HISTORIC RACING & Technology

Issue 25 UK £6.99 USA $14.99

Today's technology in yesterday's cars

The Ford That Beat Ferrari

The troubled tale of the futuristic Ford designed to win Le Mans in '66



PLUS

The world's fastest Jensen • Judd's "accidental classic" engine

The ultimate Elan • New gearbox for 100-year-old Sunbeam

25 >

9 772055 593004

Stirling Moss • John Horsman • Duncan Hamilton

Goodwood Revival RAC Tourist Trophy 2019



1st Place / 1:240 Pole lap Chris Wilson / Andre Lotterer / BGM Sport AC Cobra 289

Spa six hours endurance 2019



1st Place Philip Walker / Miles Griffiths / Gordon Shedden / HiTech Ford GT40

Ford 289 Engines supplied & tuned by

Knight Racing Services Ltd

Daventry England +44 (0)1327 871177

American V8 engine specialists
Historic Racing Engines & components
Ford / Chevrolet specialist

Online shop: **www.knightracingservices.co.uk**

The Ford That Beat Ferrari

The troubled tale of the futuristic Ford designed to win Le Mans in '66





Issue 25
Volume 7 Issue 1
Published April 2020
The next issue will be published in June 2020
ISSN 2055-5938

SUBSCRIPTIONS
Subscriptions from:
Kimberley Media Group Ltd
841 High Road, Finchley, London N12 8PT
Tel +44 (0)20 8446 2100
Fax +44 (0)20 8446 2191

Historic Racing Technology is published bi-monthly by Kimberley Media Group Ltd.

Cover image:
From the collections of The Henry Ford

Design & Production:
Maluma Design Associates

Printed by Micropress Printers Ltd
© Kimberley Media Group Ltd.

All rights reserved. Reproduction (in whole or in part) of any article or illustration without the written permission of the publisher is strictly prohibited. While care is taken to ensure the accuracy of information, the publisher can accept no liability for errors or omissions. Nor can responsibility be accepted for the content of any advertisement.

ON THE COVER

42 Turning the J-car into the Le Mans-winning Mk IV
Ford's breaking of Ferrari's Le Mans stranglehold, with the GT40 in 1966, inspired a Hollywood movie. But the tale of the futuristic new car it had intended to race instead is no less compelling, as revealed in this extract from the new edition of *The Ford That Beat Ferrari*

16 The world's fastest Jensen
There are some cars that are easy to imagine tearing across Bonneville's salt flats, but as Alan Stoddart discovers, some racers won't settle for easy

INDUSTRY NEWS

6 Stirling Moss: the passing of a master; Motorsport UK to provide financial support amid COVID-19 crisis; Retro Rallycross confirms new 4WD class; National Motorsport Academy's online boost; historic racing calendar update; John Horsman: how 'The Horse' tamed Porsche's mighty 917

FEATURES

26 Judd GV V10: an "accidental classic"
Adam Weller visits Engine Developments founder John Judd to discuss the longevity of a classic racing engine

34 New gearbox for 100-year-old Sunbeam
Doug Hill, chief engineer at the National Motor Museum in Beaulieu, tells William Kimberley about getting a 100-year-old Sunbeam back on the road

48 Duncan Hamilton
Recalling the extraordinary life and times of Le Mans winner Duncan Hamilton, born 100 years ago

54 The ultimate Lotus Elan
What do you get when a former touring car ace commissions a crack BTCC squad to build a car for historic racing? The fastest Lotus Elan around, reports Chris Pickering

62 Race Retro
There was plenty of exciting technology for historic racers on show at Race Retro this year. Alan Stoddart details some of the products which caught his eye

For Anything You Race

ARP®
automotive Racing products



Whether you're
starting a restoration
or
starting with a blank sheet
ARP makes all the fasteners
you need.

ARP fasteners provide strength and reliability for every type of racing.

5,000 catalog items and specials by request

Made In USA

All ARP fasteners are manufactured entirely in our own facilities in Southern California – and raced all over the world.

ARP-bolts.com

Toll-free in the U.S.A 1.800.826.3045
1863 Eastman Ave • Ventura, CA 93003
Outside the U.S.A. +1.805.339.2200 • Special Orders +1.805.525.1497

EDITOR
William Kimberley

DEPUTY EDITOR
Alan Stoddart

CONTRIBUTORS
Chris Pickering
Hal Ridge

CONSULTANT EDITOR
Mark Skewis

HEAD OF DIGITAL CONTENT
Sara Kimberley

ART EDITOR
Paul Bullock

COMMERCIAL DIRECTOR
Maryam Lamond

MANAGING DIRECTOR
Adrian Goodsell

PUBLISHING DIRECTOR
Soheila Kimberley



@historicrace

facebook.com/
HistoricRaceTechnology

HISTORIC RACING
& Technology

841 High Road, Finchley
London N12 8PT
Tel: +44 (0) 208 446 2100
Fax: +44 (0) 208 446 2191

www.kimberleymediagroup.com

Stepping up to the plate

As every reader will be aware, we are living in perilous times, with an unseen enemy that is devastating life as we know it. Lockdowns and travel restrictions have become the norm and while some countries are trying to bring back a sense of normality, for the majority, it hasn't happened yet.

The thing is that the full effect of the global economy more or less stuttering to a halt has still to be felt. According to research published on 15 April by the Corporate Finance Network (CFN), an accountancy network, almost a fifth of UK small businesses are at risk of collapsing by the end of May as they struggle to secure emergency cash meant to support them through the coronavirus lockdown. The same goes for small businesses in many other countries as well.

If there is one bright spot in all this, though, it is that the motorsport engineering sector has stepped up to the plate, not just in the UK and the US, but everywhere around the world. The Can-do/Will-do attitude in addressing the problems presented to the medical profession, carers and other frontline staff is a credit to motorsport companies. The trouble is that in the UK at least, such enthusiasm is being overlooked by the government.

While NASCAR and Formula 1 have grabbed the headlines with initiatives like F1's Project Pitlane, in which seven F1 teams are applying their racing expertise to assist with ventilator production, and the VentilatorChallengeUK, in which McLaren is involved with a group that includes Airbus, Ford and Siemens, the supply chain around the world is also deeply involved in producing medical equipment. This includes historic racing engineering companies that are applying their bespoke engineering expertise and know-how.

The real worry is that the historic racing world, which basically comprises SMEs, will not be in a position to return. Where it will leave those who still want to race once the pandemic is over is unclear because their favoured restorer may no longer exist. Also, will they be in a financial position to have their cars prepared? And what about the race promoters, clubs and the circuit operators? In my heart of hearts, I do believe that motorsport and especially historic motorsport will emerge alive and well, largely due to the ethos that is part of their DNA.

It won't be easy, and there will be some casualties, but this time next year it will hopefully be regarded as a bad dream.

On a different note, we are fully committed to print, but in the current circumstances we are having to produce just a digital edition for the foreseeable future. For those who have paid for the print edition, your subscription will consequently be extended so you will receive the number of print copies to which you have subscribed.

Thank you for your patience. HRT

William Kimberley
Editor



The passing of a master

William Kimberley pays tribute to Stirling Moss, who died on Easter Sunday, 12th April

ONE of Britain's greatest motorsport racers has died. Stirling Moss came to the fore because of the post-war boom in motor racing and in the 1950s, he became a household name. He epitomised the complete racing driver.

As described by Nick Georgano in his book *The Encyclopaedia of Motor Sport*, published by Ebury Press and Michael Joseph in 1971: "Not only was he the fastest driver in his day, but almost the most perfect..... As an individual he was a remarkable man, well above the average in eyesight, reflexes and judgement, and was always on top of his form, unlike some of his rivals who had off days. Moss was never known to put up a mediocre performance with a racing car, whether he was leading or in last position due to come mechanical fault.

"He always considered that he earned money by people paying to see him drive, and therefore it was up to him to give them value for money at all times, which is a refreshing outlook compared to some drivers. The only man to whom he admitted inferiority was Fangio, but only then in a single-seater GP car. His special ability was that he could make any car do what he wanted, whereas most racing drivers adapt themselves to what the car fundamentally wants to do when cornering."

Stirling was the son of Alfred, who himself was a racer having driven at Brooklands and at Indianapolis where he finished 14th in 1924 in a Fronty-Ford, and mother Aileen, who drive a Marendaz and other cars in trials in the 1930s, winning the Ladies Expert Trial in 1935 and 1936. He began racing in 1948 at the age of 18. His first season netted him 10 class victories in British hillclimbs in his Cooper-JAP.

By 1950 he had graduated to more powerful machines, driving a 2.0-litre HWM as well as a Jaguar XK120, winning the Tourist Trophy that year, his first major victory. Aged just 20, he was awarded the first of 10 Gold Stars by the British Racing Drivers Club.

However, he wasn't proficient in just circuit racing HWMs, a Formula 3 Kieft, Jaguar and Frazer Nash sports cars, but also in rallying. He won the Coupe des Alpes in the Alpine Rally in 1952,



ABOVE Stirling Moss at the wheel of the Mercedes-Benz W 196 R in the 1955 Dutch GP

1953 and 1954.

By this time, he was offered the opportunity to drive for Ferrari, but he was determined to drive British cars, a decision which delayed his rise to the top, but in mid-1954, he accepted an offer from Maserati to drive the 250F. He soon came to the notice of Alfred Neubauer of Mercedes-Benz who signed him up for the 1955 season as number two driver to Fangio.

At the wheel of different grand prix cars and sports cars he won the Mille Miglia, Targa Florio, Tourist Trophy and the British GP and was second in the Belgian, Dutch and Buenos Aires GPs, in the Swedish sportscar GP and Eifelrennen. He was runner-up to Fangio on the World Championship.



ABOVE Moss is arguably the most talented driver never to win the F1 world title



With the Mercedes withdrawal from motorsport following the horrific Le Mans accident in 1955, Moss went back to driving Maseratis in sports cars and grands prix, plus a variety of other cars.

He was runner-up in the Drivers' Championship in 1956, 1958 and 1961 and third in 1959 and 1960, but his proudest moment was winning the British GP in 1957 driving a Vanwall. This was followed up by victories in the Pescara and Italian GPs, also in a Vanwall.

> **"His special ability was that he could make any car do what he wanted"**

The following year, driving a Rob Walker 1960 cc Cooper-Climax, he won the Argentinian GP, the first World Championship race won by a private owner. He then won the Dutch and Moroccan GPs in a Vanwall, ultimately losing out by one point to Mike Hawthorn, who won that year's World Championship in a Ferrari. At the end of the year, the Vanwall team was disbanded following the ill health of team owner and patron Tony Vandervell.

In 1960 when driving for Lotus in the rear-engined Lotus 18, he won the Monaco GP and finished fourth in the Dutch. Then bad luck set in. He crashed badly in practice in the Belgian GP when a wheel came off, sending the car into a violent spin. He broke both his legs and his nose and crushed nine vertebrae. However, just 50 days later, he was back behind the wheel of a brand-new Lotus-Climax, winning the Karlskoga GP sportscar race. At the end of the season he went on to win the grands prix at Watkins Glen and Riverside and sports car races at Laguna Seca and Riverside.

His last full season was in 1961, winning the German, Monaco and Modena GPs in his privately-owned Lotus-Climax 18 and the Tourist Trophy in a Ferrari. He also gave the four-wheel drive Ferguson its first win in the Oulton Park Gold Cup.

1962 was when disaster struck. He won the New Zealand and Australian grands prix and the Goodwood Easter Meeting. However, it was in the Glover Trophy that the life-threatening and career-ending crash happened when his car, a 1.5-litre V8 Lotus, inexplicably spun out of control. While he did recover, damage to the brain meant that he lost his ultra-sharp reactions.

As Georgano wrote in his book: "From the first racing car he drove, a Cooper-JAP, to the last, a Lotus-Climax V8, Moss was always the master of his machine." HRT



Motorsport UK to provide financial support for member clubs

MOTORSPORT UK, the national governing body of four-wheel motorsport, has announced a £1 million funding package to help its clubs address the financial consequences of COVID-19.

The funding is one of a number of measures that it is implementing to offset the economic impact that the global pandemic has wrought across the sport.

In order to help protect the NHS and save lives, Motorsport UK has suspended all event permits until 30 June. This suspension is subject to a rolling review to enable the sport to resume as soon as is practicable.

Motorsport UK typically issues around 4,500 event permits per annum, across all forms of motorsport in the UK. Although circuit racing enjoys the highest profile, there are a broad range of other motorsport disciplines enjoyed by more than 40,000 licence holders across karting, speed, trials, cross-country, rally, autocross, rallycross, drag racing and autotest events. Many of these grassroots, low-cost motorsport activities can be undertaken in standard or lightly modified road cars and by enthusiasts funding their sport from their own pocket.

Motorsport UK is setting aside the £1 million of funding to support its 720 member clubs, responsible for organising and promoting motorsport at all levels in the UK. The aim is to mitigate immediate financial risk and help to aid recovery towards a strong and sustainable future.



ABOVE David Richards, Motorsport UK chairman, has announced a £1 million funding package

There are some 40,000 people working in the motorsport industry in the UK, and they are predominantly self-employed or working for small organisations, with combined revenues of £10 billion per annum. The suspension of all motorsport has an immediate and detrimental effect on the workforce, and the government has acted to begin to provide support in this area. At the same time the burden has firmly fallen on the event organising clubs and championship organisers, many of whom have no recourse to government aid.

In recognition of the considerable hardship placed on its member clubs, the Motorsport UK Board has agreed to allocate £1 million of direct funding to support the community. This investment will be used to create two funds, each valued at £500,000, to provide loan and grant support to Motorsport UK clubs through this challenging period.

A Motorsport UK panel will review each application and decide the amount to be awarded and the funding mechanism.

Applicants may receive funding from the Motorsport UK Club Continuity Loan Fund or The Motorsport UK Club Continuity Grant Fund.

The Continuity Funds have been created to support clubs that are most at risk due to the pandemic. Such clubs may be awarded funding from either stream up to a grant value of £10,000 or a maximum loan value of £25,000.

The Motorsport UK Club Continuity Funds should be a last resort for clubs which are able to demonstrate that after taking all reasonable steps and without a level of intervention, they will struggle to resume activities as a direct result of COVID-19.

Clubs are expected to use all government guidance and support available to them before considering applying for the funds.

Motorsport UK has taken measures to protect its own financial position at this time including furloughing one third of its staff, freezing all discretionary spend, suspending investment in capital expenditure projects, reducing staff pay and cutting working hours across the organisation for the duration of this period. HRT

Total Seal rings become more widely available

WINNING Brand piston manufacturers Diamond, JE and Wiseco Pistons are now stocking Total Seal piston rings in Europe and the US for upgrades to piston orders.

While the option of Total Seal rings had been available as a special order alternative, now that these manufacturers are carrying Total Seal rings in stock it makes it easier to take advantage of Total Seal's patented technologies such as its new Gas Ported Rings, Diamond Finish and Total Conform rings.

