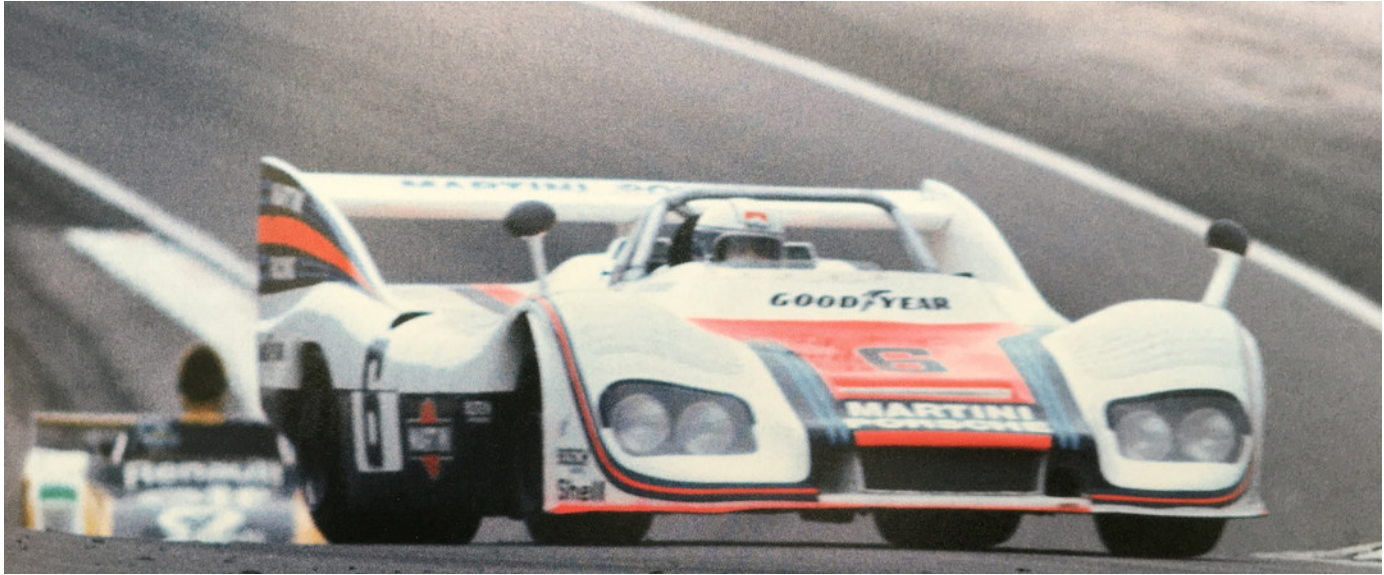


advantage of certain dispensations intended only for older cars. In a creditable fourth position was the 908 Turbo of Rheinhold Joest. However, its 15-second deficit to Stommelen's 936 clearly showed the progress that Porsche had made with its latest design.

The race itself was somewhat of an anti-climax. Within a minute of the start, Depailler tried to out-brake Jabouille into the North Curve and the two A442s speared straight across the wet grass into the barriers and were out of the race. Stommelen managed to avoid the wreck and started to run away from the rest of the field. The treacherous conditions didn't seem to trouble him, as he already had over a decade of racing experience at this notorious circuit. It seemed like 936-001 was destined to win on its début. However, the throttle cable had been snagging and began to intermittently stick. Stommelen pitted, but the crew were unable to do anything to rectify matters. He re-entered the race in second position and soon found the only way he could drive was by operating the engine using the ignition cut-out. He would coast through the corners with the engine switched off and then restart the car when the next

straight appeared. This was all the more remarkable when one considers that he was using an engine with serious turbo lag on one of the world's most challenging circuits—in the rain. By some miracle, he finished the race in fifth position, while Joest took the win in his trusty 908.

Porsche completed chassis 936-002 with the intention of using it for subsequent rounds of the championship and it was duly modified to take advantage of the same rule interpretations that the Alpine-Renault had exploited at the Nürburgring. This allowed for a significantly higher rear wing and lower roll-over bar, making the car more aerodynamically efficient. Porsche also took the opportunity to enlarge the ducts in the rear bodywork that fed air to the twin intercoolers, with the aim of better managing the cylinder head temperatures. In order to prevent any driver from having to repeat Stommelen's ignition cut-out trick, the engineers also completely revised the throttle cable linkages, even installing a second spare cable for emergencies. Visually, the biggest change was a switch in the colour scheme back to the traditional German racing white after Count Rossi decided the car—and his branding—looked better that way.



**Opposite page:** Gijs van Lennep on his way to victory at Le Mans in 1976 in 936-002. He would retire from racing immediately after the race.

**Above:** 936-001 driven by Jochen Mass to a win in the final race of the 1976 World Championship at Dijon. It is striking how much more aerodynamic the 936 appears to be without the high air-box. Wind tunnel testing demonstrated that the difference was not as large as one might think and any disadvantage was offset by the power gains allowed by better engine cooling.

After the Nürburgring, Porsche's development team was beginning to understand that the ultimate success of the 936 would come from achieving the proper balance between a lack of aerodynamic drag and sufficient engine cooling. With Le Mans beckoning, these development priorities presented something of a conflict: While the body shape needed to be optimised for maximum speed down the course's long straights, enough air also had to be collected to keep the engine running below critical temperatures.

With 936-001 freed up for testing, the team headed to Hockenheim to explore a range of different engine cooling options. The Alpine-Renault A442 was already using a prominent high-mounted air-box behind the driver to supply its intercooler, turbo air inlet, and alternator, with separate large side intakes used to feed the radiators of its water-cooled engine. The demands of Porsche's air-cooled engine were different, so while the Renault gave them a clue it still left them in need of some reliable data. However, the Hockenheim testing provided an array of temperature information using different cooling solutions and it became clear that a high-mounted air-box channelling air directly to the intercooler and engine cooling fan resulted in the cylinder walls running around

20C cooler than anything else. This benefit was critically important because otherwise the engine ran very close to its 260C limit, the point at which bad things would inevitably happen. The trade-off was that the addition of the air-box seemed to knock 200 rpm off the maximum engine speed that the 936 would pull on long straights.

Soon afterwards, Berger managed to gain further access to VW's wind tunnel and this enabled the team to try some more sophisticated air-box designs. They discovered that by incorporating the air-box into a fairing that covered the roll-over bar, then extending it to the rear of the car, they could reduce the drag coefficient by enough to largely offset the increase in frontal area. The 20C of additional cooling from the air-box also meant that boost could be run 0.25 bar higher, thereby unleashing more than 50 extra horsepower. Berger concluded that any residual drag penalty was small enough to be more than worth it.

By the time Le Mans arrived, 936-002 had won rounds two and three of the world championship with Mass and Ickx behind the wheel. However, the Alpine-Renaults had been faster and, if they hadn't suffered mechanically, the final results might have been different. Porsche decided to field three works entries at La Sarthe that year, the two 936s and a single 935. The 936s were now identical except that 936-002 featured the new air-box and engine cowling, while 936-001 had a flatter rear deck with revised air intakes set into it. Jacky Ickx and Gijs van Lennep would drive the former, while Rheinhold Joest and Jürgen Barth would take the helm of the latter.

The field that year was incredibly diverse in all the main FIA classes, plus IMSA and NASCAR entries from the US and a special ACO-devised GTP formula. The main competition for Porsche would still be Alpine-Renault, who brought three cars with different styles of bodywork to run in practice before deciding upon a single car to enter in the race. Jabouille had made up their minds for them by putting in a stunning 3:33 lap in the long-tail version of the A442 during qualifying, more than fast enough for pole position and a clear six seconds ahead of Ickx in second place. There were suspicions that the French team was running higher boost and extra sticky



tires, just to make sure they performed well in front of the home crowd. Meanwhile, Joest and Barth qualified 936-001 a further six seconds back in fifth place.

Porsche had prepared for a battle of the tortoise versus the hare. It expected the Alpine-Renault to be quicker than the 936s by up to about five seconds per lap, but knew the A442 also had a slightly smaller fuel tank and would therefore have to pit more often. The A442's poor reliability record also meant that it was likely it would eventually need to slow down or risk not

**Opposite page:** Revised narrow track 936/77 being prepared at Weissach prior to the race season, now powered by a twin-turbocharged 2.1 litre flat six.

**Right:** Jürgen Barth in 936-001 leads a pair of Alpine-Renaults and 935s down the pit straight in the early stages of the 1977 Le Mans race.



finishing. Ickx and van Lennep were therefore told to play a waiting game with the Alpine-Renault, while Joest and Barth were instructed to stay ahead of the three next quickest cars, the Mirage, Rondeau, and Lola.

