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"SANREMO" POWER

Recreating the Maserati 4CLT/48 *Engine*

Rainer Ott

One week after his victory in the Sanremo Grand Prix, Alberto Ascari raced Maserati 4CLT/48 '1594' to 5th place in the Swiss GP at Bremgarten. Team mate Gigi Villoresi finished 3rd.

Maserati's 4CLT/48 model was an evolution of its 1939 4CL, a 1500cc supercharged monoposto built for Voiturette racing. Twenty 4CLT/48 chassis were built in Bologna, offering private entrants the only effective opposition to the more sophisticated and more powerful straight-eight Alfa Romeo 158 first seen in '38.

When racing resumed after World War 2, it quickly became apparent that a more highly-developed version of the 4CL was needed if Maserati owners were to be able to combat Alfa Romeo's relentless development of the 'Alfetta', the dominant car of the period, ultimately with well over 300bhp on tap.

Ingegnere Alberto Massimino's 4CLT/48 design was lower, with sleeker, less upright bodywork than its forebear and a handsome extended nose. It had a stiffer, large diameter tubular chassis frame – the T suffix is for tubolare - with revised rear suspension and a feistier, two-stage blown evolution of the 78x78mm four-cylinder, four-valve, engine. Maserati claimed 260bhp at 7000rpm for this highly-boosted unit.

On its debut on June 27, 1948, Alberto Ascari drove Scuderia Ambrosiana's 4CLT/48 '1594' to victory in the Sanremo Grand Prix over a gruelling 283km (175 miles) on the Ospedaletti street circuit. Team mate Luigi Villoresi's sister car '1597' finished second. Honouring this success (in a 16-car field without Alfas), the slender 4CLT/48 model was often referred to thereafter as the "Sanremo" Maserati.

Run by private teams - including Ambrosiana, the Automovil Club Argentino and Enrico Platé's Milanese operation – these pretty cars enabled three great drivers to shine in International events before earning their place in full works Formula 1 teams.

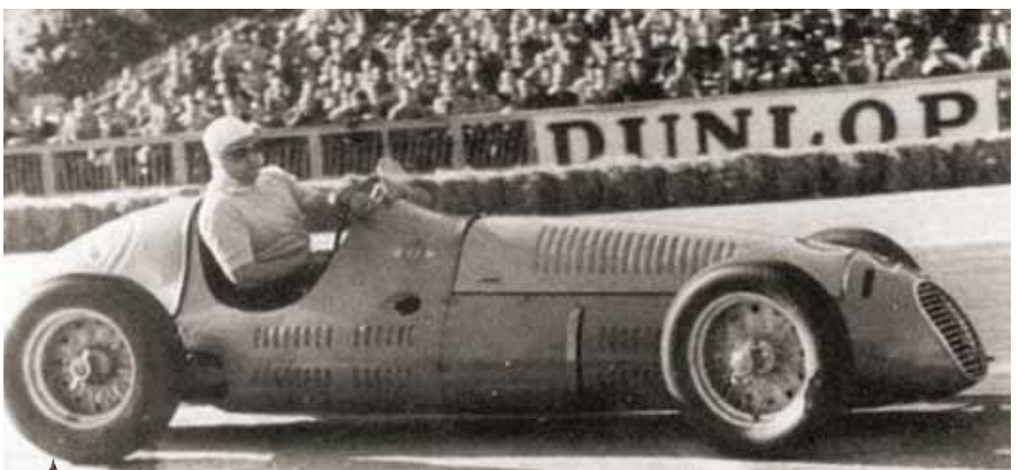
Indeed, the first eight Drivers' World Championships of the modern era, which began in 1950, were won by 4CLT/48 graduates: Nino Farina once, Alberto Ascari twice and Juan Manuel Fangio five times.

The Italian stallions were reliable mounts for many top amateur drivers too, serving them notably well in South American events long past their sell-by date. With this pedigree it is no surprise that survivors are highly sought after, if rare, in historic racing circles more than 65 years after their heyday.

One such car, which has commanded much attention in HGPCA circles over the past two seasons is Rainer Ott's chassis 1600, driven in period for Scuderia Ambrosiana by Argentinians Adriano Malusardi and Benedicto Campos, as well as their fabled compatriots Jose Froilan Gonzalez and Fangio.