Total Seal designs and manufactures piston rings for all types of applications, including racing, historic racing and classics, with product lines such as Gas Ported, Diamond Finish, Advanced Profiling Steel, Advantage, TNT, gapless and conventional piston rings. It also has a line of ring tools and specialty lubricants.

"Now engine builders and enthusiasts alike can unlock greater performance by upgrading to Total Seal piston rings when they order pistons from Race Winning Brands," said Matt Hartford, Total Seal CEO and president.

"A piston can only perform as well as the rings surrounding it do. That's why Total Seal concentrates on making the most precise, lightest, strongest, and innovative piston rings available. Total Seal unlocks all of the performance potential." HRT

Nicholson McLaren

POWERTRAIN TEST FACILITY

Creating racing history since 1974



Dynamometer Test Cell Facility

Hub Dynamometers are a radical departure from the conventional roller dyno - with a hub dyno you have total control of the vehicle as the dyno is coupled direct to the output hubs therefore minimising inertia - allowing much greater control - more accuracy and an increased level of repeatability.

Our purpose built facility is ideal for OEM's – Race Teams – R&D specialists

The facility is suited to incar engine performance, calibration and validation testing – Engine development testing & Powertrain testing.

Nicholson Mclaren's bespoke hub dyno cell can facilitate-

- Automotive Engine and Powertrain Testing
- Road & Race Cars – front/ rear wheel drive & 4x4
- Electric, Hybrid, Petrol, Diesel
- Air Cooled or Liquid Cooled
- Up to 1000hp

Customer engineers can be accommodated on site with a dedicated office facility, ensuring a discrete and confidential operation, away from prying eyes. The test cell is available for team hire.



Nicholson McLaren
12 Ivanhoe Road, Hogwood Industrial Estate
Wokingham, Berkshire RG40 4QQ
www.nicholsonmclaren.com

International Organization for Standardization ISO 9001

Contact: John Waghorn
john.waghorn@n-mclaren.co.uk
0118 973 8003

Retro Rallycross confirms new 4WD class

THE Retro Rallycross 4WD class has been extended to include cars with a cut-off date of 31st December 1999, to include Group B.

The new class will compete at three rounds of Retro Rallycross at the Motorsport UK British Rallycross Championship 5 Nations Trophy presented by Cooper Tires, and has been designed for those whom the full season does not fit their race budget.

Retro Rallycross was launched in 2012 after an ambitious two-year plan to bring back the so-called 'Grandfather Cars'. It quickly became apparent that not only did some of the original cars still exist but that there were enthusiasts willing to build replicas of the early machinery to allow them to come out and play.

The Retro Rallycross Championship is for cars that have, or types that have, competed in rallycross since 4th February 1967 with a cut-off date of 31st December 1991. Technical regulations allow for period modifications. There are two separate classes for 2WD: Retro Rallycross – up to 1600 cc and Super Retro – 1601 and over.

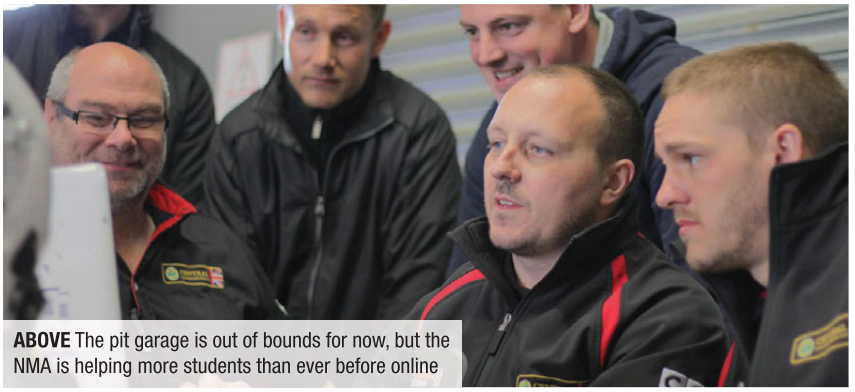
The organisers have received considerable interest from drivers in Europe who are looking to bring their 4WD cars to compete at Valkenswaard and Lydden.

Popularity in Retro Rallycross has grown to the extent that invitations are regularly received to take the magnificent collection to display or demonstrate at prestigious shows on the world stage, including at Lohéac in France. HRT



ABOVE There is strong interest in the new 4WD class in Retro Rallycross

The learning opportunity



ABOVE The pit garage is out of bounds for now, but the NMA is helping more students than ever before online

OUT of the doom and gloom surrounding much of the motorsport industry, there is a spark of light – the National Motorsport Academy has never been busier with its online degrees.

Working closely with the industry, it has designed its courses specifically to meet the requirements of motorsport engineers. Not only will its graduates be qualified motorsport engineers with practical experience, they will also be innovative, resourceful and commercially focused, highly desired skills within this exciting industry.

"As the race season is on hold, students are working harder than ever on their studies whilst they have this free time," said Kieran Reeves, NMA's director of motorsport. "They are all employed in the motorsport industry, so they are using their time wisely to study.

"We have also seen a big jump in applications since the lockdown. Online looks like it is becoming the norm at the moment, so we are very happy we were ahead of the curve when it came to developing Online degrees. The Masters degree is going from strength to strength too. It started off really well anyway but is starting to grow exponentially now we are in the second year of delivery, as did the BSC four years ago."

All NMA courses are flexible and can be studied at a time that suits a student's day-to-day activities. "Our Virtual Learning Studio (VLS) can be accessed twenty-four hours a day and allows you to learn from anywhere in the world," said Reeves. HRT

RWB Europe Now Stocking Total Seal® Gapless®, Gas-Ported and Conventional Piston Rings

Engine builders and enthusiasts alike can unlock greater performance by upgrading to Total Seal® piston rings when they order pistons from Race Winning Brands, both in Europe and the U.S.A.

A piston can only perform as well as the rings surrounding it do. That's why Total Seal® concentrates on making the most precise, lightest, strongest, and innovative piston rings available. Total Seal® unlocks all of the performance potential.

If It Has A Piston, Total Seal® Can Build A Ring For It.



Classic Race • Restoration • Aviation



RACE WINNING BRANDS

www.racewinningbrands.eu
info@rwbteam.eu
+31 (0)252 687 713

TOTAL SEAL PISTON RINGS

UNLOCK THE POTENTIAL

www.TotalSeal.com
U.S.A. Tech Line: 1-623-587-7400

HELIX AUTOSPORT



Unit 1G & 23 Vantage Business Park, Banbury, Oxfordshire, OX16 9UX

Tel: +44(0)1295 701076 Email: sales@helix-autosport.com

www.helix-autosport.com

AVAILABLE SERVICES

The technical department of Helix Autosport has over 45 years' experience in the manufacture and design of clutch system. The company's expertise, together with its flexible production facilities, enable Helix Autosport to provide a prototype and bespoke clutch service to suit most applications/installations.



Performance Clutches & Flywheels

NEWS

Historic racing calendar update

PETER Auto and the Automobile Club de l'Ouest (ACO) have confirmed that **Le Mans Classic** has been postponed until the first weekend of July 2021.

"Le Mans Classic is an international showcase that attracts almost 200,000 fans to a single venue," said Patrick Peter, president of Peter Auto. "As you can imagine, maintaining the original dates for the event in the current context was out of the question. We have therefore decided, together with our partners and the ACO, to postpone Le Mans Classic until 2021 when everyone will be able to fully enjoy this marvellous retrospective of the finest hours of the 24 Hours of Le Mans."

Any tickets already purchased for the 2020 event will give admission in 2021.

The **Sportscar Vintage Racing Association** announced its revised 2020 schedule in early April, reflecting adherence to national and local safety guidelines in the fight against the COVID-19 global pandemic. The schedule consists of the remaining 11 race weekends but with three date changes. Nine of the weekends are shared with the **Trans Am Series presented by Pirelli** as part of the **SpeedTour** format.

"Every decision we have made with respect to the pandemic reflects our commitment to the safety of our fans, members, drivers, and sponsors. That's job one," said Tony Parella, SVRA president, CEO and majority owner of the Trans Am Series presented by Pirelli.

The three date changes are for the Road Atlanta Grand Prix, the Lime Rock Park Festival and the Laguna Seca Trans Am Speedfest. All are rescheduled to the fourth quarter of the year.

Goodwood has also postponed the **Festival of Speed**. "Over the last few weeks, we have been working together with everyone involved to understand the viability of the Festival of Speed going ahead in July. Due to the uncertainty of the coronavirus threat and not knowing whether the situation will have significantly improved by then, we sadly need to postpone the Festival of Speed in July," said the Duke of Richmond.

The **Masters Historic Racing**, the **Historic Sports Car Club**, and French-based **HVM Racing** have agreed to collaborate on re-scheduled dates and races to help ensure the best deal for historic racers once the 2020 season is able to get underway.

Meanwhile, the **Silverstone Classic** is still scheduled to run on 31 July to 2 August. HRT

BELOW Fans will have to wait a year for the exciting racing seen at the Le Mans Classic



ACCRALITE
Incorporating
Accralite Pistons
as a division of
Omega Pistons Ltd.

Omega Pistons Ltd.
Oak Barn Road
Halesowen
West Midlands
B62 9DW

Tel: 0121 559 6778
Fax: 0121 559 6779

E-Mail: info@omegapistons.com
Web: www.omegapistons.com

OMEGA PISTONS



Image courtesy of Eddy Perk

Omega Pistons Ltd. have been producing high performance pistons for over 40 years for classic and modern engines of all types.
Our manufacturing methods enable us to re-produce almost any type of piston required.
We are unique in the U.K. for being the only company to produce on-site forgings, castings, piston rings and gudgeon pins.

WESTWOOD
CYLINDER LINERS

Modern, Classic, Historic, Vintage,
Veteran Car and Motorcycle Engines

- All types of cylinder liners manufactured to order
- Available in standard cast iron or ductile iron
- No minimum order quantity
- Work from dimensions, drawings or samples
- Over 25,000 liners in stock
- Direct shipping throughout the world



Westwood Cylinder Liners Limited
Tel: +44 (0)1905 799470 **Fax:** +44 (0)1905 796414
Email: sales@westwoodcylinderliners.co.uk **Web:** www.westwoodcylinderliners.co.uk

How "The Horse" tamed the beast

Simon Maurice of Chicane Marketing and **William Kimberley** pay tribute to John Horsman, the engineer credited with transforming Porsche's iconic 917

SPORTSCAR racing lost one of its legendary designers last month. John Hargreaves Horsman was born 22 November 1934, to Roy and Barbara Horsman, in Oldham, Lancashire.

After attending Uppingham School and completing military service as an officer in the Royal Air Force in radar fighter control, he gained a place at Christ's College, Cambridge, to read Mechanical Sciences, from where he graduated with honours in 1958.

During this period, his interest in motorsport blossomed – often as a photographer – and in 1958 he was offered a graduate apprenticeship with Aston Martin Lagonda by managing director, John Wyer. It was the start of a relationship of several decades with the legendary sportscar team owner that was to shape much of his working life.

Initially, Horsman worked at David Brown Industries, which made tractors and gearboxes for Aston Martin (Brown having bought the sportscar company in 1947) before proceeding to Aston Martin's Design and Experimental Department, as a project engineer. In 1961 Horsman became assistant to Wyer.

From 1963-1964, he expanded his skill set, studying Business Administration at the London School of Economics.

In 1964 he followed Wyer to Ford Advanced Vehicles Ltd, where he was responsible for the construction and preparation of the programme that produced Ford's fabled GT40.

After two Le Mans wins in 1966 and 1967, the Ford factory GT40 race programme ended. However, it spawned JW Automotive Engineering with Horsman becoming its executive director and chief engineer responsible for the development, construction and race preparation of all of JWAE's products: the Mirage M1, M2, M3, M6, the Ford GT40s and the Porsche 917s.



ABOVE Horsman: Behind the scenes hero

Through the combined efforts of Wyer, team manager David Yorke, and Horsman, the team won back-to-back Le Mans 24 Hours victories in 1968 and 1969 along with the coveted World Sports Car Championship in 1968, 1970 and 1971.

For 1970, JWAE ran the works 917s for the Porsche factory. The original 917 was renowned for being incredibly fast but spectacularly ill-handling. Much to Porsche's horror, when handed the programme, JWAE immediately modified the car, cutting away the sloping back window and building the tail panel up to a wedge shape. As far as the Porsche engineers were concerned, this was a disaster in the making as their design had been compromised and the car was going to loop the loop as soon as it reached any speed. However, the opposite was the case. Wyer and Horsman were right and the car was faster and more stable.

FINEST ACHIEVEMENT

The solution to the Porsche 917's handling issues was Horsman's self-stated proudest accomplishment, as chronicled in his 2006 book *Racing in the Rain*.

"In the clear, still autumn air of the Austrian hills there were clouds of gnats flying around and their remains were splattered all over the nose and windscreen of both closed 917s. I noted that there were hardly any dead gnats on the rear spoilers, which by now had been raised into near-vertical positions [and fixed in position]



Porsche

ABOVE Once tamed, the 917 in short-tail configuration went on to become one of racing's finest machines

during the course of testing with no discernible effect on handling.

"I knew that because they were very small and light, the gnats would flow over the bodywork exactly as the air flowed, similar to the smoke from wands used in wind tunnels. Any gnat remnants on the white paint would indicate that air had touched that surface. This proved to me that airflow was barely touching the rear spoilers. I knew immediately that we had to raise the rear deck and then attach small adjustable spoilers to the trailing edge."

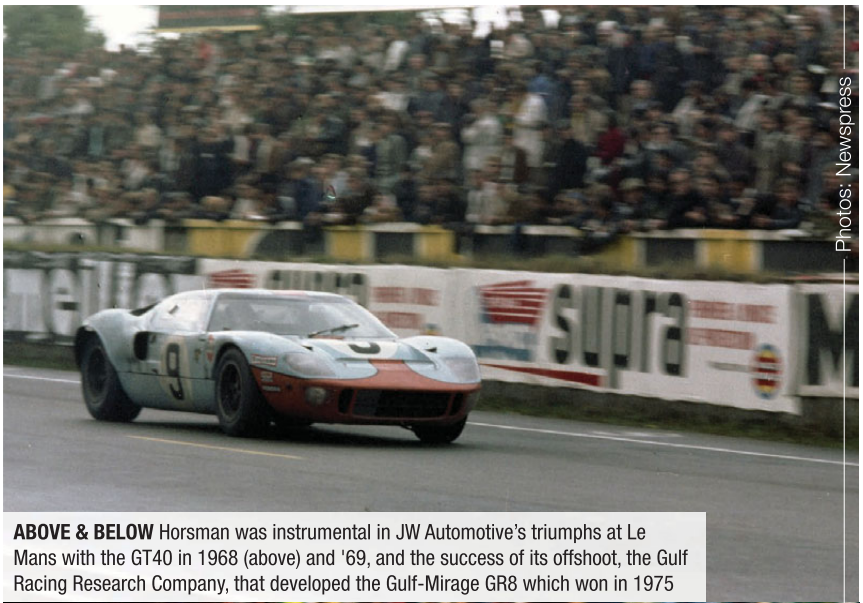
The JWA crew set to on modifying one of the two 917 coupes present at the track with whatever materials came to hand. Chief mechanic Ermanno Cuoghi, who would go on to F1 success with Niki Lauda at Ferrari, and his assistant Peter Davies then reshaped the rear of the car.