As expected, Jabouille blazed away from the start in the A442, followed by the two 936s. It built up a substantial lead before pulling in to make its first refuelling stop with just over an hour gone. Ickx, with two more laps in his tank, moved into the lead—a position he and van Lennep would never relinquish. The Alpine-Renault was certainly fast, but whatever time it gained on the 936 was more than lost by having to pit more frequently. It was also plagued by minor electrical faults, which cost it even more time in the pits. The A442 had clawed back up into third position by midnight when it burnt a piston and was forced out of the race. At daybreak, that left the leading 936 of Ickx and van Lennep three laps ahead of its sister car, which in turn was four laps ahead of the third-place Mirage.

Unfortunately, Porsche's one-two lead wouldn't last. At 7 am, 936-001

broke the extended driveshaft in the aluminium spacer between the engine and gearbox, stranding the car at Arnage. Many of the other front runners faced more minor problems of their own. By mid-morning, 936-002 was a massive 16 laps ahead of the second placed Mirage. This advantage would come in handy when Ickx brought the car in to the pits just before mid-day with the engine down on power. The left exhaust had cracked, leaking pressure and thereby hindering the turbo. Porsche opted to do a proper repair, losing half an hour in the process, and by the time Ickx returned to the race his lead had halved. That would be as close as the Mirage would get, however, and the car ran perfectly to the finish where van Lennep took the flag. After more than a decade campaigning for Porsche, it would be the Dutchman's last race, as he had promised that he would retire if he won. Having previously won the 1971 Le Mans in the white Martini-liveried 917K, it did seem like a fitting bookend to his career.

For the remaining rounds of the Group 6 world championship, Porsche entered 936-002 at three of the races and 936-001 at the fourth. Mass and



**Left:** After early mechanical difficulties 936-001 was left trailing at the rear of the field. However everything was about to change.

**Opposite page:** With his car having suffered terminal engine failure, Ickx was allocated to 936-001 and given instructions to try and win the race. He threw caution to the wind and in terrible weather conditions gained huge chunks of time on the leading Alpine-Renaults.

Ickx won every race between them and thus secured the 1976 title with a remarkable five wins from six starts. Seemingly, only a frayed throttle cable had stood between the 936 and a perfect record. However, the Alpine-Renaults had been faster all year. And the battle would have likely been even closer, but for a series of preventable mishaps: The A442 started one race in reverse gear, while in another it had been accidentally fitted with flat tires.

**Porsche's controversial decision to split efforts** between Group 5 and Group 6 had paid off handsomely in 1976 and they took home both world titles. However, the company had been stretching themselves very thin, so for 1977 it decided to focus its attention mainly on the Group 5 championship, while saving the 936 for a one-off attempt at Le Mans. Meanwhile, Alpine-Renault was running its Formula 1 program in parallel, so the French team also decided to apply the whole of its Group 6 effort to the victory of that single most important race.

Freed from the need to compete at slower tracks, Porsche looked at how to

better optimize its 936 for the unique demands of Le Mans. As the Alpine-Renault A442 had been faster on the Mulsanne straight, its first priority was the reduction of aerodynamic drag. Porsche calculated that it could knock 6% off the 936's frontal area simply by reducing the track by 40 mm at the front and 30 mm at the rear, then narrowing the bodywork to suit. Any slight reduction in road-holding that would result was deemed to be inconsequential at La Sarthe. Porsche then toyed with a range of different ideas for the rear aerofoil, air-box, nose section, wheel discs, and the length of the tail. The history file for 936-001 is full of fascinating freehand drawings of these competing proposals, many of which were made up in fibreglass and tested in the wind tunnel.

Porsche strived for a more elegant solution to the cooling conundrum than the rather bulky high-mounted air-box on the 1976 car, trying out both a wide low-profile design as well as a smoother and longer fairing into the rear deck. The low-profile air-box gave much better drag results but just could not generate the required airflow to the engine compartment that Porsche figured they needed for Le Mans. Rather, the revised oval air-box

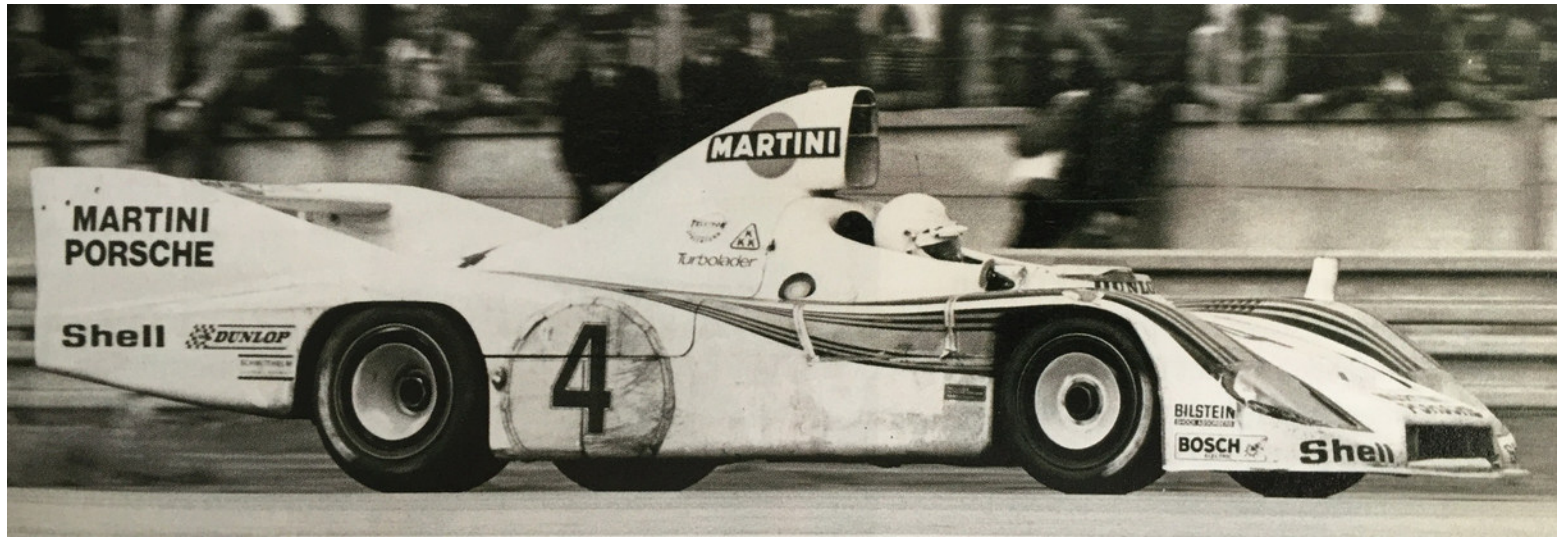


and fairing, much like the A442's, was found to be the best option. Other changes included a tail extended by 50 cm, more upswept cockpit sides, a shallower rear wing profile, and 935-style wheel fans to aid brake cooling. Porsche used 936-001 to try out these modifications, then took 936-002—still in its unaltered Le Mans-winning form—to the wind tunnel for comparison. In its new 936/77 spec, 936-001 generated an impressive 9% less drag than 936-002.

Porsche had also been busy with engine development. The 935 had already switched from a single turbo to twin turbos for 1977, with resulting improvements in both power and reduction of lag. Each unit could be made smaller and therefore had less inertia when spooling up to peak operating

speeds. The same approach was then adapted to the 936's 2.1-liter engine, with one smaller KKK turbo feeding each bank of three cylinders and the whole system controlled with a single waste-gate. The intercooler was also redesigned to be a single integrated unit.

The revised engine produced 540 hp at 8,000 rpm when running 1.4 bar of boost, ostensibly putting Porsche's engine 40 hp ahead of the Alpine-Renault. When taking into consideration the fact that the Renault engine used a slightly smaller overall displacement, the specific outputs of both engines were actually quite similar. However, they achieved their power in very different ways: While the 936's engine was a production-based, two-valve, single-overhead-cam design with a modest—by racing standards—8,000 rpm redline and peak



**Above:** After the Alpine-Renaults succumbed one by one to engine failure, 936-001 found itself with an unassailable lead. With 45 minutes to go all it would need to do would be to cross the finish line to win. Then it burned a piston and all seemed lost.

**Opposite page:** After some frantic work in the pits, Jürgen Barth manages to complete two final laps on five cylinders to win the race.

boost levels of 1.5 bar, the Alpine-Renault utilized a very short-stroke bespoke racing unit with 4-valves-per-cylinder and double overhead cams, fed by a single turbo and producing peak power at 10,000 rpm with only 0.9 bar of boost. Considering that the normally-aspirated version of 936's engine produced around 70 hp less than the A442's, and that the Porsche was managing to use so much more boost, it does seem that Alpine-Renault was significantly constrained by the thermal issues associated with turbocharging.