The unserviceable original Maserati engine - serial number 1597- was the model and inspiration behind an extraordinarily ambitous recreation.

Photo: Simone Kalk



Jose Froilan Gonzalez racing chassis 1600 - now Rainer Ott's car - in the 1950 Monaco Grand Prix. 'The Pampas Bull' qualified third but retired. The Maserati competed in the blue and yellow of Argentina. *Photo: Rainer Ott Collection*

A subsequent owner of 1600, Juan Viaggio, raced it with a Ford V8 engine [as the Ford Maserati] in Argentinian and Uruguayan *Formule Libre* events as late as 1962. Fortuitously, little in Argentina was ever discarded and its original Maserati four-cylinder, number 1597, remained with the old warhorse.

The replication of this aged and fragile Maserati engine, and the extraordinary passion and endeavour behind it – a true labour of love - is the reason that renowned German historic racer Ott is able to enjoy the wonderful car today. We are indebted to Rainer for sharing his fascinating story:

"In 2007 I wanted an additional race car, to complement ERA R9B. What fitted the bill better than a Maserati? Finally, I had the choice of two 4CLT/48s. One was race ready, on the button. The other had a defective engine, and parts of its chassis and body had been modified, but this one interested me more.

"The engine was not repairable because its magnesium block was corroded and worn. So I asked some very good people in the UK to build me a complete new one, with superchargers and everything - but nobody wanted to. 'Too difficult, too expensive, a big risk,' they said.

"Then I asked a friend in Germany who I believed was capable of doing it. He said 'yes' but I said it should not take longer than a year, otherwise I would buy the other car - I wanted to race one before I turned 70! He confirmed, 'yes, one year,' so I bought '1600' in September 2007. We quickly discovered that a year to build this complex engine from scratch is impossible. In that time we could perhaps have the casting patterns, if we were lucky. Unfortunately my friend got sick and I had to take sole responsibility...

"I realised also that the enormity and cost of the entire project was too great for one person alone, so I looked for partners who also needed engines for their cars, because they would like to keep the originals safe. Finally I was able to press ahead with building five engines and to amortise not all, but an important part of, the cost between the investors. At that point everything became too complicated to do it privately, so I established a company, Historace GmbH, to build the engines.

"I just had retired after a long working life [Rainer was CEO of a major German aerospace company], so to start a new business was the last thing I intended to do. But it was a must. When developing the engine, each week we hit a new problem. My rationale was, if we could not solve it ourselves, to seek out the best qualified people to help. Here I was looking for small, excellent, companies within 30km of home, to enable personal intervention for fast resolution of issues.

"Being located in South Germany's Suebian Alb area, close to Stuttgart, there are many small engineering businesses serving Porsche and Mercedes. They were happy to work with 'Maserati' too, however there was one stumbling block. Numbers. When they asked me 'how many thousand units should be manufactured,' I answered '5.' First they thought 5000, but again I said, 'only 5 units from the relevant parts.' And this was the problem.

"So I had to convince the managing directors what a wonderful job it would be to contribute their expertise, so that a unique historic Formula 1 engine could be re-made. I showed them pictures of the car, the engines, Fangio driving this car, etcetera. Finally they became very enthusiastic and part of the 'team,' Their input was absolutely vital.

"As starting point I used the original engine from my car. We made drawings and CAD files for CNC machining. Craftsmen created wooden moulds for casting patterns in the traditional way. Gravity sand casting was employed. The original material was no longer available, so we searched for the most appropriate alloys. Making the first cylinder block meet our quality criteria took six attempts. Casting, machining, cutting up, inspecting, then improving and re-mastering the moulds was labour intensive.

"Machined steel and aluminium components were created mostly from our CAD drawings. Machining the cylinder block in one part with the heads was very challenging. Working with our supplier we developed a unique way to machine the combustion chambers, valve seats and channels with a variance of less than 0.01mm between heads. Finally we achieved identical combustion chambers and channels, resulting in

smooth and vibration-optimised running.