"I explained to Ermanno and Peter what I had in mind, which was to extend the line of the tail from the top of the rear wheelarch at a slight upward angle until it reached the top of the spoilers, which would act as supports," recounts Horsman. "Then adjustable trim tabs were to be added to the trailing edge.

"We had to cut the aluminium to fit around the base of the Perspex window, which covered the engine bay, and rivet it securely in place. Using the steel Armco railing as a hammering buck, we bent the sheet to fill the gap now open behind the rear wheels."

As a result of the 917's transformation, Porsche won the World Championship of Makes in both 1970 and 1971, and the 917 became one of the greatest sports racing cars of all time.

In 1972 Horsman became managing director of the Gulf Research Racing Company, an outgrowth of JWAE headquartered in Slough, just outside London. Here were built the Gulf Research series of cars – essentially developments of the Mirage. The GR7 emerged in 1974 and was followed by the GR8, which took first and third place at Le Mans in 1975. Both cars used F1 Ford Cosworth DFV engines that were detuned to meet the fuel efficiency regulations and which, remarkably, lasted the equivalent of more than a dozen Grands Prix in one run, on their way to victory.



Photos: Newspress



ABOVE & BELOW Horsman was instrumental in JW Automotive's triumphs at Le Mans with the GT40 in 1968 (above) and '69, and the success of its offshoot, the Gulf Racing Research Company, that developed the Gulf-Mirage GR8 which won in 1975

After Gulf Research Racing closed its doors, Horsman moved to Scottsdale, Arizona in 1976, with his second wife, Janet, and her two daughters, Alison and Clare (they were later joined by John's two daughters from his first marriage, Caroline and Samantha).

Horsman then joined the GTC company and its GR8 – now re-named Mirage – finished second at Le Mans in 1976 and again in 1977, the latter occasion with Renault power instead of the original Ford engines.

The GTC Mirage programme continued for two more years and then John was reunited with his friend, Vern Schuppan, running the Australian racer's McLaren IndyCar team to pick up a highly creditworthy third place at the 1981 Indianapolis 500. John also returned to Le Mans four more times as part of Schuppan's team.

In 1983, John and Janet moved to Tucson where John worked with Australian Bib Stillwell at Learjet and with Bib's amateur racing team, in historic racing events.

Few can claim that their racing careers spanned the greatest decades in sports car competition – the 1960s and 1970s – and extended into the 1980s. Fewer still were consistently successful. Some records achieved by Horsman's team still stand, more than 40 years later. He was also immensely proud of the fact that, in a period when sportscar racing was notoriously dangerous, no driver was ever lost in one of his cars

The blue and orange Gulf-sponsored Ford GT40s, Porsche 917s and Mirages prepared by "The Horse" – as he was known around the workshop – and his team, are among the most famous race cars ever produced. HRT

The world's fastest Jensen

There are some cars that are easy to imagine tearing across Bonneville's salt flats, but as **Alan Stoddart** discovers, some racers won't settle for easy

LAND speed record cars are some of the most evocative of all historics. Unlike most racecars they are not designed to be victors; they are built to be milestones. These cars are not sweated and fretted over to best other, often very similar cars, they are painstakingly created to overcome much more intangible and ambitious feats. Land speed cars aren't just run to beat other people, they are also very much built *for* other people too.

This unusual *raison d'etre* has given birth to a particular type of car: long, sleek, elegant and purposeful, far removed from roadgoing machinery and without a single unnecessary gram. The mecca for this very particular type of event is of course Bonneville. Drive on to this history-steeped geographical oddity during the annual Speed Week festival and you'll see all manner of these bespoke, streamlined, single-seater beauties. Visit Speed Week this year though, and (COVID-19 permitting) you'll also see a 1960s British GT car returning after a dramatic debut in 2018.

"It started when I bought a 1965 Jensen C-V8," says Ian Northeast, the driver, in both senses of the word, of the Jensen land speed project. "I was specifically looking for a car that was older than me, because there is something special about that.

"I also specifically wanted a British car. All the big ones were too expensive, but at the time, as is still the case now, Jensens were ridiculously undervalued. So after an aborted look at a 541 I picked up a road-legal C-V8 that was up and running. I think I paid £5,000 for it, taxed, with a year's MOT, and with only 250,000 miles on the clock.

"It was a bit rough though. It had two crossplies on it and two radials, but the split was left and right, not front to back, so it handled like a boat. It was properly atrocious."

Despite this, Northeast was enamoured with his Jensen. The car was his daily drive, so there was no big restoration project in the works; instead, he would pick up a few parts from his trusted supplier, Appleyards, and just do small, weekend-sized projects, one job at a time.

This continued for a while until a rally to Trier in Germany was held by the Jensen Owners Club to mark the 45th anniversary of the C-V8. During the drive down Northeast really began to appreciate what a magnificent grand tourer the car was: smooth and effortless. Unfortunately, the rally also included a trip to the Nürburgring. A few laps of the Green Hell was all it took to convince him that "this track business was the way forward".

So despite his car still being stock apart from a new seat, radial tyres (now all round) and some new Wilwood brakes, Northeast took part in his first season of sprint racing. Although the Jensen's pace was something of a value proposition, giving the C-V8 more time on track than the faster cars, Northeast decided that, on balance, it was probably time for some upgrades.

"The very first thing I did was, with the help of John Sleath up in Doncaster, I fitted a FAST multi-point fuel injection system to the car," he recalls. "This meant I could mess around, and do absolutely



anything I wanted, with no experience whatsoever, and John could fix it. He'd make an absolute dog of an engine with the lumpiest cam in the world run so sweetly. He was a miracle worker.

"I started tuning the engine, I did the camshaft, the fuel injection system, blew the original engine up, bought a new engine and put all the good bits in that. I tweaked the suspension on the car, lowered it, improved the brakes.

"I mean, I wasn't able to do any more racing: I couldn't afford it after spending all my time and money on the car. What I did manage to do though, was turn a really beautiful GT car, that was really wonderful on the motorway, to a car that was essentially undrivable on the road. It is one of the best handling C-V8s out there though."

"HOW FAST IS YOUR CAR?"

Car talk and pubs go hand in hand. One night, a couple of pints in, and the question arose of 'how fast is your car?' Northeast was able to relay some information about the speeds he'd been clocked at in a few of the races he'd entered, but as someone who had been involved in the Bloodhound land speed record project, the question got him thinking. "For those guys there is just a different idea of speed, so I started thinking about how fast I could get my car to go," he says, "so, without telling anyone, I started working towards turning it into a land speed car."

This covert work went on, until tragically, a friend suddenly passed away. After this mortality shock, Northeast thought about having to act while you are able, and resolved to take his Jensen to run at Bonneville, making it happen, instead of waiting until 'one day'.

"So, I told someone I was going to do it, and because you have told someone ▶



LEFT An alien environment it may be, but the Eric Neale-designed Jensen C-V8 still looks gorgeous

> **"I was in heaven: screaming and shouting. When I got to the end, I was in floods of tears"**



ABOVE Pendine Sands might not be the same as Bonneville, but it gave the team the chance to test a few upgrades

you are going to do it, you have actually got to do it."

Of course, going through with the plan meant the beloved C-V8 needed some choice upgrades. One of the most crucial was the addition of a roll cage. Northeast wanted to have one installed ahead of the public launch of the project at the Classic Car Show at the NEC in November 2017 to make it look like a proper land speed car. However, on the sage advice of one of Bonneville's technical inspectors, who are responsible for scrutineering at the Salt Flats and determining who is actually allowed to run, the installation of the rollcage was put on hold until new rules were announced by Bonneville.

With the revised rules in hand, Northeast enlisted the services of CCK Historic. "They were absolutely brilliant," he says. "But when I shoved the car over to them and said 'build me a rollcage', the guy who was building it could not believe what I was asking for, so I showed him all the drawings.

"He asked if I was sure, and I said 'yes, I've got to have it'."

The confusion was down to the type of cage being installed. "It isn't what you'd normally fit," he continues. "It's more like a full drag race funny car cage, so it has the four-wheel perimeter cage around the outside, as well as a cage around the driver."

While CCK was working on making the car safer, steps were also being taken to make it faster too.

The C-V8 uses a big block Chrysler V8, displacing 383 cubic inches, or 6.3 litres from the factory. Although a humble unit, the unexotic powerplant meant that there was a wealth of information and parts readily accessible, and many companies ready to ship drop-in parts.

One of these companies is 440 Source, which stocks an unbelievable range of engine parts for all manner of American engines. From 440 Source Northeast bought a stroker kit, which upped the already capacious 6.3-litre engine to a much heftier 8.2 litres. The kit came with a new crankshaft, ARP bolts, new forged aluminium pistons, Clevite bearings, Total Seal piston rings and new conrods. In the end, though, these were substituted for a set of Eagle H-Beam rods.

The new pistons made the headline-grabbing change. The original engine was first introduced in 1958, and as such used 1950s technology. This included the pistons, which were originally around 3.5 inches long. The new pistons are almost two inches shorter than that, making a significant difference to the available volume within the cylinder.

On top of this, in order to help the engine breathe better, Northeast opted for some "very trick" Super Stealth cylinder heads, also from 440 Source. Rounding off the list of performance upgrades is a new, custom camshaft from Comp Cams, which was specced by John Sleath, and was what Sleath used in his own drag car. ▶



ABOVE The big block Chrysler V8 was heavily modified before being returned to the engine bay of the Jensen



Engineering Art Ltd

Fine Prints of Original Engineering Drawings

www.engineeringart.uk.com



ABOVE There are no fancy garages at Bonneville, and the teams have to make do with nothing but a gazebo as protection from the 120-degree heat

"I learnt a long time ago that it is far better to learn from someone else's mistakes than to just keep repeating them," Northeast comments. "So if someone who has blown up several drag engines says this is the one to use, that's what I'll use."

With all the extra power, there have also been some modifications aimed at preserving the 55-year-old engine. "I have put every strengthening mod you can imagine in the bottom end," he admits.

"There is an engine girdle, which is 8 mm thick, across the whole thing holding the main bearing caps, which are also uprated, as are the studs that hold them in.

"The sump is also as big as we can possibly make it. Now it has almost three quarters of a gallon more capacity, as well as a floating pickup and an external feed to a high-volume pump. The hydraulic cam followers have been replaced with solid ones."

Away from the engine, a considerable amount of the car is surprisingly unfettled. Weight isn't really a concern because there aren't any rapid direction changes; on the long runs, even acceleration can be relatively gentle without impacting the top speed. Furthermore, at the 200-plus miles per hour speeds that are being aimed



ABOVE Just getting to Speed Week is a challenge in itself. The Jensen had to be towed 1,800 miles after it was collected from the port



for, as long as it is close to the ground, additional weight improves the stability and road-holding of the car.

The hydraulic rotary dampers that were fitted to the front of the car and were "basically rubbish", have been swapped out for some coilovers, which have the added benefit of lowering the front. At the rear, suspension setup is the same as the car left the factory with: standard dampers and leaf springs. One necessary change mandated by Bonneville is that all suspension and brake components need to be secured with Aeroquip locking nuts, a simple, but particularly time-consuming task on the Jensen given the mixture of metric, Whitworth and AF fasteners used on the car. The braking system, though, is fairly standard, and is very much as you would find on any other Jensen C-V8, apart of course from the parachute.

One area that did have to be significantly modified was the transmission. Dealing with all the power from the uprated engine meant that a tougher gearbox was required. A Getrag unit from a Lister XJS was deemed to be strong enough, while a paddle-style clutch was also installed to avoid any slip. What's more, Bonneville's rules also mandated that a ballistic bellhousing be fitted, so if the clutch explodes the driver's feet are protected. Getting a ballistic bellhousing was easy enough, given it is a popular drag upgrade: Summit in America are able to offer them off-the-shelf.

"But while they do a ballistic bellhousing that fits the engine, they don't do one that fits the gearbox," explains Northeast ruefully. "Unfortunately, as it turns out, when we made it fit by cutting a big hole in the back of it and getting it recertified as ballistic, we were less than one degree out of dead straight.

"Now, I didn't think that was going to cause an issue..."

And, at least at first, it didn't. The car was reassembled, now ready for Bonneville. A shakedown was conducted at an event on Pendine Sands, to give the team chance to get to know the procedural side of land speed racing and learn about what the car needs for the very particular kind of running involved. It also served to give Northeast his very first taste of running on a loose surface.

"It's absolutely terrible and terrifying!" is his verdict.

"The problem is that the surface changes every time, so you will be driving down the sand, and one corner of the car, front, back, left, right, will just veer off for no reason, with no warning. That's quite unnerving."

The shakedown was invaluable, and with car and driver tested, the C-V8 was put away, not to be driven again until it was on the Salt Flats of Utah.

> **"He was a miracle worker. He'd make an absolute dog of an engine run so sweetly"**

The Jensen was shipped to Galveston, where it was met by the team, who then proceeded to tow it the 1,800 miles to Bonneville. Eventually, after the epic journey was completed, some salt flat wisdom had been gleaned from the 'Bend in the Road Gang' (a group of spectators who attend Bonneville Speed Week every year and camp at the only bend into the road onto the Salt Flats). There was also a scrutineering ordeal, involving the size of wheel bolts, to be dealt with before Northeast lined up at the start line for his first run.

The team's goal was to take it slowly and ramp up over the week, enabling Northeast to secure his first licence. To stop drivers with no experience ▶



ABOVE Pendine also allowed Northeast a first taste of driving on a loose surface



ABOVE The emptiness of the Bonneville Salt Flats is hard to convey, but it is a lonely place when sat on the start line

showing up and suddenly finding themselves going 350 mph, they must log runs of progressively higher speeds, with the first one clocking a run between 125-150 mph.

"With all the fanfare of a point in the general direction from the starter, off you go," he smiles. "I had a perfect pull away, and I just went off and I was in heaven, screaming, shouting and woohooing. When I got to the end I must confess I was in floods of tears. It was the emotion of it all, getting there, and then doing the run.

"Then I was waiting for the support car and I heard on the radio that I'd done 126 mph! That was our weekend's work done on the first run."

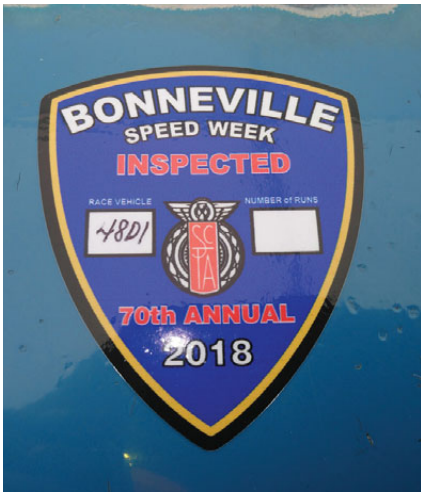
What's more, that speed, which isn't the absolute top speed but an average between two mile markers, was on an engine that couldn't pull above 4,000 rpm because of the altitude. The flats are about 6,000 ft above sea level, and with the high temperature are more equivalent to being about 8,000 ft. At that effective altitude, oxygen is a scarce resource and the ECU's map was struggling.