During May of 1977, 936-001 was extensively tested at Paul Ricard, covering a distance of nearly 3,000 kms with Jacky Ickx, Henri Pescarolo, and Manfred Schurti at the wheel. The aerodynamic changes from the wind tunnel were evaluated, the engine's fuelling was calibrated, the handling balance was sorted, and basic driver ergonomic issues were addressed. The

engineers ran the low-style air-box again, as if the wind tunnel data could not be trusted, but temperatures still suggested that it wasn't up to the job. Pescarolo even stuck his hand in front of it while driving down the Mistral straight to try and sense negative inlet pressure. There wasn't any and so the idea was abandoned. Some important reliability issues were discovered, though, not least of which was the tendency for the new rear deck to detach itself from the car at high speed. Encouragingly, the best lap times were now around 1:50, compared to 1:53 when 936-001 was last tested at Paul Ricard the previous year.

With the benefit of the data from the test, 936-001 and 936-002 were prepared to identical "936/77" specification and set up for Le Mans. They would represent Porsche's 1977 factory effort, along with a single 935/77, chassis 935-005. Jacky Ickx remained Porsche's de facto number one driver



and, with Jochen Mass now unavailable due to his F1 contract with McLaren, was partnered with fellow three-time winner Henri Pescarolo and assigned to 936-002. Jürgen Barth and Hurley Haywood would drive 936-001, with Rolf Stommelen and Manfred Schurti in the 935. For their part, Alpine-Renault was not so much entering the race that year as mounting a total assault. Four works A442s were to be driven by the *crème de la crème* of French motor racing talent: Laffite, Depailler, Tambay, Jassaud, Arnoux, Pironi, Jabouille—plus a token Brit named Bell. There were also two Mirage GR8s powered by the turbocharged Renault engine in the field, just for good measure.

As soon as practice began, it was evident that the 936/77 was a major step forward. The previous year's car had not quite managed to crack 200 mph on the Mulsanne straight, but the 936/77 was now measuring on the official radar at 217 mph. The reduction in drag and the additional horsepower were certainly having an effect, just not quite enough: The Alpine-Renault A442 was hitting 221 mph. Jabouille's A442 took the pole with a lap of 3:31.7, followed by team-mate Laffite at 3:32.9, then Ickx's 936-002 a tenth behind at 3:33.0. Barth and Haywood ran 936-001 conservatively and ended up in seventh position, with a lap time of 3:40.0, just pipped by Stommelen who put in a star turn in the more powerful but much heavier 935. The Mirages were surprisingly well off the pace, handicapped by their Renault gearbox being over-gearred—a consequence of the two teams using different tires.

Porsche's strategy for the 1977 race was basically the same as the one it had employed successfully the previous year: Drivers would drive to their own pace and not be drawn into an early battle for the lead. Ickx and Pescarolo's 936-002 would be the number one car, with Barth and Haywood supporting from behind in 936-001, should anything go wrong. Porsche still believed the Alpine-Renaults' weak point was durability, but now that they had four cars rather than one, the odds of at least one car reaching the finish line first were not so easy to calculate.

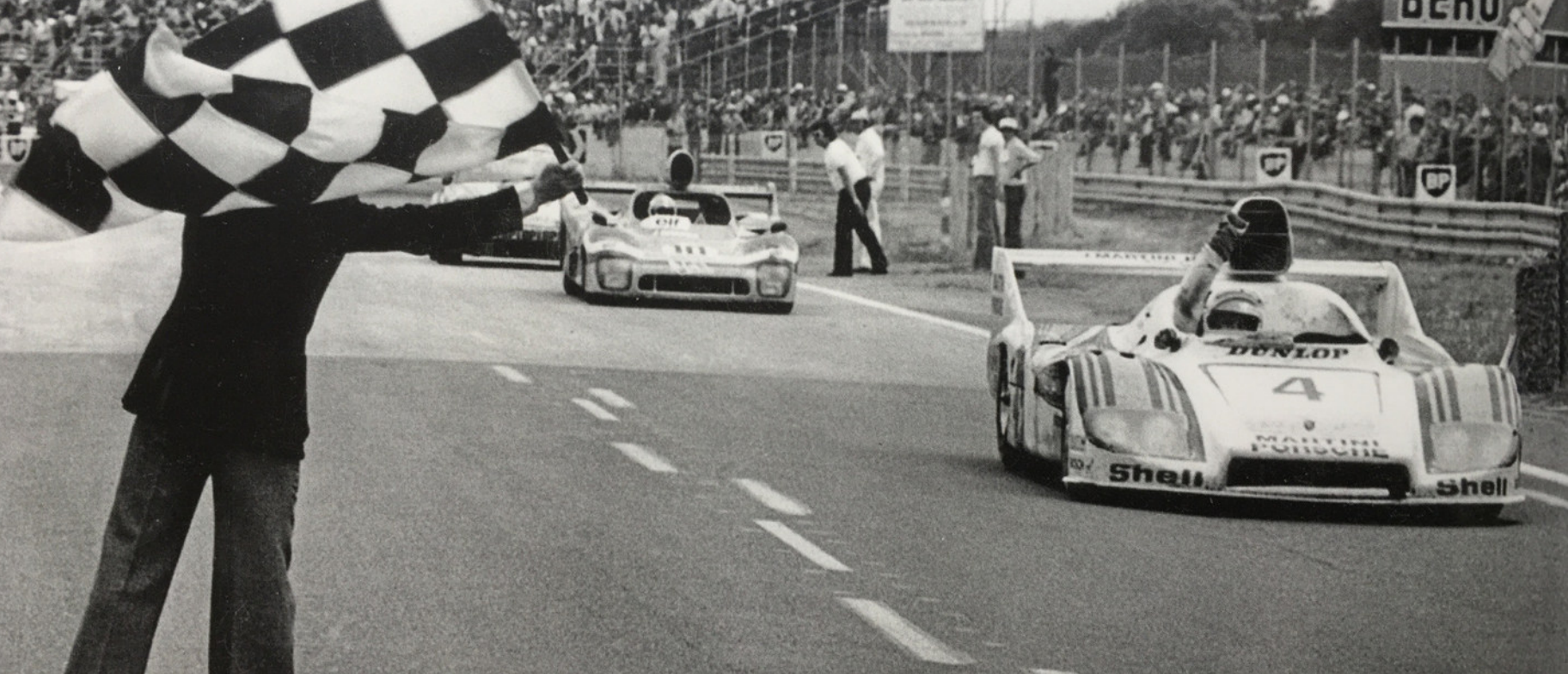
Just as Porsche had suspected, Alpine-Renault had in fact designated Didier Pironi and Rene Arnoux's A442 as the "hare." This plan lasted as long as

the Mulsanne corner on the very first lap, when Pironi pulled off the circuit with his car in flames. That still left the remaining three Alpines-Renaults jockeying for position at the head of the field. With an hour gone, Barth began to encounter an engine stutter that required him to pit. The team couldn't find a fault and sent the car out again with Haywood. He came straight back after a lap with the problem worsening. Engine guru Valentin Schaeffer was in the pits at the time and he remembered a 935 exhibiting similar symptoms in another race, so he instructed the mechanics to change the fuel injection pump and the problem was sorted. But the 30 minutes spent for the repair had relegated the car to the back of the field.

By the early evening, Pescarolo was battling for the lead with Jabouille and Bell when something went horribly wrong in the engine as he was flat out at Indianapolis. He managed to get the car back to the pits, but a conrod had broken and been sent through the crankcase. This was no fault of the driver, as it would later be discovered that the titanium rods had not been properly stress relieved. However, the loss of the number one car so early in the race was a serious blow to Porsche's prospects. This was compounded 45 minutes later by the retiring of Stommelen's 935 with a blown head gasket.

The Alpine-Renaults now occupied the first three positions, led by Jabouille and Bell. Barth and Haywood in 936-001 had managed to claw their way back into the top 20 but seemed to have no more than an outside chance of reaching a podium position. At this point, Ernst Fuhrmann intervened. Under Le Mans rules, teams were allowed to switch drivers between cars and so he decided to put Ickx in 936-001 with very simple instructions: win or bust.

What happened next has become Le Mans legend. Ickx set off into the failing light on a manic three-hour driving stint. Using the full qualifying boost of 1.5 bar, he was soon the fastest car on the circuit, breaking the lap record several times. He gained an average ten seconds per lap on the leading Alpine-Renaults and, by the time he came back to the pits to hand off the driving duties, his car was up to sixth place. Haywood was instructed to back off the boost and maintain position while Ickx rested for a couple of hours. The Belgian was back in the car just after midnight and



set off on another three-hour sprint. Up to this point, the Alpine-Renaults had encountered few problems, but at 1 am the engine in the Jassaud/Tambay car started to smoke badly. The diagnosis of piston failure would rattle the team, as stress cracking in the pistons had been a problem identified in testing that they thought they had solved.