"Casting and machining the water and oil pumps was easier, the challenge here being to define the correct tolerances for impellers and gears. For the crankshaft, conrods, pistons and camshafts we found suppliers who produced them to our drawings and quality requirements.

"Making the superchargers, including gears and rotors, was also technically challenging. Here it was very difficult to find first the supplier and then develop the best method of machining, again requiring highest precision."

"Assembling the engine was especially difficult because we had no Maserati 'know-how.' We had to invent things as we progressed, which marque specialists had doubtless already done, but not told us. We were delighted that the high level of machining precision enabled our dedicated team to get it oil and water-tight, requiring almost no gaskets.

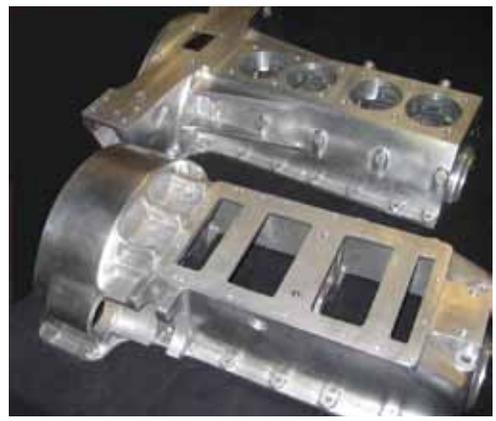
"When, after many setbacks, we entered the phase where the first engine was ready to be run, another series of problems arose. We had the good fortune to be able to use the very modern computer-controlled dyno at the Hochschule Ravensburg, the University of Applied Science in the nearby city of Weingarten.

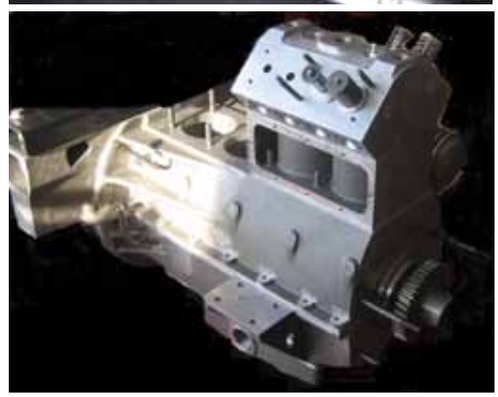
"We received enormous assistance from Professor Dr. Michael Pfeiffer and his enthusiastic young engineering students. Within weeks they had studied many books to maximise theoretical knowledge about alcohol-fuelled double-staged supercharged engines. Their input was fantastic and they were justifiably proud when they saw, and heard, the result of our project together. The university is also successfully developing and building a racecar in the German Formula Student competition.

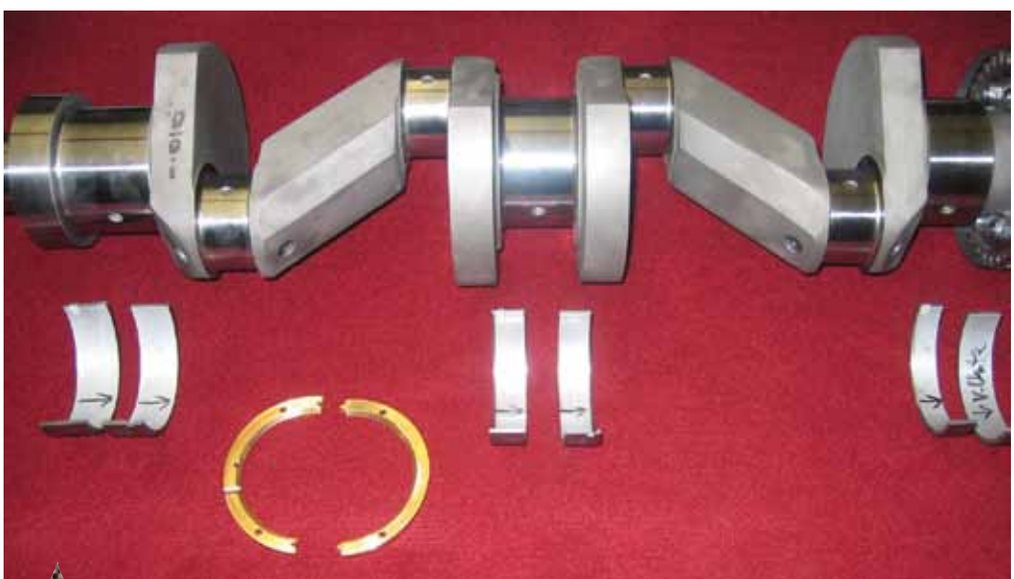
"Naturally we were nervous in the lead-up to starting our engine for the first time. When I pushed the starter button it turned, but there was no ignition reaction. We reviewed ignition timing, carburettor settings and fuel supply, but again nothing. Eventually we discovered that the starter motor was turning in the wrong direction. Once corrected the engine ran, without leaks. We were very happy and thought 'we are almost ready now.'