Despite the problems, the Jensen was taken for another run, where it managed to log a 136 mph speed.

Luck seemed to be on their side however, as a Jensen owner from San Diego, who had always wanted to go to Bonneville and was scheduled to attend to see Northeast's runs, turned out to be an engine tuner.

"He actually runs his own company, F&B Throttle Bodies, and he'd made the 11-hour drive after work in his campervan, rocked up at Bonneville in the middle of the night and then was up as six in the morning to watch us race," explains Northeast.

"Instead he actually spent the best part of a day and a half tuning the engine, trying to read a laptop in the baking heat. He just sat there tapping away until he got it sounding really sweet, and revving flawlessly to 6,500 rpm. It just sounded beautiful."



ABOVE Safety at the Salt Flats is obviously paramount, so cars that meet the standard are clearly marked

It was several days before the new tune could actually be tested, however. One run was cancelled by Bonneville because of an accident elsewhere on site, following that the Jensen's starter motor gave out and had to be replaced – no easy task when the nearest city is a day's drive away. There was then an issue with the battery, which had fallen victim to the vibrations of the Salt Flats, and finally a problem with the hydraulic pipe for the clutch release bearing inside the ballistic bell housing.

Eventually the Jensen was back on the start line and running perfectly. It was about to undertake a tuning run to check that the new map was all okay, and wouldn't lead to overheating or other problems. As such, Northeast had been instructed to go up and down the mid-range in third and fourth, keeping an eye on the gauges, rather than going hell for leather.

"That was okay, but we still got to 148 mph, and I knew there was easily 165, if not 170 in there. I thought, 'We've got this licked, this is perfect,'" recalls Northeast. "But unbeknownst to us, that was our one good run. If I had known that I would have gone balls out!"

The next run fell victim to another clutch problem. But, in cutting holes in the bulkhead to get to the clutch, the main battery feed wire was severed. This was an annoyance in itself, but more problematically it also spiked the ECU, completely flashing the map that had taken days to perfect.

Finally, on the last day, the car was ready to try one final run.

"We were running and we were on the start line. All of the great and good of land speed racing were there to see these crazy British guys that won't give up," he recalls.

"The engine sounded okay, and I had been tentatively pushing the clutch pedal to check it was still there. Finally, I get the go ahead, put my foot on the ▶

RACE WINNING BRANDS

YOUR PERFORMANCE PARTS CENTER

JE PISTONS

• PISTONS • PINS • RINGS • GASKETS •



Custom pistons engineered to your specifications!

Hundreds of off-the-shelf European and Sport Compact models available!

- Billet or forged pistons
- Designed specifically for you to achieve your power and durability goals
- Coatings and platings available- skirt, crown, ring groove, pin bore
- Dozens of customizable features- 3D milling, gas porting, and more

WISECO Performance Products | KING RACING High Performance Bearings | BoostLine Connecting Rods | K1 Technologies | DART

Please contact us and find your local distributor info@rwbteam.eu | +31 (0)252-687 713

And distributed brands: ACL | ARP automotive products | ATHENA | COMETIC Gasket

Moto HISTORICS

Specialists in race car preparation and restoration

T: 01342 834579
M: 07917 767558
E: info@motohistorics.co.uk
W: www.motohistorics.co.uk





Over the past years we have had success at all major historic events with wins at Classic Le Mans, Goodwood Revival, Spa 6 Hour and Winners of the Tour Auto 2012 and 2014. Our aim is to supply a first class service and to be a leading and respected name within the classic racing circuit.

clutch and went for first. Then there was just a horrible grinding noise, the whole crew jumped out to try and push the car but it was hopeless. The whole gearbox had let go, even the casing was actually smashed.

"So, it turns out a Getrag Jaguar 5-speed gearbox, which I have been told is good for 600 hp, cannot cope with 750 hp, particularly when it is one degree out. That was the reason the clutch had failed, and that was why the gearbox broke. Just that one degree."

200 MPH BARRIER

Despite the disappointing end for the team, there were no feelings of bitterness. Northeast rates it as "the best time ever" and the whole team is looking forward to this year's return to the Salt Flats. Particularly emboldening the crew are the improvements made following on from the lessons learnt from its maiden tilt.

The FAST system has been replaced with an Emerald ECU, ignition and injection system that is more modern, but also much easier to use and less troublesome. It will also be specifically mapped by Emerald to run with the turbo that was ditched at the last minute in 2018. This should help the car get within spitting distance of 1,000 hp. It should also help the car generate meaningful power after 7,000 rpm, which is crucial if the Jensen is to break the 200 mph barrier that is now being targeted.

There are some other more unusual ideas too. The radiator is going to be removed and replaced with a water tank inside the car. This means the engine can be cooled by a greater volume of water, while negating the need for airflow at the front and allowing the use of a fully enclosed bonnet. A bigger wing is going to be employed to push the driven wheels through the layer of dust right down to the hard salt below, where they can find traction, while a flat floor is also going to be made, with a much more effective diffuser.

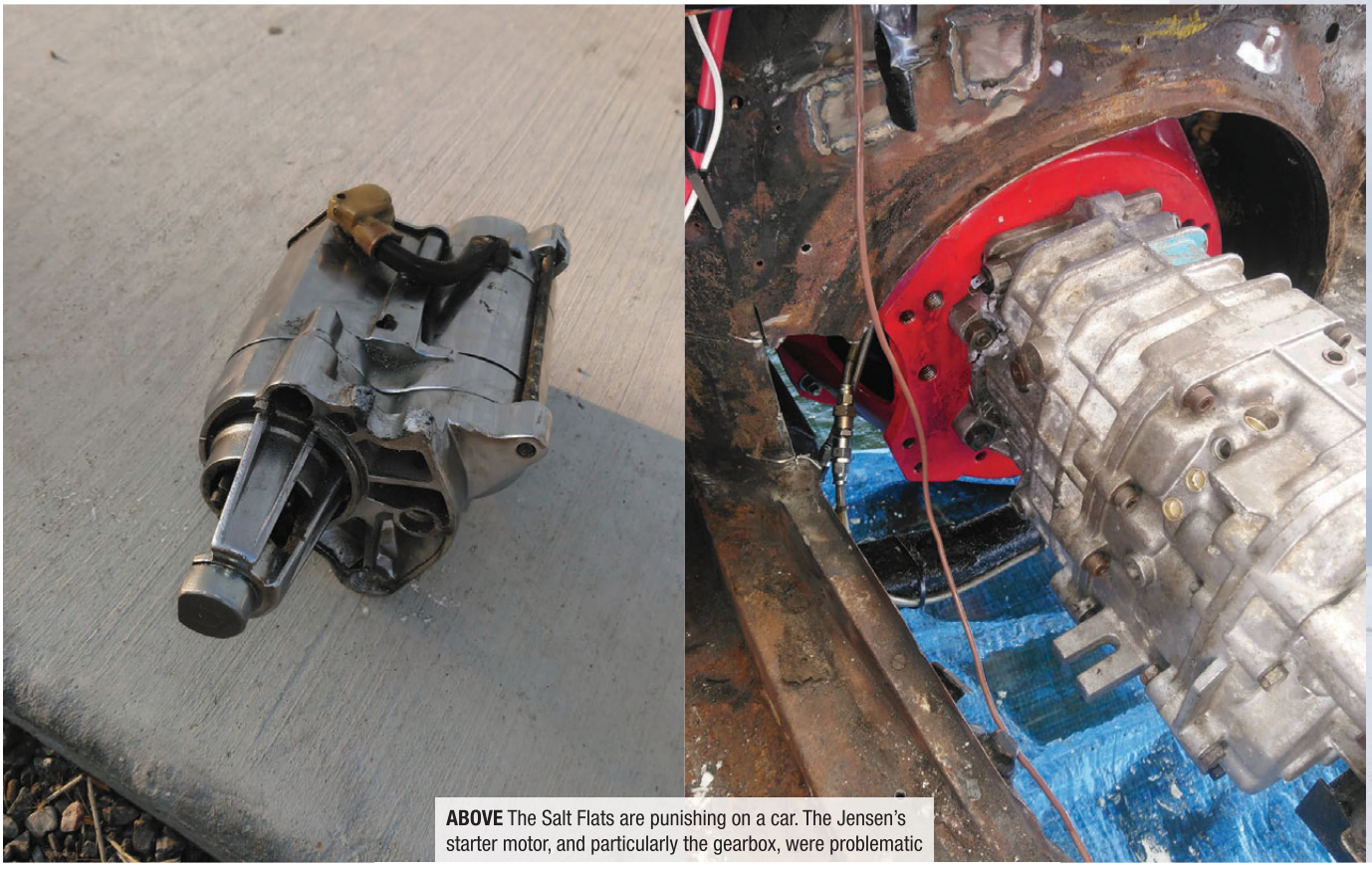
Most importantly of all though, is curing the single degree deviation that so catastrophically hampered the team in 2018.

"We have now solved the gearbox issue," says Northeast definitively.

"Learning from our mistakes we have now got the gearbox from a Dodge Viper. As well as being able to cope with 800 hp, it is also a six-speed. If I can get into that extra ratio at a point where the turbo is producing power, it should give us about 230 mph theoretically. Now I'm not expecting that because that assumes perfect traction and the like, but it should stand us in good stead.

"More to the point, you can get ballistic bellhousings that fit both the engine and the gearbox.

"So, I know it's straight this time." HRT



ABOVE The Salt Flats are punishing on a car. The Jensen's starter motor, and particularly the gearbox, were problematic



ABOVE It wasn't an easy thing to do, but the team got the C-V8 to Speed Week. Now all eyes are focused on that 200 mph target

> "It is far better to learn from someone else's mistakes than to just keep repeating them"



ABOVE It was a week of ups and downs, but it was certainly an adventure for Ian Northeast and his hardy Jensen

An accidental classic!

Adam Weller visits Engine Developments founder John Judd to discuss the longevity of a classic racing engine

PRIVATEERS are often described as the backbone of this sport, particularly in endurance racing. It is for that reason that numerous companies, including major manufacturers such as Audi, Porsche and Chrysler, built some of the best endurance racing machines of all-time around the idea of selling the cars to customers.

Of course, the privateer was also the bread and butter of companies focused entirely on racing, though the modern era of spec components and limited chassis tenders has rather dulled that once sharp knife.

However, in the fertile ground of 2000s prototype racing, one mercenary motor forged a reputation as the off-the-shelf go-to for privateers across the world.

Entering development 30 years ago, in time for a Formula 1 debut with BMS Scuderia Italia in 1991, the Judd GV would be a consistent factor in top level motor racing up until its final start in top-flight competition at the 2012 Sebring 12 Hours.

UPPED IN CAPACITY

Over the course of its tenure, this visceral V10 unit underwent a raft of changes. Starting life in 3.5-litre configuration to fit the shared engine formula of Formula 1 and Group C sportscar racing at that time, its life in sportscars would see the engine redesigned and upped in capacity numerous times.

The BMS Scuderia Italia effort of 1991 was a promising customer car package, with Dallara building the chassis and Judd providing the engines. While some reliability issues were evident, points finishes – including a podium at Imola – were a promising sign.

However, the agreement with BMS Scuderia Italia was not extended to the following year. The engines would end up in the hands of Brabham and the infamous Andrea Moda outfit for 1992, a season that would mark the end for the Judd brand in Formula 1.

1992 also marked the Judd GV's debut in sportscar racing, under the GV10 guise. A pair of Lola T92/10s, powered by the GV, were entered by the Euro Racing outfit in the World Sportscar Championship.

> "Not much survived the 20-year interval between world championships in sportscar racing, but the GV did"

Meanwhile, having seen the Wankel rotary engine outlawed from Group C by the new 3.5-litre formula, Mazda also turned to the GV for its 1992 sportscar programme. The motor – badged as a Mazda MV10 – powered the Japanese manufacturer's MXR-01, itself a customer version of the TWR-developed Jaguar XJR-14.

Neither programme set the world alight against the might of the Peugeots and Toyotas. Nevertheless, strong finishes including a second place at Silverstone for the 'Mazduar' was a good showing of the GV's potential.

There was no World Sportscar Championship for 1993, and the landscape of the discipline would go through several uncertain years, with BPR's brand of GT racing taking the baton as the most popular form of sportscar racing for several seasons.

The GV appeared to have met an early demise.

However, the engine's architecture would see a lifeline courtesy of a tie-up with Yamaha for its entry into Formula 1, resulting in a partnership with the Tyrrell outfit for 1993. The Yamaha collaboration resulted in the OX10 family of engines, which received more input from the Japanese firm than a typical rebadging.

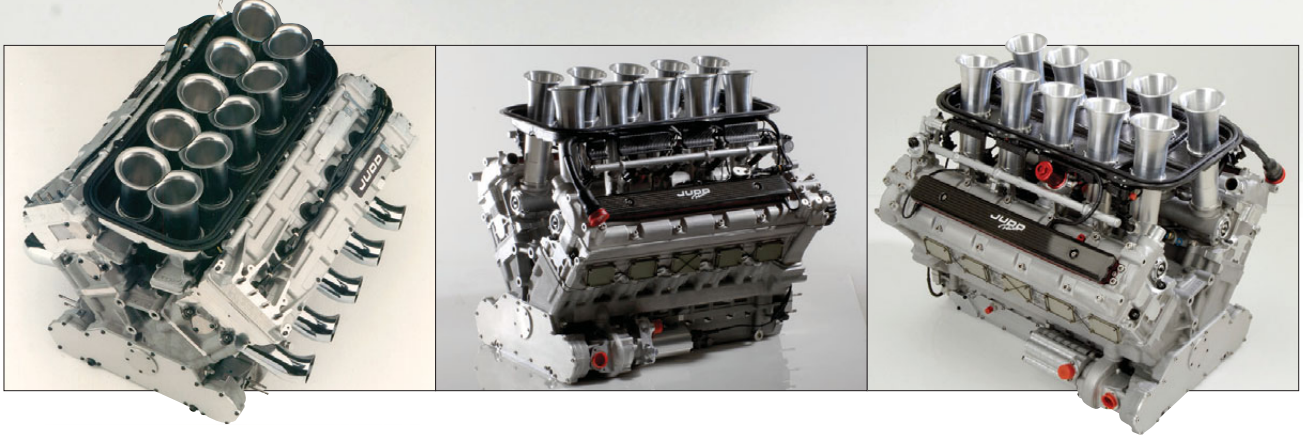
John Judd, the co-founder of Engine Developments alongside the late Sir Jack Brabham, recalls the project: "We worked with Tyrrell on installation, and Yamaha on the development side of things. They put ideas into it, as did we.