When he came in at 3.30 am, Ickx handed 936-001 over to Barth in third place, now only four laps behind the second-place Alpine-Renault of Laffite and Depailler. Barth drove a double stint in which he had to battle tricky wet conditions and the waning concentration of other drivers, narrowly surviving a near-miss with Alain de Cadenet's Lola. As dawn began to break, Depailler brought his A442 into the pits with gear selection problems. Porsche immediately pitted the 936 and stuck Ickx back in to see if he could make up the deficit while the Alpine-Renault was stationary. By the time the A442's gearbox was repaired, Ickx had sailed past and was two laps clear in second

place. Ten hours earlier, the same car had been in 41st place.

Ickx battled on in atrocious conditions for a scarcely believable four hours, driving in an open cockpit that offered very little protection. By the time he next handed over to Barth, he had given his all and was completely exhausted. At this point, 936-001 still enjoyed a comfortable margin in second place, but was seven laps down on the leading A442 of Jabouille and Bell. Then, at 9 am, the French team's fears were realised when Jabouille's car started trailing smoke. Twenty minutes later, the leading A442 was out with the same piston failure as its sister car. That left 936-001 in front, but Barth was far from in the clear. Alpine-Renault had instructed its hot-shoe Depailler to put the hammer down and he closed to within a lap. The crowd was just starting to get excited at the prospect of a battle for the win when Depailler's engine blew. The cause? The same dreaded piston failure.

This put 936-001 in a seemingly unassailable situation, 19 laps in front of the far-from-healthy Mirage-Renault that was trailing in second position. Porsche cautiously backed off the boost and started to count down the clock. But, alas, nothing at Le Mans is ever certain. With Ickx having reached the maximum time he was allowed to drive, Haywood was put in the car for the last stint to the finish. With just 45 minutes left to run and the champagne being readied, white clouds started billowing from the car as it approached the pit complex. Haywood coasted in with a dead engine—he, too, had burned a piston. The mechanics hurriedly assessed the damage: While there was no way to fix the damaged cylinder in time, it was possible the car might still run well enough on the other five.

By now, 936-001 had completed a total distance that would be impossible for the chasing Mirage-Renault to match before the race ended at 4 pm. However, Le Mans rules required that cars be running at the finish in order to be classified. In other words, you could not win while sitting in pit lane. Furthermore, the last lap had to be completed in less than three times the car's official qualifying time. For 936-001, that meant no slower than 10:20 and, since it had technically already started a lap when it entered the pit area, it would have to finish one additional circuit before the final lap could commence.

The mechanics isolated the fuel and ignition supplies to the damaged cylinder and waited for the clock to tick by. There was no point in doing any more laps than were strictly necessary. At this point, they didn't know whether the car would restart at all, never mind how far it would run. They decided to put Barth in the cockpit, as he was an engineer and best able to coax the stricken car to the finish. To make sure he timed it right, they taped a large red Omega clock to the center of the steering wheel.

At 3:50 pm, Barth was given the go signal and he managed to drag the spluttering car out onto the circuit. Six minutes later, he came round to begin his final lap. After a further six minutes elapsed, a relieved and ecstatic team were able to cheer him across the finish line. The 936 had won its second consecutive Le Mans—if just barely.

Despite the many celebrations that would follow what would become one of Porsche's more famous Le Mans victories, the team was left with plenty to ponder. The attrition rate amongst its turbocharged cars at Le Mans had been very high. Aside from the problems with both 936s, no less than eight 934s/935s had suffered engine failures. The root cause of the problem with 936-001's piston could not be definitively identified, but high cylinder wall temperatures had certainly played a part. That could have been due to the extended periods of running at high boost. Then again, the decision to reduce the boost towards the end of the race may have caused the fuel mixture to weaken and thereby lessen its cooling effect. Regardless, this much was clear: Porsche was reaching the limits of its production-based engine's ability to withstand the thermal stresses of turbocharging, especially over such a long and gruelling race.

Meanwhile, over at the Renault Sport headquarters in Viry-Chatillon, the team scrutinised their performance in detail. They diagnosed a combustion issue at sustained high engine speeds, such as those experienced on the Mulsanne straight, which was causing heat build-up in the top edge of the pistons, leading to eventual failure. Remedial experiments to eradicate the issue were started on the dyno almost immediately and, by September, a fully-funded program for the 1978 campaign had been approved. Alpine-Renault weren't about to give up on their Le Mans ambitions just yet.



**Above:** In the 1978 Le Mans race, Ickx found himself trying to repeat his remarkable recovery of the previous year. He would have succeeded had it not been for a late gearbox problem. 936-001 finished in a strong second place.

**Fuhrmann took the news that** Alpine-Renault would be returning to Le Mans as a challenge. He knew that Renault was pouring a huge amount of resources into both its Le Mans and F1 programs—leaving Porsche with no choice but to up its game significantly to stay ahead. Immediately after Le Mans, Norbert Singer had drawn up a list of improvements that could be made to the 936's chassis and running gear. However, the key requirement was going to be more power and reliability from the engine. Mezger was keenly aware of the limitations of using a 12-year-old road-based engine design as the starting point and had already drawn up a proposal to construct an entirely new race engine one year earlier. This was a water-cooled design that bore no similarity to anything that currently rolled off the Zuffenhausen production line, other than being a flat-six.

The problem for Porsche was cost. Unlike Renault Sport, Porsche's racing department had to finance itself from sponsorship and customer racing revenues. Plus, Group 5 rules still required engines to be production based and Porsche couldn't afford to build two entirely different engines for each racing category. There was simply no way around it: The 936's engine would have to retain the same 911-derived architecture as the one found in the 935.

Of course, Mezger had been thinking about the development potential of the 911's flat six almost from the moment that he first conceived of it. To extract more performance, higher crankshaft speeds would be required—but that necessitated four-valve heads. He had experimented with these on the 911 engine already and had found they didn't leave enough surface area for air cooling to work adequately. His solution was to water cool the heads separately from the rest of the engine, which remained air-cooled in the conventional manner. Mezger also reduced the stroke of the engine while simultaneously increasing its bore, thereby allowing more room to position the four valves, which were operated by double overhead cams. Many of the 935's engine failures were due to blown head gaskets, so the heads were welded to the cylinders as an extra precaution.

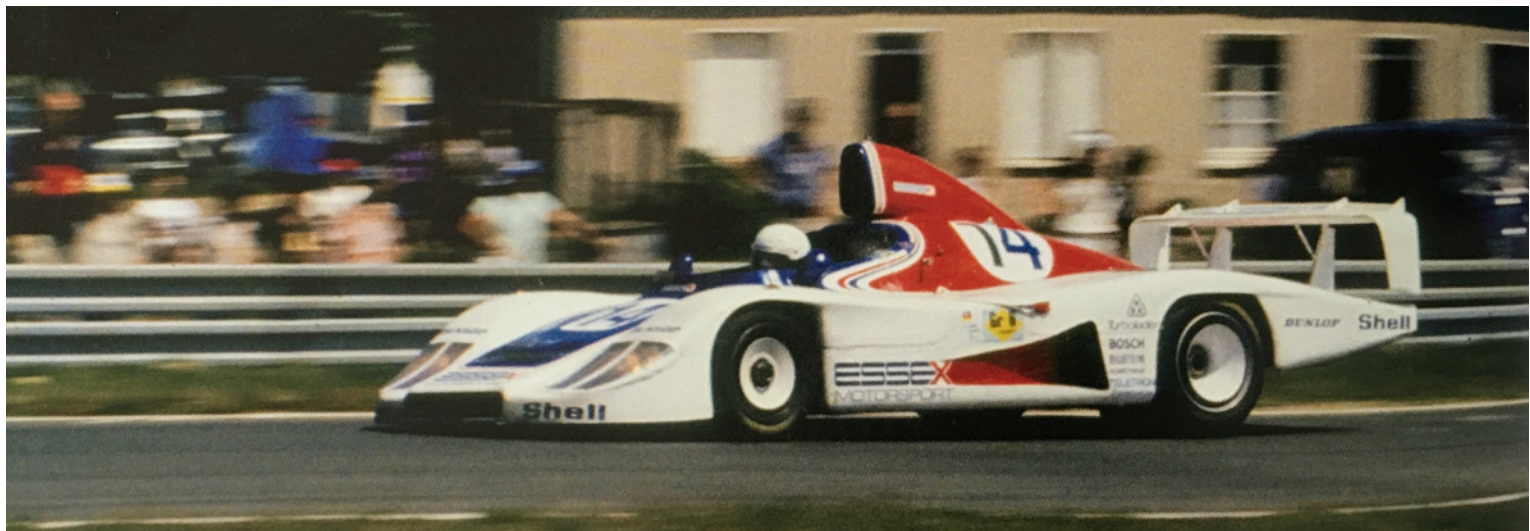
The initial dyno results of the new Typ 935/71 engine were promising. Not only did it now produce 580 hp at 8,500 rpm with 1.5 bar boost, but almost more importantly the peak cylinder wall temperatures had dropped from 260C to 200C. This opened up the prospect of running higher boost for longer periods of time.