"From buying the Maserati to returning it to the track took five years of toil, discovery and perseverance"

"From that long-awaited and very memorable first day we came out with a slightly disappointing 190bhp and, in the last test run, a holed piston. This was reason enough to work out a Dyno Test Programme, comprising individual test runs for camshaft timing, ignition timing (starting with 28 degrees advance, then 35° and 42°), fuel mixture, carburettor settings (jets from 300 to 550) , fuel pressure (0.2 to 0.5 bar), supercharger boost (1.5 to 2.2 bar) and compression ratios (6.0:1 to 7.5:1).







Every part of the engine is bespoke, manufactured from scratch to exacting standards, by specialists in their field based close to Historace GmbH's base in Southern Germany. *All photos: Simone Kalk*

"We ran the prototype on the dyno for almost nine months, during which a vast range of ignition and cam timings, compression ratios, supercharger drive ratios, boosts and fuel mixtures were tested using special equipment from the university's engine research department. We were even able to 'look' into the combustion chambers during engine runs. This period of trial and error was at times very frustrating – we strengthened the magneto and had to repair occasional damage - but also exciting. Eventually the results were as well.

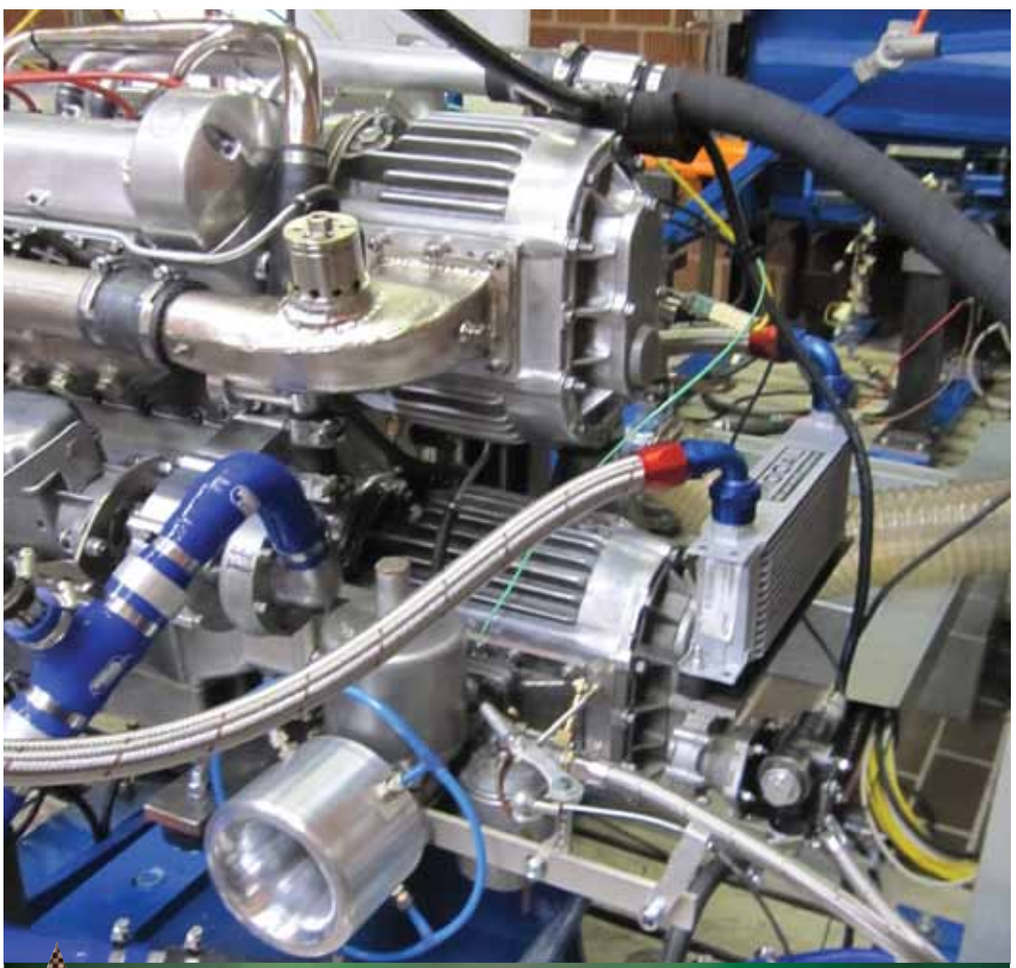
"None of us would have believed then that it would take another year to come to a more or less perfect product, to be installed in the 4CLT for its first outing on a race track, but each parameter had to be tested individually. As progress was slowly made we measured 210bhp, then 225 and 235, until we recorded our 260bhp target. In later steps we found even more power, however we went back to 260bhp at 7000rpm, to have a reliable engine producing high torque at lower revs.