"We bounced off each other, and we worked quite well together. We used to have a resident engineer or two here (at Engine Developments) and get a lot of visits. Most of the dyno work was also done here, and we got it up from an initial output of 680 bhp to something like 750 bhp before the end of the 3.5-litre era."

1995 saw 3.0-litre engines mandated, and the introduction of the OX10C engine, otherwise known as the Judd HV. "I think we made a mistake," Judd reflects. "We went down on bore size; we should have reduced the stroke to maintain reasonable combustion chamber proportions.

"It was the wrong decision, and we probably compounded that by continuing into the [1996] JV with ▶

ABOVE & BELOW The enduring appeal of Judd's GV V10 makes it in some ways sportscar racing's equivalent of the DFV



the same bore size, though we did get good power out of it in the end. Clearly, we should have kept the original 94 millimetre bore."

1997 saw the end of the Yamaha project, after a single season powering the Arrows team and defending champion Damon Hill.

That same year marked the re-emergence of European prototype action away from Le Mans, courtesy of the International Sports Racing Series, later known as the Sports Racing World Cup and FIA Sportscar Championship. While the momentum of the series was far from overwhelming, it presented a new opportunity for the firm. In 1999 Judd's V10 would re-emerge in 4.0-litre 'GV4' form.

Judd explains the early days of the project: "Since we found ourselves no longer in F1, we had to find something else to do! The first thing we did was make a 4.0-litre version of the engine, and then we changed the bottom end quite considerably.

"When the GV finished in F1 at the end of 1994, we still had an open crank case, where the engine used main bearing caps and didn't have separate chambers. Since then, it was becoming apparent that you get more power in this type of engine by dividing the crankcase into five V-twins. Instead of pushing gas around the bottom of the crank case, just compress it and expand it within the same chamber, like a v-twin motorbike.

"We took the 3.0-litre HV, put the bore back to 94 millimetres, made some long stroke cranks for it and got a basic 4.0-litre version running. At a later point, we made a divided sump and scavenge setup which gave quite a good power gain – that's more or less how it started out in 1999."

And thus, the GV4 had arrived. Chassis from the likes of Riley & Scott and Lola were fitted with the Judd engine,

BELOW Still seen racing in the BOSS GP series, the BMS Scuderia Italia F1 racer was where the Judd V10 first saw action



> "We got it up from an initial output of 680 bhp to something like 750 bhp before the end of the 3.5-litre era"

most notably in the hands of DAMS. The French team debuted its new Lola B98/10 at the Monza 500 km, starting from pole, and while gearbox issues hindered the team in Italy, the outfit would go on to take four victories in 1999, netting third in the Sports Racing World Cup points.

A first GV-powered win stateside would also occur at Road Atlanta, in the second round of the inaugural American Le Mans Series season, courtesy of a Rafanelli-run Riley & Scott MKIII.

More teams began gravitating to the GV, even those running the venerable Ferrari 333 SP. Teams would rip out the ▶





ABOVE & BELOW The GV V10 screamer became a go-to engine for sportscar racing privateers like Rollcentre (above) and Nasamax in the noughties



BELOW The Lola T92/10 was another early application for the Judd V10



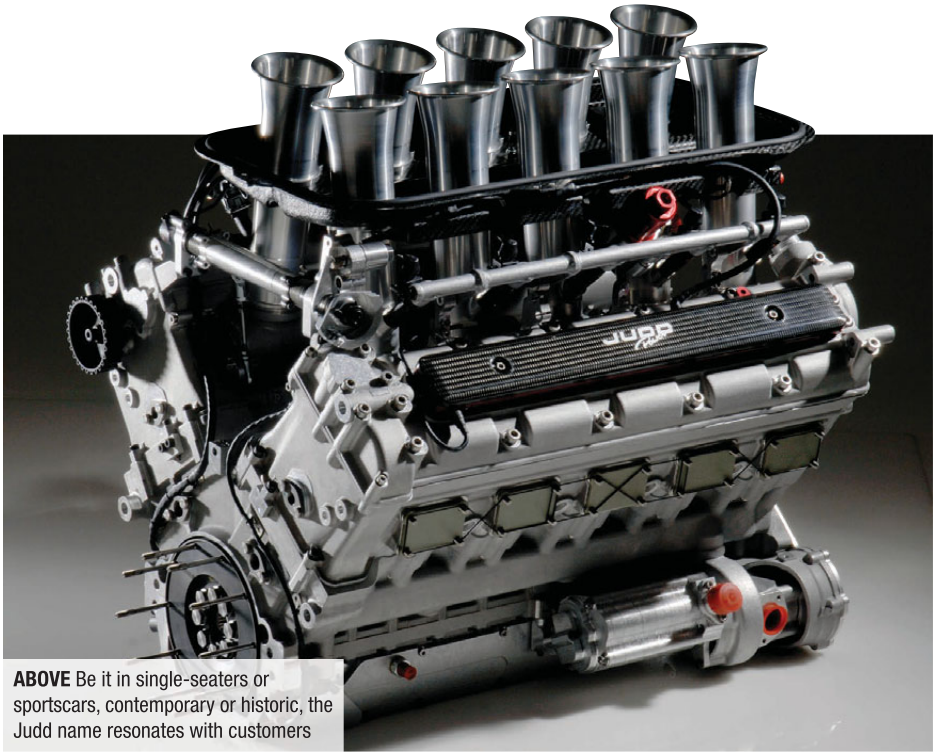


ABOVE Sacrilege maybe, but some Ferrari 333 SP victories were courtesy of the Judd powerplant, including one at Monza

original V12, carefully placing it to one side for later reinstallation to boost the car's eventual value, and then install a GV4. One such team – GLV Racing – even scored victory on the hallowed turf of the Tifosi at the 2001 Monza 1000 km.

"It was quite good that," Judd recalls with a chuckle. "We were quite pleased with that one, but we don't imagine the Italians were as amused."

The GV4 would secure further successes on both sides of the Atlantic. They included victory at the 2002 Daytona 24 Hours with Doran-Lista Enterprises and its Dallara, as well as two consecutive titles with the Dome of Racing For Holland in the 2002 and 2003 FIA Sportscar Championships.



ABOVE Be it in single-seaters or sportscars, contemporary or historic, the Judd name resonates with customers

It was certainly a solid product, and custom from ORECA, Rollcentre, Nasamax and Creation ensured that the Judd motor was the go-to for privateers. However, some customers were looking for changes, as Judd explains: "We didn't need to improve the GV very much, just incremental changes to keep it reliable. They're restrictor engines, and I think that we were getting about all we could get off the restrictor size.

BEST SHOT AT LE MANS WIN

"Jim Matthews in the US wanted a bigger engine," says Judd. "We told him that you won't get any more power; in fact, a bit less probably because of the way the restrictors worked. However, we made the bigger engine, and it was popular because it was easier to drive. It's lower-revving, perceived as more flexible although I'm not sure it was, strictly speaking."

It was the enlarged, 5.0-litre GV5 variant that provided Judd's best chance of a Le Mans 24 Hours victory in 2005. That year, the now venerable Audi R8 had been neutered considerably by restrictors, giving Henri Pescarolo's eponymous Judd-powered team a clear pace advantage heading into the twice-round-the-clock event. However, ▶

mj tech limited



With a wealth of knowledge we are specialists in motorsport transmissions covering rebuilds, design and reverse engineering of parts for all types of gearboxes and axles.

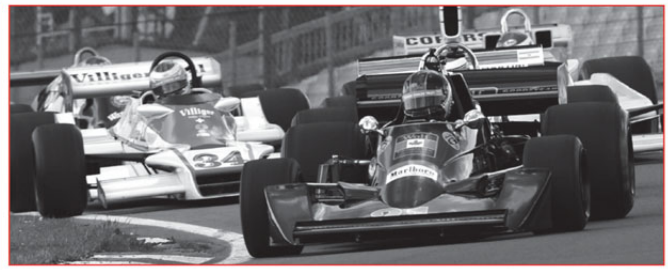
Supporting teams in the World Endurance Championship, European Le Mans Series, Blancpain, Masters Historic Championship and Formula E.

On completion, gearboxes are run on our spin rig to check oil temperature, oil pump pressure and oil flow as well as input and output rpm. M J Tech Limited are also Aerospace certified in non destructive testing (NDT) using the Magnetic Particle Inspection and Dye Penetrant Inspection methods.

All internal components and casings are crack checked on strip down and reported on prior to rebuild.

NDT of suspension and driver controls for teams in Historic championships for scrutineering passports.

Tel: 01525 240022 • Email: enquiries@m-j-tech.com
Web: www.m-j-tech.com • M J Tech Limited



RACEPARTS

DISTRIBUTORS FOR

OMP



3 Rockfort, Wallingford,
Oxfordshire, OX10 9DA
Tel: +44 (0) 1491 822000
Fax: +44 (0) 1491 822009
e-mail: sales@raceparts.co.uk
www.raceparts.co.uk

ASV | LAW

Entertainment + Sport Lawyers

Your Trusted International Motorsport Lawyers

www.asvlaw.com

113a Jermyn Street, London, SW1Y 6HJ

it wasn't to be, with the team only managing second position after gearbox issues during the race.

As Judd reflects, "that was the chance to win it", but a pair of Le Mans Series titles and another second place at Le Mans the following year still proved to be great results for Judd and Pescarolo alike. These results, along with further developments to the engine for 2006, saw it come close to ubiquity among privateers. The update entailed a completely new top-end for the GV; everything from the cylinder heads upwards was revamped for what was dubbed the 'S2' series of GV engines.

A 5.5-litre variant, the GV5.5, came onto the market in 2007, in what Judd describes as a "marketing move". However, when the late-2000s financial crisis struck, this had a knock-on effect on top-flight sportscar competition, especially among privateers.

The collective money pot had simmered down, as had the potential customer base for the GV. Despite that, the motor remained a leading choice for privateers into the turn of the decade, last racing in the top-flight in 2012 with Pescarolo, at the first event of the new FIA World Endurance Championship. Not much had survived the 20-year interval between world championships in sportscar racing, but the GV had.

John Judd's Engine Developments firm spent much of the '70s and '80s maintaining and tuning the Cosworth DFV for the likes of Williams. It is, then, rather serendipitous that the firm went on to build a similarly timeless and enduring motor.

"It's probably the nearest thing in



ABOVE A modernised version of the GV4 has proved popular with historic racers

An F1 afterlife

THE story of the Judd GV in Formula 1 cars extends well beyond the World Championship itself. As the customer base began to swell in sportscar paddocks in 2001, several relatively new Formula 1 cars would receive the 4.0-litre GV4 sportscar engine in an effort to boost drivability and durability for wealthy owners, thanks to its lower-revving characteristics.

Kevin Mansell of Mansell Motorsport specialises in the maintenance and preparation of these cars, up to and including the actual process of fitting a GV as a replacement engine. As he puts it, there are limited options for engine swaps, but the balance of pros and cons make the GV4 a very attractive proposition.

"It's very cheap!" he says, "and it's much longer between rebuilds than the original engines. Weight's not too much of an issue either thankfully; the big [drawback] though is torque.

"When the cars were getting 17 or 18,000 rpm, the gearboxes just got smaller and smaller. When you do a conversion, one of the big issues is packaging. Because the bodywork fits the car so closely, it's difficult to house it all. With a Judd installation, you really need to run a pre-2001 car, because after that the gearboxes are just too small."

Nonetheless, though, the market for such motors is alive and well, even in a time where series such as BOSS GP see fewer Formula 1 cars than the heyday of its predecessor, EuroBOSS. With many private owners across the world looking to run their cars without the complications of the complex and high-strung original engine, a modernised version of the GV4 was built in the early 2010s.

The new variant has a slightly upped 4.2-litre capacity, extra power and a change from a slide throttle to a barrel throttle, and it has proven to be a success. Mansell, who was the first person to install the 4.2-litre unit to a car, puts it across simply: "The gains were not 200 cc – the gain is that it's the greatest specification GV. It has different heads and everything. As an installation, it's a nicer engine. All the coil packs are hidden under a carbon cover – it just looks more F1!"

BELOW Kevin Mansell was the first to install the 4.2-litre variant in a car. It features lighter cylinder heads, twin barrel throttles, a lower centre of gravity and is also 10 kg lighter than the 4-litre version



sportscars," says Judd, "but the DFV was clearly a much bigger thing than this. It's not a bad platform, and it's been around so long that we know most of its quirks and idiosyncrasies, and yeah – it's a good one."

Judd also acknowledges the fact attested by anyone who's been trackside when a GV-powered car is in full throat: "The first time we fired it up on the dyno we thought, 'Shit, that sounds nice!' – it's fair to say that it's an accidental classic."

Thankfully, much like the DFV, the Judd GV series of engines is still actively supported by its creator. Now that the LMP cars of the 2000s are becoming the new hot ticket in historic racing paddocks, we can expect to hear the wail of this V10 for many seasons to come. HRT



ABOVE When these GVs were assembled in the Engine Developments workshop, few could have predicted that a steady stream of work on the engine would still be ongoing more than two decades later

Rebirth of a record breaker

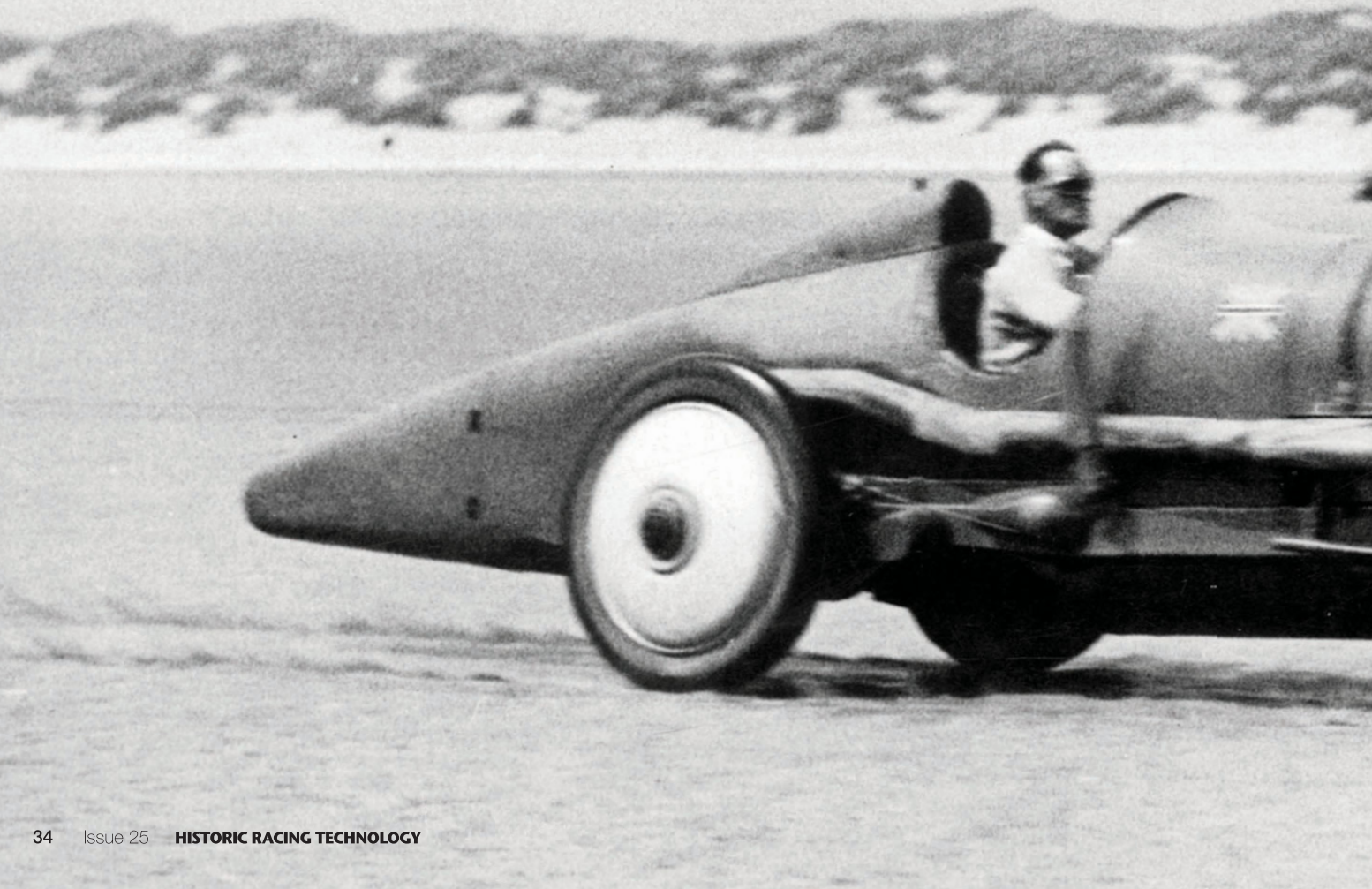
Doug Hill, chief engineer at the National Motor Museum in Beaulieu, tells **William Kimberley** about getting a 100-year-old Sunbeam back on the road

ONE of the big projects that has been consuming the small but passionate engineering team at the National Motor Museum is the restoration of the fearsome 350hp Sunbeam, celebrating its 100th birthday this year.