The new engine necessitated some changes to the body. Large ducts were set into the car's flanks in order to channel air to the newly installed water radiators for the cylinder heads. In order to make room for these radiators, the wheelbase of the car was extended slightly by lengthening the rear trailing radius arms. Perhaps the most noticeable visual change was the new rear wing. The large tail fins that the old wing was attached to were gone, replaced by two more central supports. The wing itself was developed with the assistance of the Dornier aircraft company and, at their suggestion, had vertical winglets at each end to reduce drag. Elsewhere, the body was fine-tuned with a slightly longer nose, lower tail, and revised air-box design. Singer also went through his list of learnings from the previous year's Le Mans and addressed a range of driver complaints, including weatherproofing the cockpit, improving the instrumentation, and re-positioning the mirrors.

At the beginning of the year, Helmut Flegl swapped places with Wolfgang Berger and was now back in charge of the 936 program. Conscious of Alpine-Renault's likely assault, he decided to prepare three 936s for Le Mans. By now, 936-001 had completed a lot more mileage than 936-002, so the older car was completely rebuilt to the new 936/78 specification. A brand-new car, 936-003, was also built to the 936/78 design. That left 936-002, which remained in good enough condition to once again be raced in its older 936/77 form, still with the two-valve engine. This decision to run the third car in the old configuration was more a matter of Flegl spreading his bets than saving money. The new four-valve engine had resulted in the 936/78 being 70 kg heavier than the 936/77, largely due to all the additional cooling paraphernalia, and it was now tipping the scales at 810 kg, well over

**Right:** Having recently been dug out of the museum, Porsche decided to test 936-001 at the 1979 Silverstone 6 Hours. At a media event before the race, one brave soul has taken up the offer of a passenger ride on the vestigial second seat.

**Below and following page:** In theory all the Porsche team had to do was stay out of trouble to win Le Mans in 1979. Bob Wollek managed to put 936-001 on pole and here leads the early stages of the race. Worsening engine problems would eventually eliminate it from the race.



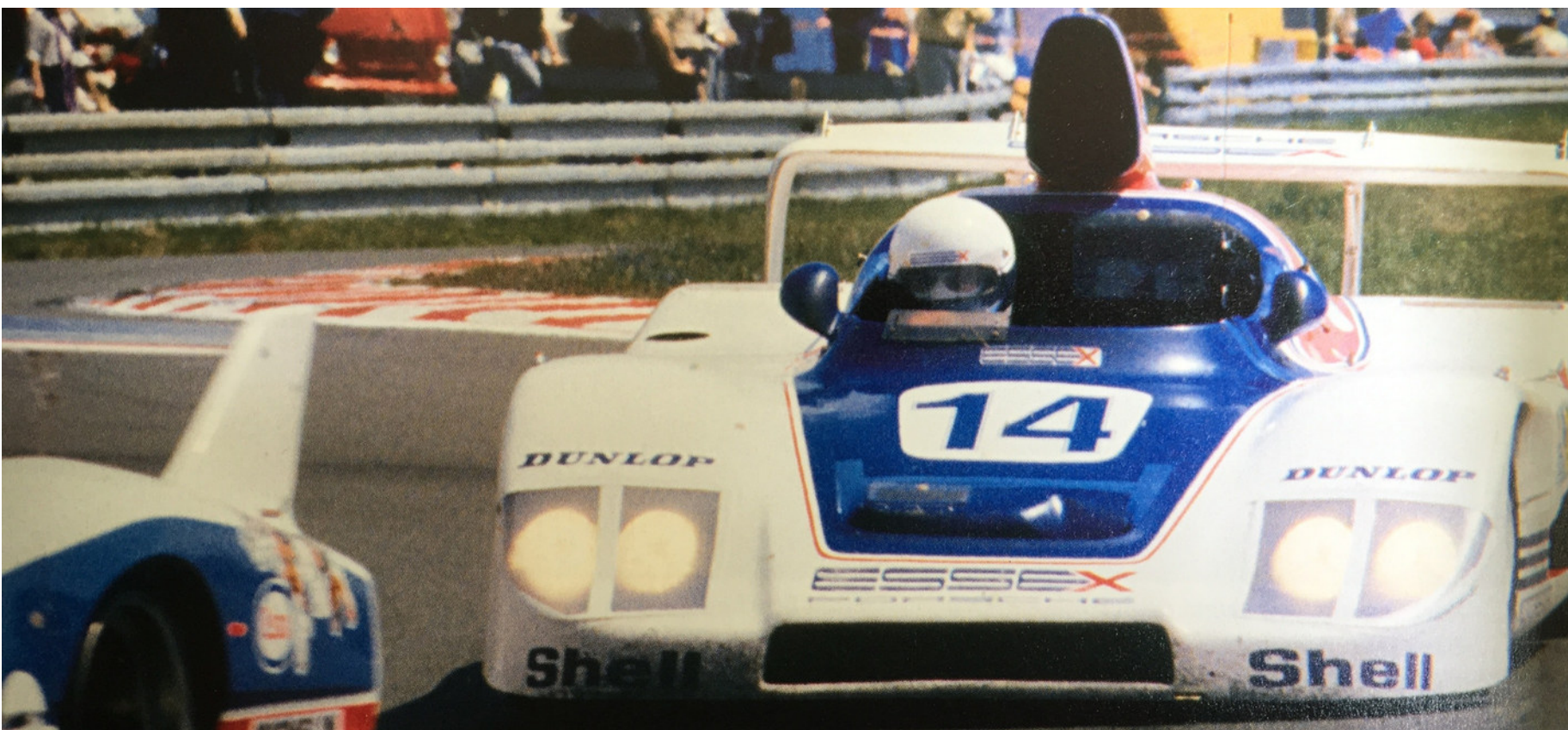
the class minimum of 700 kg. That additional weight was expected to increase the 936/78's fuel consumption, which would mean more pit stops. It remained to be seen which car could cover a greater distance over the course of 24 hours.

Bob Wollek and Jürgen Barth would drive 936-001, while Jacky Ickx, Henri Pescarolo, and Jochen Mass would pilot the new 936-003. Hurley Haywood, Peter Gregg, and Reinhold Joest were assigned 936-002. Ickx was also named as the third driver for 936-001, just in case circumstances required him to switch cars during the race.

Alpine-Renault turned up with four cars again, one of which was the new A443. This wore a new long-tail body with side skirts and had a clear Perspex canopy over the cockpit that virtually turned it into a coupé. It also carried a

new 2,138-cc engine that now made around 520 hp. Jabouille and Depailler would drive the new car. The other three entries were all older A442s, but modified with new long-tail bodywork. Also heavily supported by Renault were the two new Mirage M9s. The French giant had done a huge amount of testing and was confident it had overcome the piston problems of the previous year. Anything less than a win would result in national humiliation.

It looked like Porsche had the edge during practice, as this time it was the Germans—not the French—who had turned up the boost. With his engine running 1.7 bar of boost and producing around 620 hp, Ickx managed to lap the circuit in 3:27.6, almost six seconds ahead of his qualifying lap from the previous year. Depailler in the new A443 could only manage to post a time of 3:28.4. Stommelen's 935/78 "Moby Dick" came next, which had a massive



850 hp and was easily the fastest car down the Mulsanne straight. The remaining 936s, A442s, and a Mirage filled out the rest of the top 10.

Once the race was underway, it didn't take long for the Alpine-Renaults to show their true speed, as Jabouille's A443 streaked away from the field. Both Ickx in 936-003 and Haywood in 936-002 suffered minor niggles early on that delayed each of them a lap. In the early stages, the three Alpine-Renaults led from Wollek in 936-001, who at least was managing to stay in touch. The 935/78 was often the fastest car on the circuit, though it had to stop for fuel twice as often due to the thirst of its engine and its smaller Group 5 fuel tank.