"We also tested different fuel mixtures (85% methanol, 10% benzol, 5% acetone and many ratios in between). We then added water (1%, 3% and 5%) with interesting results, but finally opted for 100% methanol, as we have run in the ERA for a long time. As I think is well known, the lower the exhaust gas temperature, the better for the engine.

"We found out by accident in one of our last dyno runs that the engine is strong too. I asked the student operator to enter 6900rpm [maximum]. However, he entered 69,000rpm in error and the computer did what it was asked for. I realised something was wrong when the engine started screaming louder and higher than I had heard before. It sounded like a Stuka aircraft, 300 metres above the ground. When I hit the emergency stop the log showed almost 10,000rpm - and unbelievable horsepower!

"The engine survived, so we know it can stand very high revs. And the higher the revs, the greater the performance. We actually now set the rev limit at a conservative 7000rpm, at which the engine develops a reliable 260bhp, the figure Maserati always referred to in period, yet we believe seldom reached.

"This prototype has been in my 4CLT from our first outing at the Nürburgring in March 2012 and we made our race debut at Dijon in June that summer. It is still running. Only once has it suffered a problem (a cylinder liner slipped, causing some damage, at Pau),



Nine months' intensive development on the Hochschule Ravensburg's dynamometer extracted the requisite power and torque figures from the complex two-stage supercharged engine. *All photos: Simone Kalk*

Maseratis revived! Rainer Ott and Klaus Lehr in their Italian stallions at Goodwood in 2012.

but that has been the only failure. It was soon fixed, and the design changed on subsequent engines.

"Everything we learned about this engine's development is documented in a thick book. Maybe some people knew this already, but for us it was all new. In another book I have recorded for each individual part all drawings, dimensions, heat treatments, suppliers, order numbers and specialities, in a specific numbered order. Using what I call the Cook Book, the 'reader' could build a 4CLT Maserati engine!

"At last I now consider this project almost completed, so I am trying to phase it out in a controlled way over the next 12 months. It was never my idea to establish a new business out of what was my hobby - all I wanted was to race my Maserati 4CLT/48, for which there is time now - but none of this could have happened without the fantastic and unwavering support of suppliers, the university and my partners.

"If I had known from the start everything I would have to do over almost five years to be able to race this car, I would have bought the other one. But now mine is alive again – and the original engine is displayed in my workshop so visitors can admire this wonderful piece of technical art - I would have not have missed one of those days. Team spirit was our Joker. At the end it was a great experience, and even a lot of fun."

Five years after he initiated the project, Rainer Ott's mission was accomplished when he finally had the satisfaction of driving his 're-born' Maserati 4CLT/48 at the Nurburgring. *All photos: Simone Kalk*