Under the bonnet is a modified 18,322 cc V12 Manitou aero-engine, a type used on naval seaplanes. While there were orders for 840 such units, only 13 were built, including a redesigned one for the Sunbeam.

The twin-cam four-valve head was replaced by a single-cam three-valve head and an increase in bore to 120 mm, allowing space for three valves. The articulated connecting rods – where one rod runs on the crankshaft journal, but the other acts indirectly through a journal on the other rod – were retained. The challenge was that this gave a different piston stroke and journal rotation centre for each bank, leading to unbalance and possible vibration problems. Stroke was 135 mm on one bank and 142 mm on the other.

On its first outing, scheduled to be at the 1920 Whitsun Brooklands meetings, the car burst a tyre on a practice lap, causing it to crash on the Railway Straight. While the driver, Harry Hawker, was not hurt, the car was not



in a condition to race.

On the next outing, in August, the engine stalled and would not restart. It was third time lucky when René Thomas made fastest time of the day and a course record with 108 mph/173.81 kph in France at the Gaillon hillclimb.

The car was then campaigned by Kenelm Lee Guinness in 1921 and 1922 before Malcolm Campbell borrowed it in 1923 to compete in the Saltburn Speed Trials. While he had a run of 138 mph/222.09 kph, it was not recognised as an official world record. He consequently bought the car and commissioned Boulton & Paul to build a new body for it, painting it in his distinctive blue colour scheme.

In September 1924 he took it to Pendine in South Wales to make an attempt at the official Land Speed Record, achieving a new record speed of 146.16 mph/235.22 kph. He went one better 10 months later on 21 July, 1925 when he drove the car to a new record of 150.76 mph/242.62 kph.

The car then had a succession of owners, including band leader Billy Cotton. One of those owners, Harold Pratley, loaned it to Rootes, which had acquired the Sunbeam company in 1935. At this point the car underwent some cosmetic restoration.

In 1958 it passed to the care of Lord Montagu and the National Motor Museum. There it was restored to working order and driven in different events, having its last outing at Goodwood in July 1962. During a test fire-up 31 years later, in 1993, to assess the car's condition, disaster struck when a blocked oil way in the engine caused it to seize and 'throw a rod'. For several years after that, the car was on display in the museum with a very visible hole in its engine where the piston and conrod had exited.

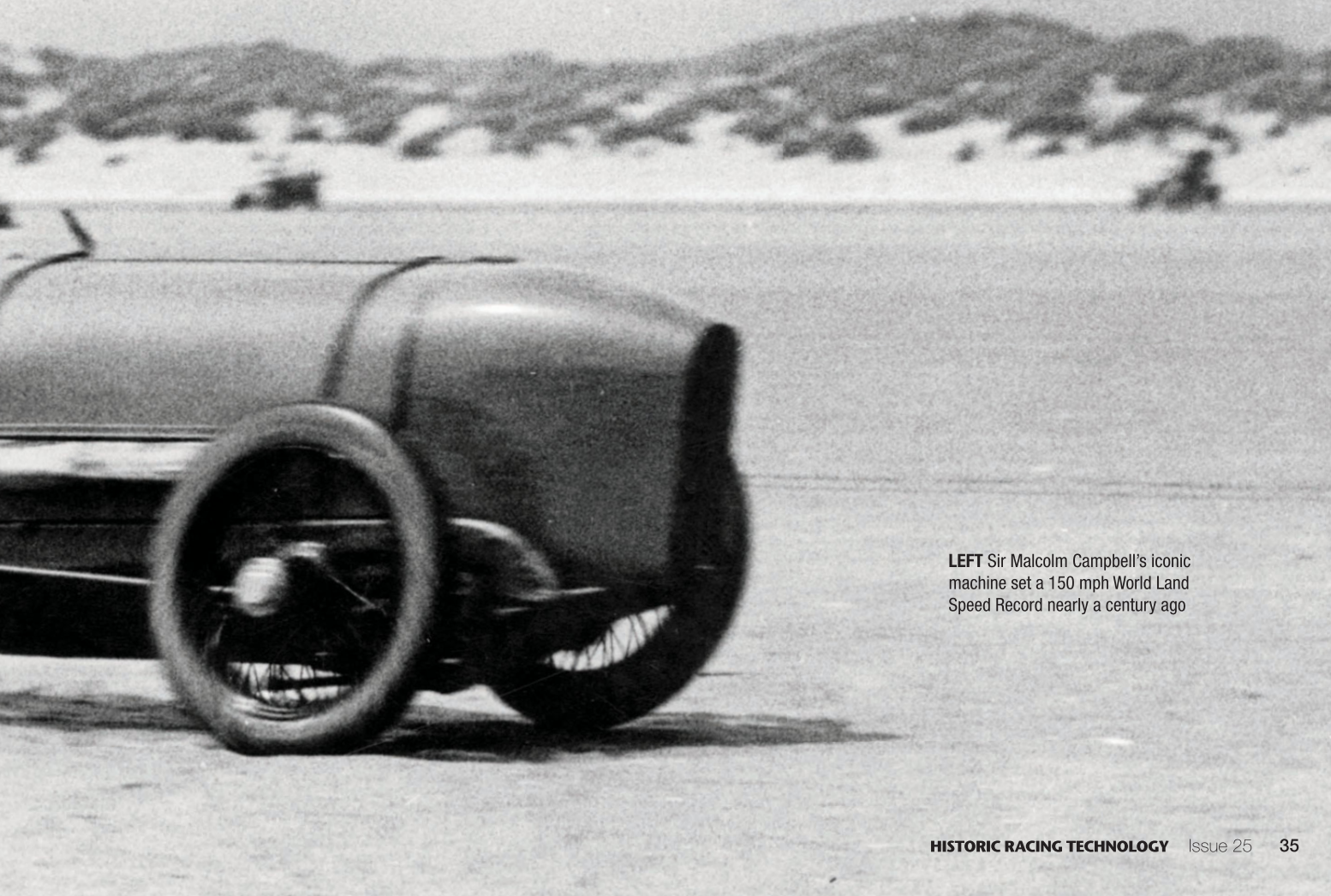
> **"People coming up with cunning plans were not grasping the fact that we wanted it to be as totally original as possible"**

RESTORATION PROJECT

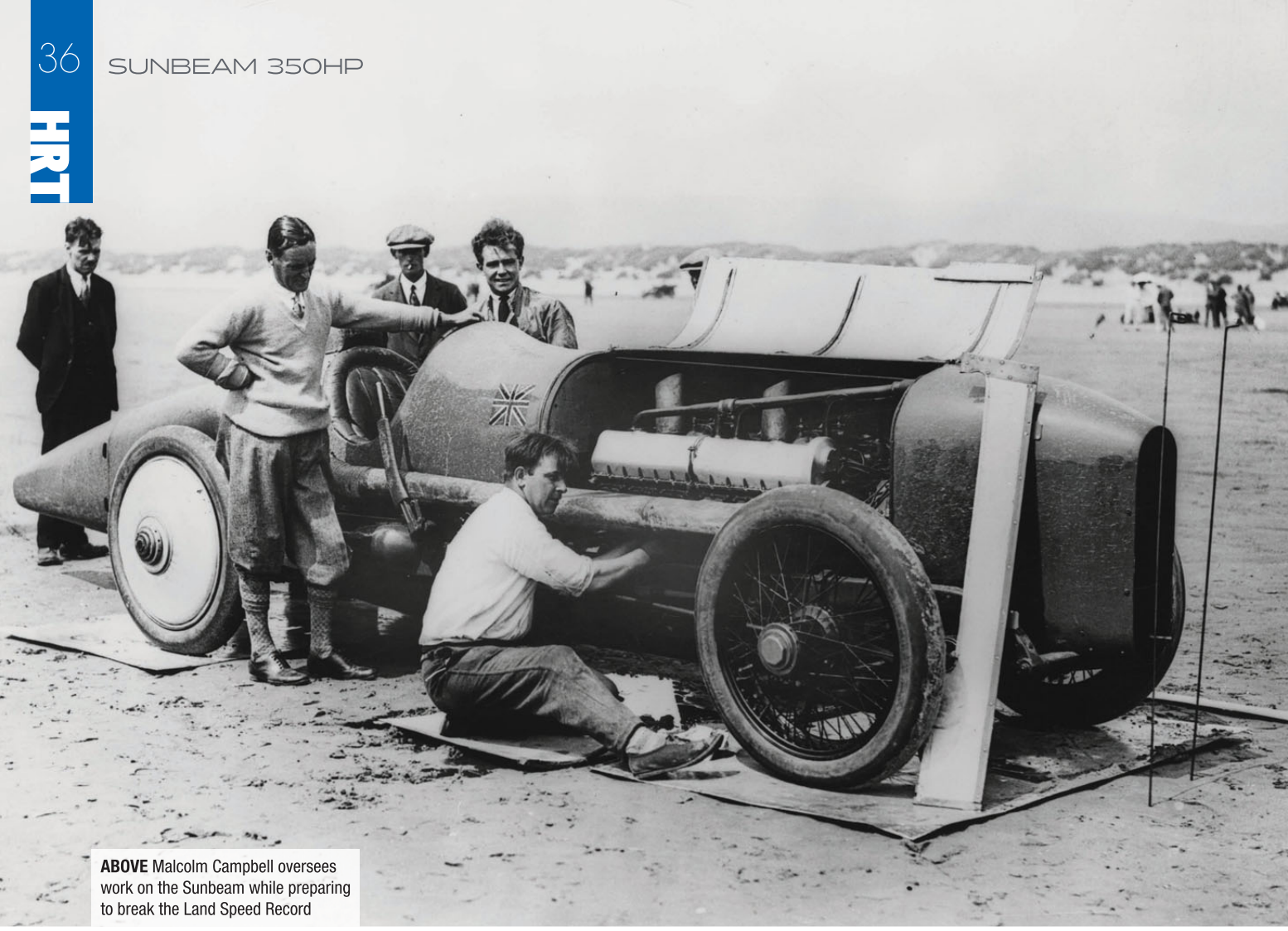
The ongoing project to restore and preserve Sir Malcolm Campbell's iconic machine has been a labour of love for Beaulieu's workshop engineers. Having painstakingly rebuilt the complex V12 engine, the engineering team, lead by Doug Hill, triumphantly took this landmark vehicle back to Pendine Sands in 2015 for a low-speed reconstruction of its World Land Speed Record 90 years earlier.

"The engine had new conrods and pistons, new valves and valve springs, because there's no way the car would have worked, but we've kept all the original parts," says Hill.

While the engine was then in fine fettle, the non-original gearbox was always the Achilles heel in this car's history and has long been the missing part of its ▶



LEFT Sir Malcolm Campbell's iconic machine set a 150 mph World Land Speed Record nearly a century ago



ABOVE Malcolm Campbell oversees work on the Sunbeam while preparing to break the Land Speed Record

puzzle. At some point after World War II, the original gearbox was removed and by the time the car became an exhibit at the National Motor Museum, it was fitted with a temporary gearbox from an Albion 35hp. Only designed to handle a tenth of the engine's power, this gearbox also lacked a transmission brake – an important part of the Sunbeam's original brake set-up.

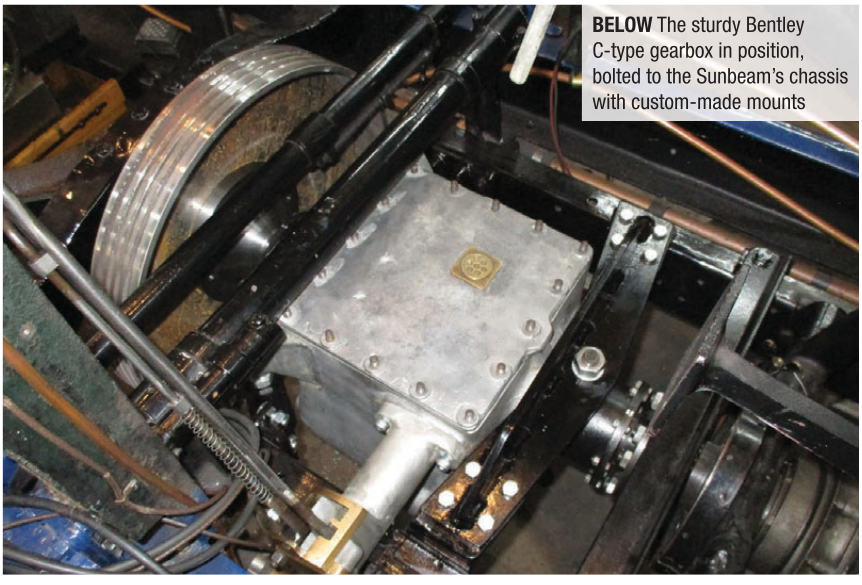
"The Achilles Heel of the 350hp Sunbeam has always been the gearbox," says Hill. "The only reference we could find anywhere historically was in Malcolm Campbell's own words that yet again the layshaft failed, so we knew it had a weird layshaft. Edward, Lord Montagu, campaigned the car in 1962, the last recorded time the car was seen with the original gearbox along with a picture of the car in Lord Montagu's workshop.