By early evening, Ickx and Pescarolo had regained much of their lost ground when suddenly fifth gear failed. The pit crew had to open the gearbox up for the repair and, by the time the broken gear had been replaced, over 45 minutes had been lost. Without any hope for victory with this car, team manager Manfred Jantke decided to switch Ickx into 936-001, leaving Mass to partner Pescarolo in 936-003. For much of the night, 936-001 harried the leading Alpine-Renault A443 of Jabouille and Depailler and by daybreak was only two laps adrift in second place. It was just starting to seem possible that Ickx might repeat his previous year's feat when gearbox trouble struck again, forcing over half an hour of repairs. That put 936-001 back to fourth place, behind the trio of Alpine-Renaults, but with the boost turned up to 1.7 bar it managed to eventually claw its way back to second position.

When Pironi's winning Alpine-Renault A442 crossed the finish line at 4 pm, 936-001 was still five laps behind, while 936-002 was in third place a further two laps adrift. That gearbox fix had cost 936-001 the equivalent of ten laps. Fuhrmann was understandably furious when it was later discovered that the transmission's gears had not been manufactured to Porsche's specifications. However, even Porsche would admit that the French victory was good for the sport, as it demonstrated the level of intense perseverance required to win.

**As its motorsport department was busy** developing an engine for the American Indy Car series, Porsche announced that it would not be competing as a factory team at the 1979 running of Le Mans. The three 936 chassis were retired to the newly-established Porsche Museum next to the factory in Zuffenhausen, destined to sit dormant except for perhaps the occasional demonstration run. As Alpine-Renault had already withdrawn from sports car racing to focus on Formula 1, it soon became clear that there would be no manufacturer-run Group 6 teams at Le Mans.

This fact was not lost on David Thieme, a wealthy American oil trader and owner of Essex Petroleum, already a front-line sponsor of the Lotus Formula 1 team. Thieme could see that the 936s would walk all over the field now that the Alpine-Renaults were gone, so he approached Porsche in early 1979 and offered to finance the entirety of a works effort. Porsche didn't require much persuasion: The costs were underwritten and the chances of a fifth win were high. By the time a final decision was made, only three months remained before the race. With such a short time-frame for development, the scope had to be limited, so Flegl focused on improving the flexibility of the very peaky four-valve engine and adopting the superior brakes from the 935/78, which would also require the use of its 16-inch rear wheels.

The testing program amounted to only a single round of the Group 5 championship at Silverstone in May with 936-001. All seemed to be good. In qualifying, the 936 was in a league of its own, five seconds a lap quicker than anything else. By the mid-point of the six-hour race, it had a seemingly invincible seven-lap lead. Then, with just an hour to go, the car suffered a catastrophic rear tire failure that caused Jochen Mass to spin it into the barriers at high speed. Fortunately, Mass was unhurt and the car was salvageable, but the cause of the tire failure was worryingly unknown. Back at Weissach, the wheels were tested, and it was discovered that if the tires suffered a momentary pressure drop at high speed, they would separate from the rim. Porsche modified the wheels with a taller safety bead and headed off to Le Mans hoping that this had solved the problem. Unfortunately, it had not.



During early practice, while nearing the end of the Mulsanne straight at near maximum velocity during practice, Bob Wollek had a sudden blow-out in 936-001. By some miracle, he managed to save the car from spinning and used the escape road towards the Mulsanne village to slow down. One of the tires had jumped off the rim again. An engineer couriered the offending wheel back to Weissach immediately on David Thieme's private jet and the problem was quickly diagnosed: The tires were deforming at very high speed and the sudden release of load over a bump could cause rapid deflation. Several sets of wheels were modified with longer safety bolts and flown back to Le Mans the very same day.

Otherwise, qualifying went smoothly for both the 936-001 of Wollek/Haywood and the 936-003 of Ickx/Redman. Porsche had made improvements to both the fuel injection pump and exhaust system, and Ickx reported that the engine was now noticeably more responsive. Wollek put 936-001 on the pole with a lap of 3:30.1, with Ickx just over a second behind, still on the front row. Their nearest challengers were the Kremer and Gelo 935s about five seconds back, with the best of the Mirages ten seconds down. The 935s still suffered from the handicap of a small Group 5 fuel tank, so it looked like all the 936s needed to do was to get to the finish line in order to claim victory. Jantke formulated a conservative race strategy designed to put minimum stress on the cars and even contemplated a one-two finish at the Friday team meeting.

Once the race started, however, the prospect of an incident-free run didn't last long. In the third hour, the dreaded tire issue returned when Redman had a blow out in 936-003 at the Dunlop curve. During the tortuous process of returning to the pits, the de-laminating tire caused extensive damage to the back of the car and the incident cost more than an hour of lost time, which demoted him and Ickx to the rear of the field. Wollek and Haywood led the race for several hours in 936-001 but encountered worsening ignition problems that would lose them increasing amounts of time in the pits as the mechanics struggled to solve the issue. A quarter of the race in,

both cars were running well again but had significant deficits to make up. Jantke was forced into attack mode and both cars switched to qualifying boost levels. They made up time hand over fist, but those earlier issues had not entirely gone away. Nonetheless, by the early hours of the morning, both Porsches were back in contention with 936-001 running as high as third position.

Unfortunately, 936-003 was still suffering from the ancillary damage caused by the blown tire and Ickx suddenly found himself with a completely dead engine on the Mulsanne straight. He parked up by the side of the track and, with cars passing him at full pelt in the rain at 2 am, he managed to diagnose a snapped fuel injection pump belt. Repairs to a stricken car were allowed under the rules but had to be undertaken by the driver without outside assistance. For this purpose, most cars carried a set of spares, and the drivers were trained in how to use them. Ickx managed to put the spare belt on the pump well enough to get the car started, but he only made it as far as Mulsanne corner before it came off. There was no way of finding the ejected belt in the dark and the car didn't carry another spare. Frustratingly, Ickx was parked under the noses of the Porsche signalling crew at the corner exit who could see exactly what was going on. With no other option, Valentin Schäffer jumped on a scooter with a spare belt and sped to the signalling box. Hoping no one would see him in the darkness, he threw the belt over the track to Ickx, who fitted it successfully this time. He was back in the race—at least temporarily. The marshals had, in fact, witnessed the whole episode and soon an ACO representative visited the Porsche pits to inform the team that the car was disqualified.

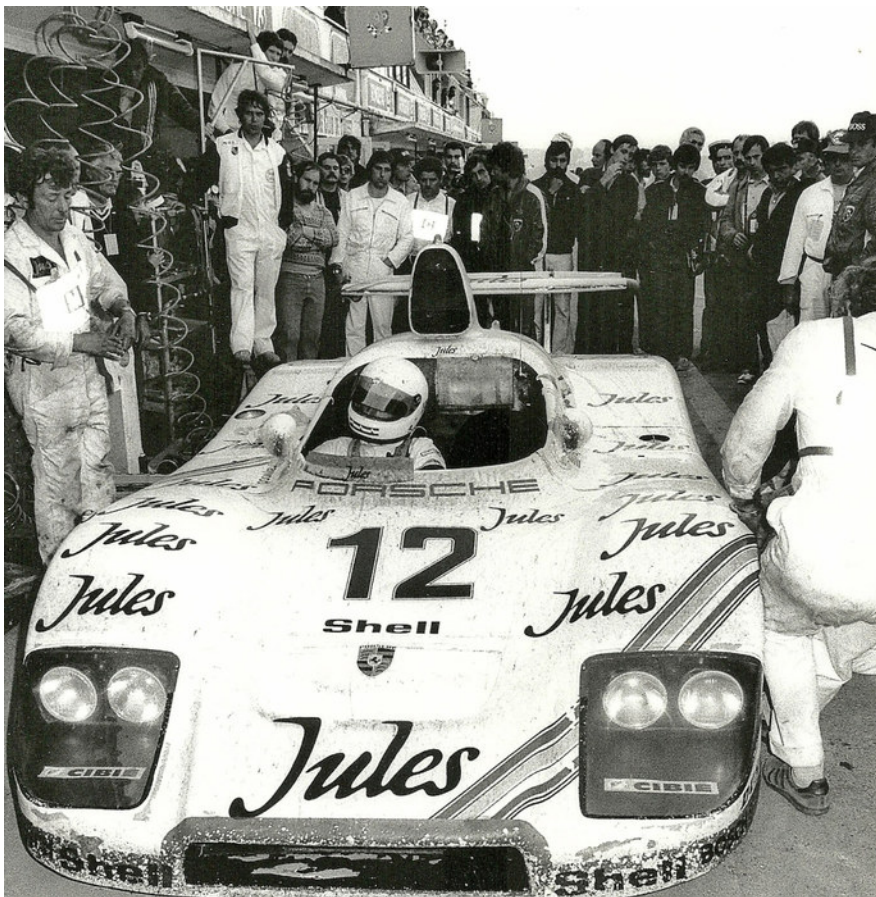
This left only 936-001 in the race, still battling against its misfire problem, but nonetheless now in second place after a couple of the cars ahead had retired by dawn. Despite the efforts of the mechanics, the engine problems worsened, and the car lost compression on one cylinder completely. By 8 am, it couldn't pull any gear higher than third and was forced to retire. It was an uncharacteristic failure for the factory team, with both 936s



**Above:** 936-001 at Le Mans in 1981 in its final 936/81 specification, complete with 2.65 litre "Indy" engine. Were it not for Porsche's new CEO, Peter Schutz, Porsche would only have been racing for minor class honours that year with the 924 GTR seen in the background.