> "The temporary gearbox lacked a transmission brake – an important part of the Sunbeam's original brake set-up"

35 HP, NOT 350 HP!

"The gearbox was then removed and an Albion van gearbox, which was designed for a 35 hp vehicle, not a 350 hp one, was installed into the car very badly. However, it worked so the car would propel itself, but it wouldn't take the power – and we knew that. Despite being very careful on a demonstration run, it stripped first gear, which meant that we couldn't drive it anymore, nor would we want to put the clutch through the stresses of running it in top gear. We therefore had to fundraise and try and re-create the original gearbox.

"We knew it was a 4-speed with a reverse and we had an idea of the size and shape of the casing and the ▶



BELOW The sturdy Bentley C-type gearbox in position, bolted to the Sunbeam's chassis with custom-made mounts

REVOLUTION
COMPETITION ▲ WHEELS



4 SPOKE RACE
Available in 13" in a variety of widths. Matt black with diamond rim.

NEW

8 SPOKE RACE
Available in 13", 14" and 15" in a variety of widths. Silver all over or matt black with diamond rim.

CR10 FLOW-FORMED (ALLU-LITE)
Available in 15", 16", 17", 18" and 19" in a variety of widths. Matt black or hyper silver. Available in centre lock.

WWW.REVOLUTIONWHEELS.COM
E INFO@RWIL.ORG.UK / T +44 (0) 1623 860000 / MOB +44 (0) 7702 845264

HISTORIC QUALIFIER

No one offers more Rod Ends and Spherical Bearings for historic and vintage applications.

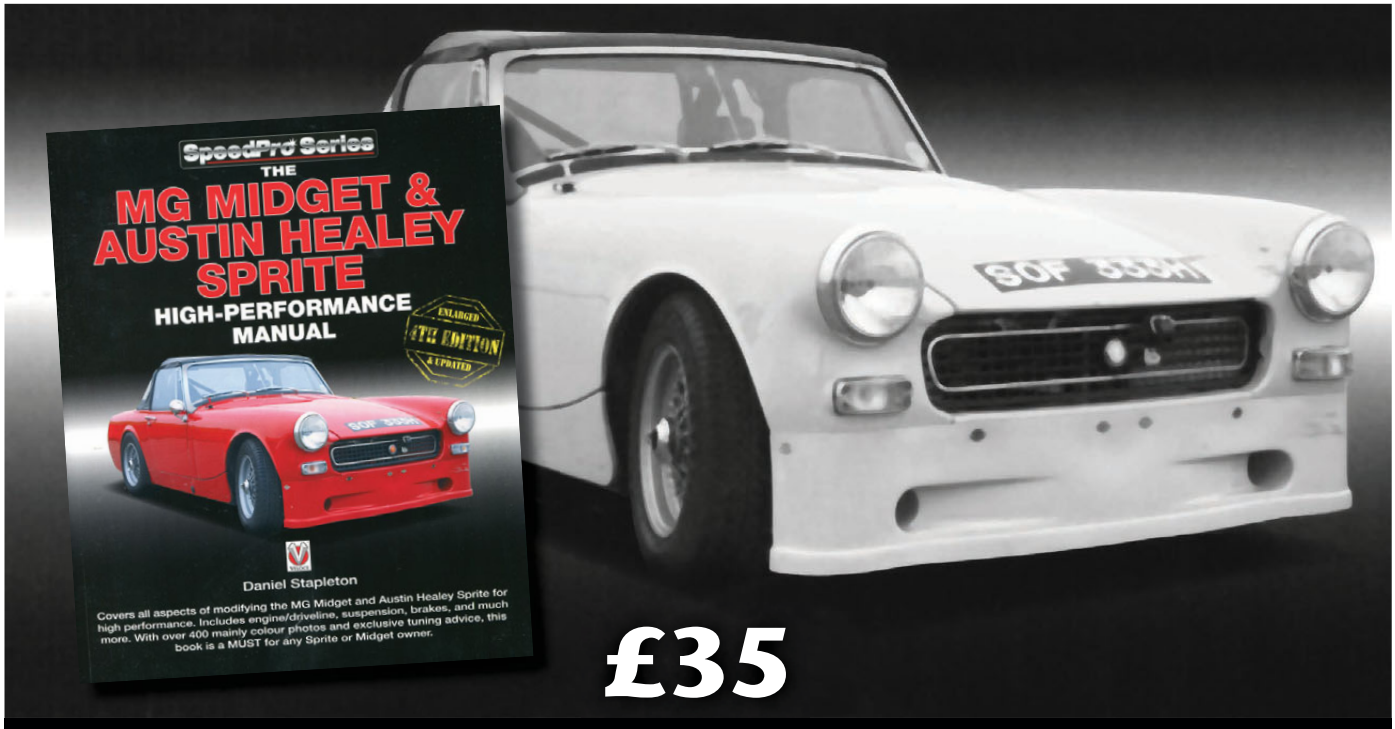


©AutoPhotos 2009, Ed Lyman

Aurora Bearing Company
901 Aucutt Road
Montgomery IL. 60538

AURORA ®

Complete library of cad drawings and 3D models available at:
www.aurorabearing.com
Ph: 630-859-2030



£35

To order visit our website at:
www.kimberleymediagroup.com

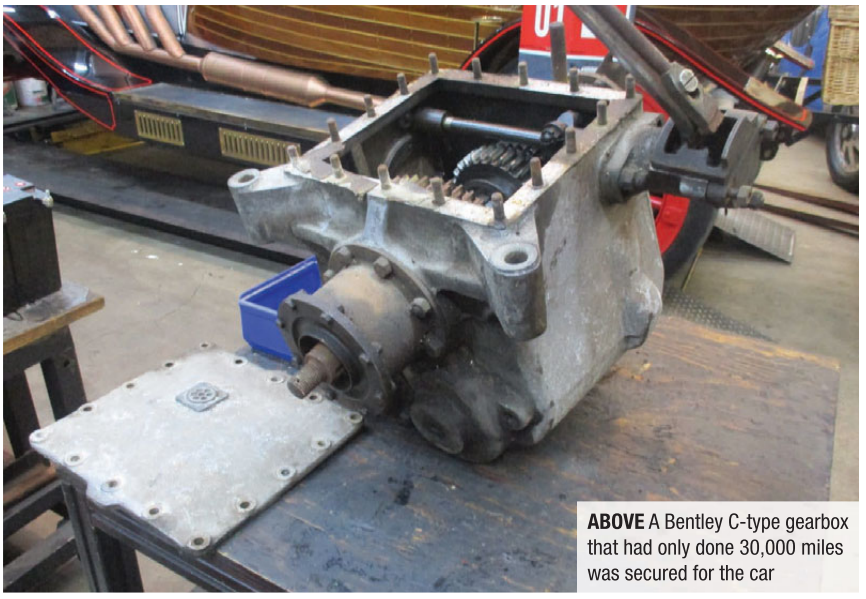
For further information please contact Kimberley Media Group Ltd e-mail: info@kimberleymediagroup.com
841 High Road, London, N12 8PT, UK, Tel +44 (0) 208 446 2100 Fax +44 (0) 208 446 2191
E-mail: soheila.kimberley@kimberleymediagroup.com Website: www.kimberleymediagroup.com

KIMBERLEY MEDIA GROUP LTD

space we had to fit, but that's all we had to go on.

"When it came to drawing and designing the gearbox, we spoke to many people. It was Cecil Schumacher, a successful F1 transmission designer working alongside Alistair Lyle, who came up with some wonderful figures.

"We knew what we needed in as far as ratio and gear profiles and so on, but to get that drawn into a gearbox and come up with a design was a completely different matter. We soon realised that people who were coming up with cunning plans were not grasping the fact that we wanted it to be as totally original as possible, with the thinking of the design to be of the period. We even had the promise of a billet for it to be machined out of, but then senior engineer Ian Stanfield and I were talking to the people who run aero engines in classic race cars and most people were grafting them onto other gearboxes. It soon became apparent that the C box-type Bentley box was the way to go."

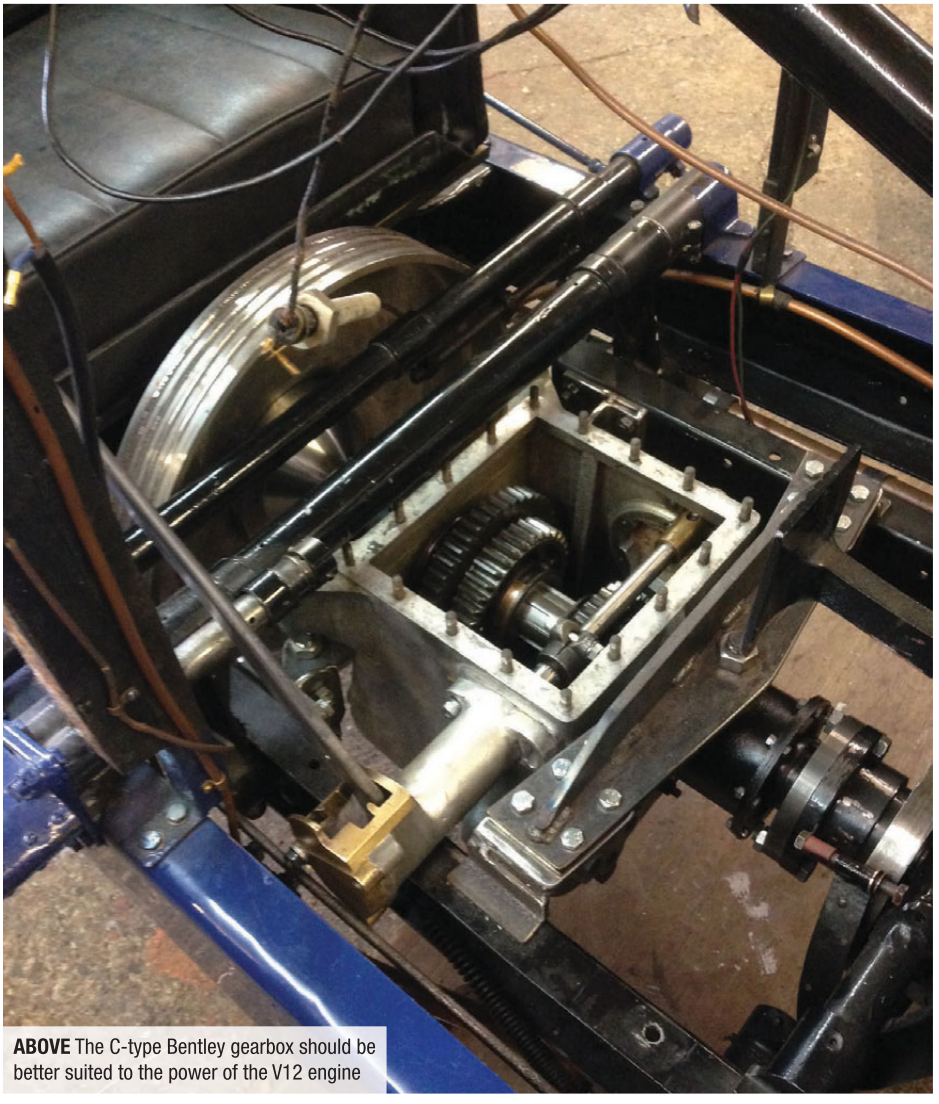


ABOVE A Bentley C-type gearbox that had only done 30,000 miles was secured for the car

Reinstating a suitable gearbox had been a priority for the engineers as it was the next stage of the car's ongoing preservation. With help from the museum's supporters, a Bentley C-type gearbox that had only done 30,000 miles was sourced and adapted to fit the Sunbeam's chassis with custom-made mounts. This unit has proven, in other applications, to be well suited to the task of handling the colossal power of the 18-litre V12 engine.

"It was hugely over-engineered and was quite capable of having in excess of 400 hp, maybe over 500 hp, so we looked at the design and thought that it was going to fit," says Hill. "The right-hand gearchange with the shaft across the car could have been a problem, but we have many examples of that to copy.

"It might seem the easy cop-out for us to put that gearbox into it but it has proven itself with high brake horsepower and it's one we can get parts for. However, it required a huge amount of effort to fit it, and while not the original, we were content in the fact that the original gearbox just does not exist; there aren't any drawings, so there was no way we could re-recreate an absolute original."



ABOVE The C-type Bentley gearbox should be better suited to the power of the V12 engine

HUGE ISSUE

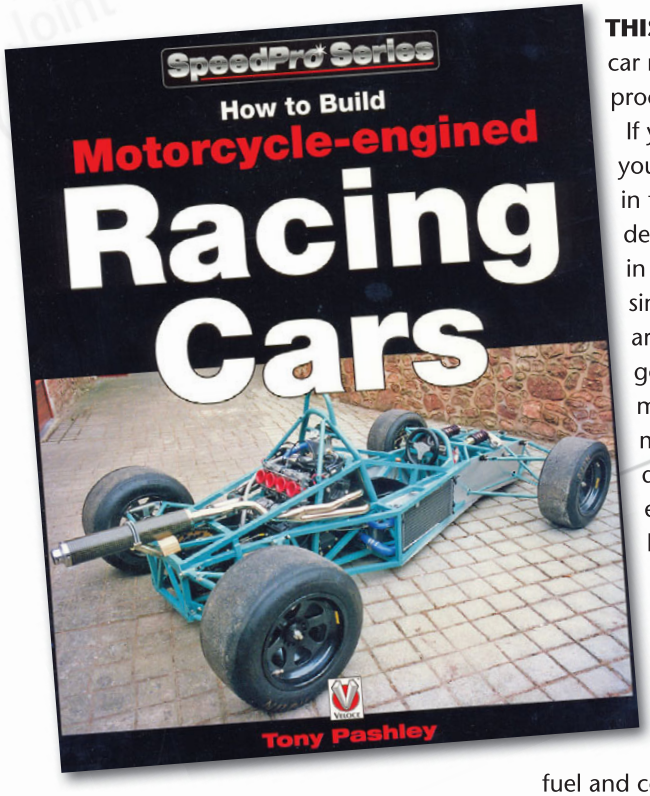
"After purchasing it, we sent it to WB Gears to inspect, strip and crack test the casing, polish the gears, fit new bearings and seals to make sure that everything was okay. However, we still had to manufacture the mountings and alignment.