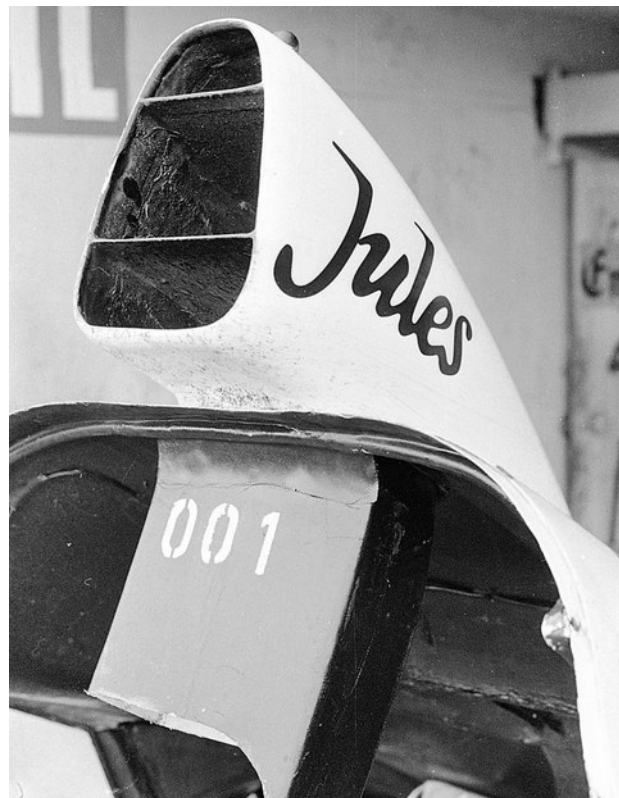
suffering a constant stream of ailments. Perhaps the lack of preparation was to blame. Certainly, the tire issue was discovered too late, but the water-cooled heads also needed development, as the poor running of 936-001 turned out to be overheating valves. There was, however, a silver lining for Porsche: Privately-entered 935s had managed to fill all three places on the podium, with the Kremer Racing K-3 giving the company its fifth Le Mans victory.

**At the dawn of the new decade,** it appeared that Porsche was moving away from its rear-engined past and into a front-engined future. As the board had decided to re-allocate resources in a way that more directly reinforced the company's marketing efforts, privateer racing support was abandoned in order to focus efforts on a competition version of the 924 in Group 4. Once again, the three 936 chassis were relegated to a dusty corner somewhere in Stuttgart.



Then, Reinhold Joest approached Porsche for a favour. He was still running his somewhat antiquated 908/3 Turbo with surprising success, having won the championship races at Dijon and Brands Hatch the year before, but the 936 seemed to be the car to have at Le Mans in the absence of any manufacturer entries.

Joest's relationship with the race department couldn't have been closer. He had been both a factory driver and a customer, while his race shop had recently been chosen by Porsche—together with the Kremer brothers—to



**Above:** The air-box supplied cool air via three separate ducts to the main cooling fan, intercooler and gearbox oil cooler.

build the privateer cars that the factory was no longer willing to supply. So Joest asked if he could borrow one of the idle 936s for his team to prepare and run at Le Mans. Granting this request would prove to something of a dilemma for Porsche: Though the department wanted to help out its long-time friend, many knew that this would create an awkward precedent with other customers, who wouldn't appreciate favouritism being shown to a rival who might also request similar kinds of special favours down the road.

A solution was soon found: Porsche would supply everything necessary for

Joest to complete its own car for the race. Other than the chassis, which was constructed from scratch, Porsche already had pretty much everything needed for the build on its shelves already. However, the company was unwilling to part with another four-valve engine, so it was decided to utilize a two-valve unit in 936/77 specification. Sub assembly was completed at Porsche and then the parts were shipped to Joest for the final build. Though the end result effectively created the fourth 936 chassis, 936-004, Porsche insisted that Joest refer to the car as a “908/80” in order to imply that it was a development of his existing car.

Though Jacky Ickx was officially retired by 1980, he readily accepted Reinhold Joest’s invitation to co-drive the car at Le Mans. Another win would see him break the record of four Le Mans victories that he shared with Olivier Gendebien, which was apparently a prospect that he could not ignore. With Ickx on board, Martini became the headline sponsor and the car was liveried in the famous red and blue stripes. It sure looked like 1977 all over again.

Despite a brace of Cosworth-powered Rondeaus and several 935s, the Joest 936 was the fastest car entered that year. The Group 5 entries still suffered from needing to pit far more often and the Rondeau had a poor reliability record. Joest accordingly planned a cautious race strategy and decided to wait for others to make mistakes. It nearly worked. With three quarters of the race gone, Joest and Ickx led by two laps ahead of the sole remaining Rondeau. Then the ghost of 1978 returned and Ickx lost fifth gear. Twenty-five minutes went by while it was repaired, putting Ickx into another desperate chase to the finish. He almost made it, too, but a rain shower towards the end tricked the Joest team into selecting the wrong tires. They ended the race in second place, a mere two laps down on the winning Rondeau.

**The end of 1980 saw major changes** at Porsche. Fundamental disagreement over the future of Porsche’s product lines had been straining Ernst Fuhrmann’s relationship with Ferry Porsche and he was persuaded to

retire from the company. His replacement, Peter Schutz, wasted no time in reviewing the company’s racing program. When it was famously explained to an incredulous Schutz that the 924 Carrera GTR had no chance of an outright victory at Le Mans, he responded with a question: “Do we have a car capable of winning?”

The answer to that question was not a straightforward one, as much was changing in the world of motorsport. The race department had spent a lot of effort over the preceding 12 months developing a 2.65-liter turbocharged engine for the Indy Car series, only to be stymied by a ruling from the organisers on the amount of boost that it would be allowed to run. The rules at Le Mans had also changed, with the 3-liter engine capacity limit for sports prototypes now replaced by a new formula based on fuel consumption, presaging the FIA’s move to Group C in 1982. Out of these seemingly unfavourable circumstances, Porsche formulated an ingenious path: What if the Indy Car engine was placed into an existing 936 chassis? Schutz liked the idea and so the 936/81 was born.

The Indy Car engine was closely related to the one used in the most recent 936s, with the same water-cooled four-valve heads but a larger 2.65-liter capacity, per the Indy regulations. However, the Indy engine had been adapted to use methanol fuel and thus had to be re-engineered to run on gasoline. Initial tests were promising: 620 hp at 8,200 rpm with 1.4 bar of boost. However, the 20% increase in torque heightened concern over the durability of the 5-speed gearbox, which had already been at the root of the failures during Le Mans in 1978 and 1980. A decision was therefore made to replace it with the 4-speed unit from the 917/30, which had handled all 1,400 hp of the Can-Am monster and was considered unbreakable, if heavy.

Norbert Singer had both the 936/78s completely disassembled and rebuilt. The intercooler and water radiators were updated to cope with the higher thermal loads produced by the larger engine and the fuel tank was reduced in capacity to 120 litres, as required by the new regulations. Most importantly, he changed the wheel supplier to BBS, whose rims were



**Above:** In contrast to its winning sister car, 936-001 was plagued with technical problems during the 1981 Le Mans race, its final competitive outing.

confirmed to be airtight up to 250 mph on their testing machine. By the time the cars were reborn in 936/81 guise, it was too late for little more than a shakedown test at Weissach. The title sponsor had even yet to be found when the two plain white cars were already packed into the truck and headed for La Sarthe.

Jacky Ickx was tempted out of hibernation once again in order to drive 936-003 with Derek Bell, who was back in a front-running Porsche for the first time since he had driven the Gulf 917 ten years earlier. The duo had already won the 1975 Le Mans in a Mirage and were firm friends. This left 936-001 in the hands of Hurley Haywood, Jochen Mass, and newcomer Vern Schuppan. At the last minute, Porsche signed up Christian Dior as race

sponsors and the two 936s were plastered with “Jules” perfume brand stickers. Reinhold Joest also decided to enter 936-004 alongside the works team, despite the fact that he was down about 100 hp with his 936/77-spec car.

The main opposition for the 936s came from Rondeau, the previous year’s winner. They were fielding five cars for 1981, two of which had the new 3.3-liter Cosworth DFL endurance engine, and employed an experienced driver roster that contained several Alpine-Renault exiles. In practice, the 936s still proved to be quickest. Ickx claimed another Le Mans pole at 3:29.7, with Haywood and Joest closely behind in second and third. The flock of Rondeaus were five to ten seconds adrift of Ickx’s qualifying time.

The early stages of the race were marred by two nasty accidents on Mulsanne that resulted in the deaths of a driver and a marshal. The Safety Car, an innovation for Le Mans that year, was deployed for over an hour while the track was cleared. With four hours of the race gone, it was Joest's 936/77 that was surprisingly in the lead, as its 2.1-liter engine was proving quite a lot more economical than the larger one in the 936/81s. Unfortunately, this initial promise was cut short when a loose wheel caused Joest's co-driver Dale Whittington to crash and eliminate the car from the race. This put Bell and 936-003 into a comfortable lead, with 936-001 recovering from misfire issues. By 10 pm, the two Porsches led the field and stayed in that formation for the rest of the night. At dawn, Ickx and Bell had a lead of four laps over Haywood, Mass and Schuppan, who in turn were four laps clear of the fastest Rondeau.

Then, at 6 am, Schuppan encountered serious trouble when the clutch of 936-001 started slipping badly enough to need replacing. This required the gearbox to be split from the engine and took well over an hour to complete. By the time it returned to the race, it was down to seventh position, so the drivers were told to attack and try to reclaim a place on the podium. With the boost turned up, they reeled off a succession of the race's fastest laps, with Mass even breaking the lap record at one point. They were finally closing on the third-place Rondeau when Schuppan was again hit with mechanical problems, this time related to the fuel system. A further hour spent in the pits would annihilate their podium ambition.

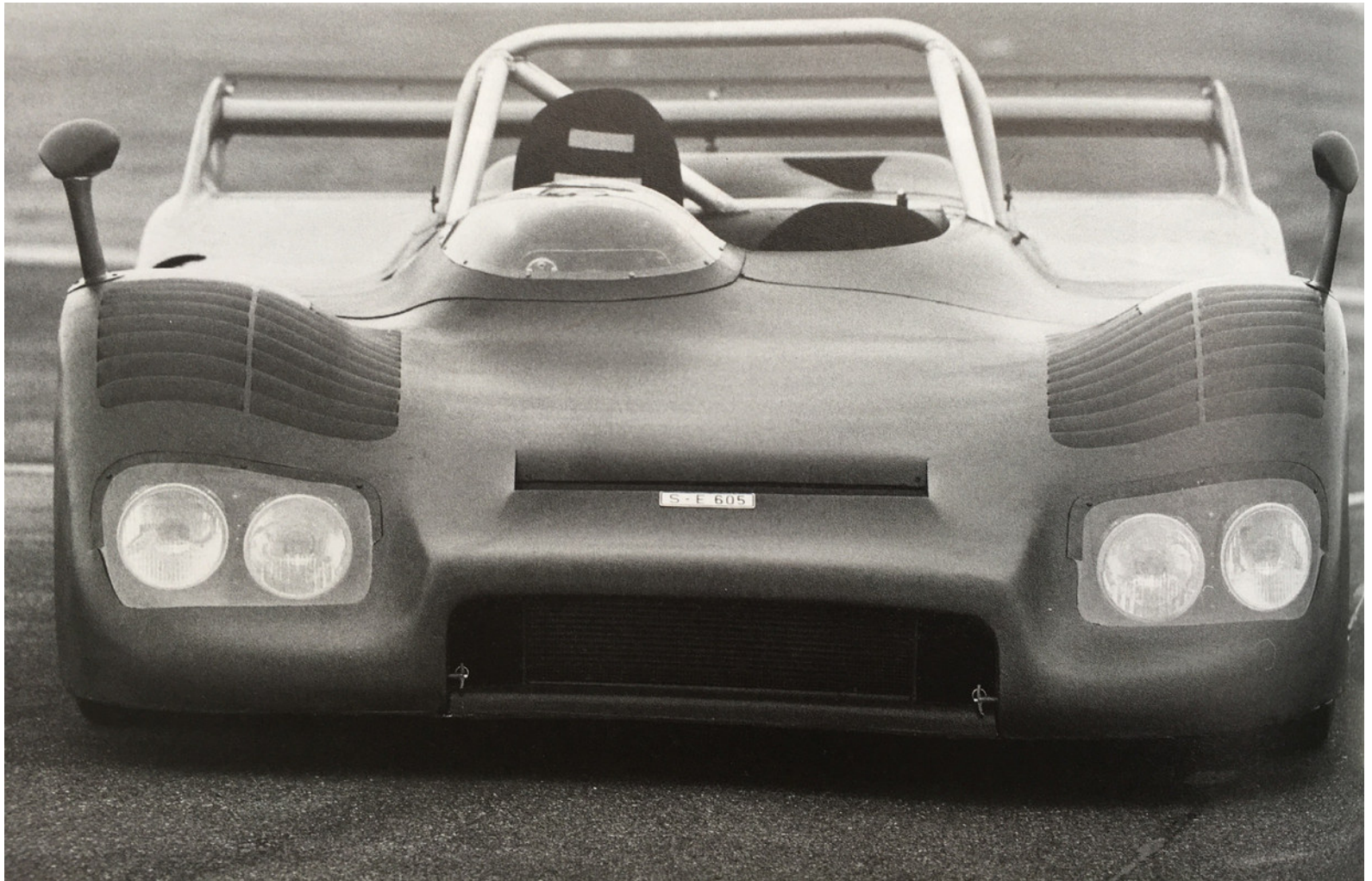
Meanwhile, Ickx and Bell were continuing to hold the lead without any major issues. They had dropped their pace and, with three hours to go, were easily controlling a ten-lap advantage over the pursuing Rondeau. This didn't assuage the nerves in the Porsche pit, where memories of the final-hour panic during 1977 had not faded. However, they need not have worried: 936-003 extended its lead and crossed the finish line without further incident. The Porsche team were jubilant. Ickx had won Le Mans for a record-breaking fifth time.

After the 1981 race, 936-001 and 936-003 were both withdrawn from racing for good and soon joined 936-002 in the retirement home known as the factory museum. Incredibly, by this point, each of the three works 936 chassis that Porsche had produced could claim a Le Mans win, while even

the Joest car finished a close second. While perhaps not quite as astonishing a feat as the seven wins that the later 956/962 would garner, over a hundred of those were built instead of just four, which evens out the odds quite a bit.

While the three factory cars would not be seen in competition ever again, Joest continued to race 936-004 in the German DRM series. With Mass driving in 1981 and Wollek in 1982, his team won several races. The Kremer brothers also built their own 936, but with slightly less help from the factory than Joest had received. They were looking to enter the newly-formed Group C in 1982, but with the 956 not yet ready for delivery to customers, the factory supplied Kremer with surplus 936 parts that they then married to their own frame. Powered by a two-valve 2.1-liter engine that Manfred Kremer built himself, the end result received an official blessing from Porsche, who even allowed it to carry the 936-005 chassis number. Kremer entered the car into the DRM that year with Rolf Stommelen at the wheel and earned several podium finishes. When Porsche finally started supplying their much more advanced 956 to customers in 1983, the Joest and Kremer 936s became obsolete and they, too, were retired.

Though it often sits in the shadow of the legendary 956 that followed, the 936 represents the critical bridge that both ends Porsche's long and successful career with space-frame chassis prototypes and begins its legendary turbocharged era that would last well into the late 20th century. And while the 956 took a quantum leap forward with its aluminium monocoque chassis and ground effects, it remained directly connected to its predecessor through its use of the very same 2.65-liter four-valve engine that had been first developed for the 936/81. Without the near decade of work that had gone into perfecting the performance and reliability of this turbocharged flat six, Porsche's next generation of endurance racers would have very likely come onto the scene with a whimper and not a bang.



**Above:** 936-001 as it was first created. The chassis would go on to race at Le Mans a total of five times, claiming an outright victory, a second place and a pole position qualifying lap.

# BIBLIOGRAPHY

Barth / Dobronz – Porsche 936  
Frere – Porsche Racing Cars of the Seventies  
Ludvigsen – Excellence was Expected  
Wimpfen – Time and Two Seats  
Horsmann – Racing in the Rain  
Smith – Alpine & Renault, The Sports Prototypes  
Singer - 24:16  
Singer – My Life with Porsche  
Donohoe – The Unfair Advantage  
Barth / Busing – The Porsche Book  
Cotton / Trispel / Weber – Porsche Kremer Racing  
Morgan – Porsche 956 / 962  
Mezger – Porsche and Me  
Fodisch et al – Porsche 908, the Long Distance Runner  
Porsche Factory Archive records for 936-001

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