"One of the huge issues with the original gearbox is that it had a transmission brake on the output shaft which we have had to reverse ▶

KIMBERLEY
MEDIA GROUP LTD

Essential BOOK for the motorsport engineer's library:

How to Build Motorcycle-engined Racing Cars: £30



THIS book takes the reader from the conception of a budget racing car right through to its appearance on the racetrack, with the whole process described in easy to understand steps. By Tony Pashley

If you are aspiring to build a racing car this could be the book that you've been waiting for! Tony Pashley revisits the path that he took in the Pashley Project articles in Race Tech magazine during the design and construction of two successful hillclimb cars. This time in great detail with a view to enabling the reader to carryout a similar exercise for themselves. Although hillclimb and sprint cars are the focal topic, a lot of the book is applicable to race cars in general. The cars under discussion in the book are powered by motor cycle engines which, in the smaller racing car classes are meeting with great success. The total process of building a car is described beginning with the selection and procurement of the engine. Chassis and suspension design is covered in a simplistic but adequate manner as the author's aim is to minimise the inclusion of involved calculations. Two recipes for chassis construction are illustrated in detail along with guidance on the processes of construction and a description of the required equipment. Following on from this the fabrication of the suspension is explained. Further chapters are dedicated to the remaining aspects of the vehicle covering; transmission, brakes, fuel and coolant systems and electrics. The book is heavily illustrated with 200 photographs and extensive explanatory diagrams and tables. This book is a vital addition to any would be kit car builders library.

To order this fine book and many others, please go to www.kimberleymediagroup.com/shop or phone +44 (0) 20 8446 2100 where our friendly staff will take your order.

kimberleymediagroup.com

RACE TECH Motorsport Engineering
racetechmag.com

HISTORIC RACING & Technology
historicracingtechnology.com

TrackCar performance
trackcarperformance.com

engineer. We are actually using a brake drum from a 1914 Rolls-Royce on the back of the gearbox.

"It has yet to be driven but we are 100% confident it will be fine," says Hill. "The ratios are not conducive to doing 150 mph, nor would we ever want to go that fast, but the first and reverse gears are low enough to be able to manoeuvre in the paddock and take it slowly up the hill in second. If we are on the Pendine Sands, the car is quite happy to tick over at 55 mph in top gear. I think its top speed would be around 130 mph. It has a very small flywheel and just wants to go but we have got to think about its future."

Best of all, this is enabling the engineers to install a strong and historically correct transmission brake and propshaft. Once the full installation has been completed, the Sunbeam will have the robust transmission its mighty engine deserves.

"The best way to maintain a vehicle is to keep it running," suggests Hill, "but there's a counter argument that the car is being destroyed, which I understand and get into an ethical quandary. We are working on the Science Museum's Connaught, basically replacing the fluids with lubricants that coat all the metal parts to prevent corrosion. It's the only Connaught with the original Alta engine, but how far do you go in replacing parts?"

LUBRICANT DILEMMA

Hill does not endorse any one lubricant, but uses a range, depending on the car. "There is not one cure for all lubricants so we don't endorse any, but use a variety from many different manufacturers," he says. "We have to be careful because if we use a high-detergent lubricant, it could clean all the muck out of an engine that's been there for years, leading to it running its bearings. We try and get as close to the original lubricant as possible.

"Pre-war Rolls-Royces had a sludge trap in the crankshaft, so if a good oil is put in, the sludge starts coming out the crankshaft, leading to the bearings being run. So when you analyse, or risk assess, you have to question whether you need to strip the engine before you put the new lubricant in.

"We are delighted that by the end of this year I hope that we will be driving the car again and we will have speeds and a reverse."

The car can usually be seen on display at the National Motor Museum as part of a multi-media presentation, which also features its record-breaking stablemates: the 1927 Sunbeam 1,000hp, 1929 Golden Arrow and 1960 Bluebird CN7. HRT

BELOW Don Wales, Malcolm Campbell's grandson, drove the car at Pendine Sands in 2015 as part of an appeal to raise funds to build the new gearbox





ABOVE Doug Hill at the wheel of the Sunbeam as it fires up

The Ford That Beat Ferrari

Ford's breaking of Ferrari's Le Mans stranglehold, with the GT40 in 1966, inspired a Hollywood movie. But the tale of the futuristic new car it had intended to race instead is no less compelling, as revealed in this extract from the new edition of *The Ford That Beat Ferrari*



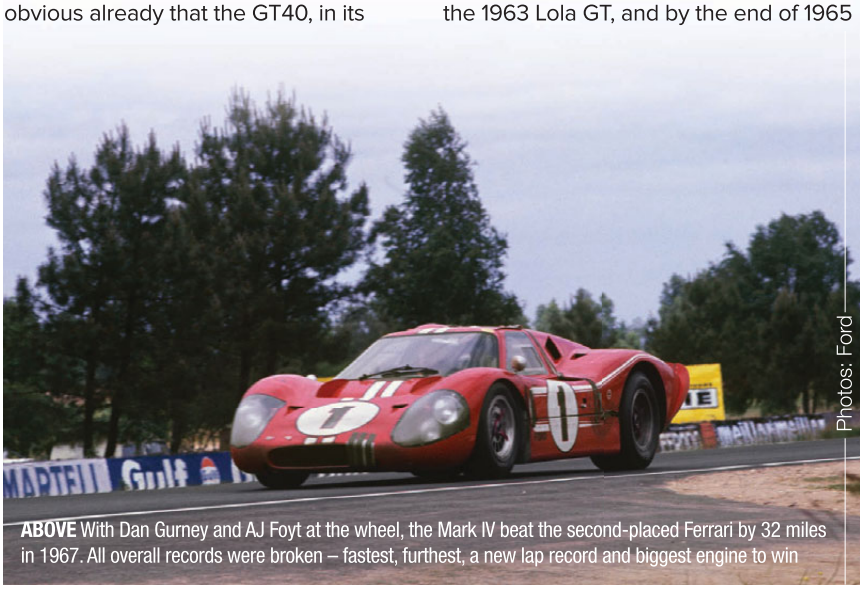
ABOVE The troubled J-car eventually morphed into the Mark IV that delivered an historic American-powered, American-built, American-driven victory in 1967

THE clamour of Le Mans 1965 was still ringing in the ears of the Ford personnel as they planned their assault on the 1966 edition of the 24-hour race. Racecar development proceeds at a fast pace, and it was obvious already that the GT40, in its seven-litre Mark II form, would have to be the subject of intensive development work to keep it competitive with the cars that Ferrari would be building in the next couple of years. The GT40's design concept had been based closely upon the 1963 Lola GT, and by the end of 1965 it was effectively three seasons old.

> "Its troubles stemmed partly from its shape, which was futuristic but very inefficient"

What was needed for the future was a brand-new car, technologically advanced, with room for several years of updating. In September 1965 the decision to produce such a car was taken, the hope being that it would be available for use in time for Sebring, 1966. The new car was dubbed the Ford GTP (Grand Touring Prototype) but, because of its compliance with the new Appendix J regulations due to come into force on 1st January 1966, it was known almost universally as the J-car.

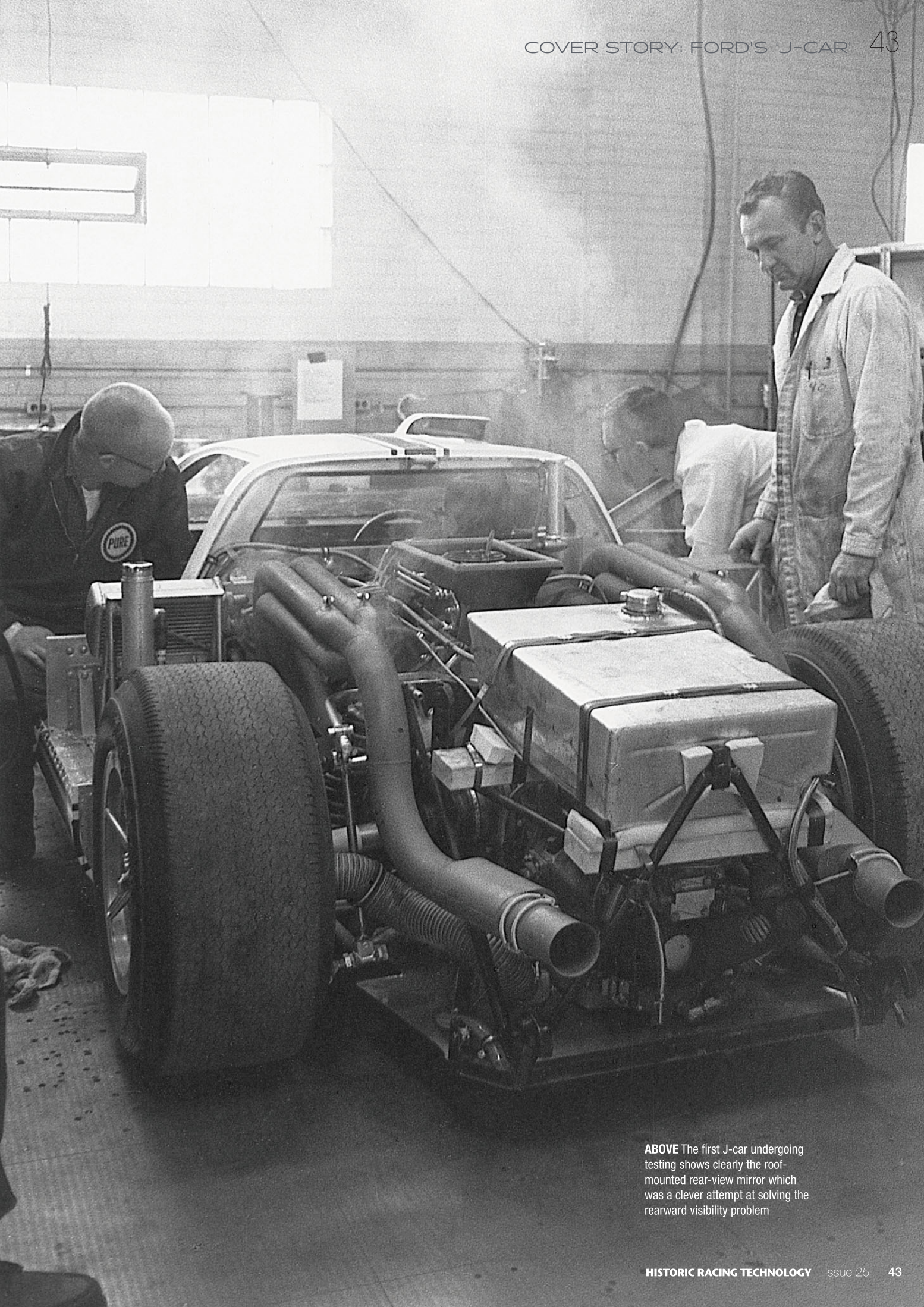
The GTP was to be almost totally new, with only the engine and gearbox ▶



ABOVE With Dan Gurney and AJ Foyt at the wheel, the Mark IV beat the second-placed Ferrari by 32 miles in 1967. All overall records were broken – fastest, furthest, a new lap record and biggest engine to win

Photos: Ford

From the collections of The Henry Ford



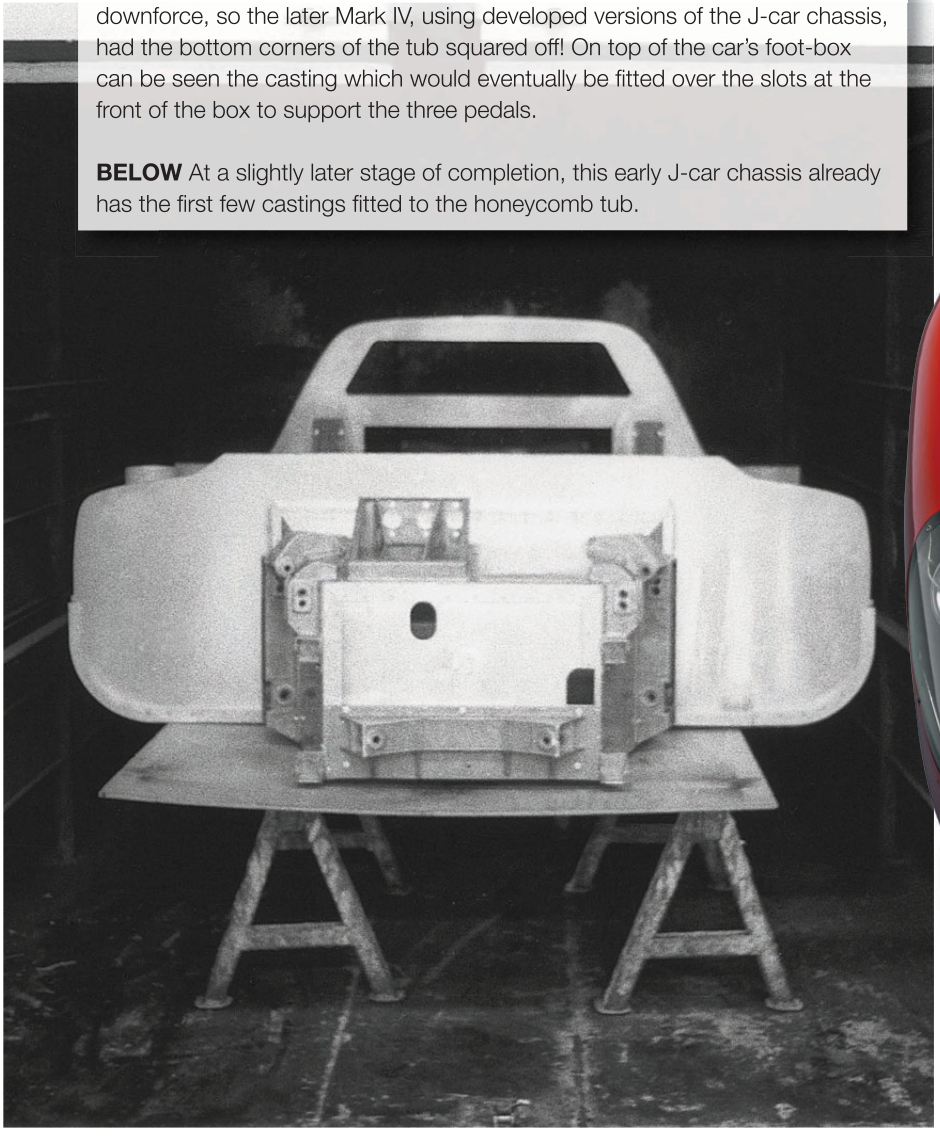
ABOVE The first J-car undergoing testing shows clearly the roof-mounted rear-view mirror which was a clever attempt at solving the rearward visibility problem



Get rid of that curve!

ABOVE The J-car's tub was extremely simple and, to make maximum use of plain honeycomb sheets, used flat panels wherever possible, only the sills being curved. This was rather ironic. At that time, aerodynamics had not yet concerned themselves much with the concept of air passing beneath a car; eventually it was realised that air spilling out from underneath a car reduces its downforce, so the later Mark IV, using developed versions of the J-car chassis, had the bottom corners of the tub squared off! On top of the car's foot-box can be seen the casting which would eventually be fitted over the slots at the front of the box to support the three pedals.

BELOW At a slightly later stage of completion, this early J-car chassis already has the first few castings fitted to the honeycomb tub.



being carried over from the Mark II. Indeed, it was hoped that even the gearbox would be different, as Ford planned to use a semi-automatic two-speed transmission whenever the conditions were appropriate. The main difference between the J-car and its immediate predecessor, the GT40, was in the chassis. The J-car's tub, although visually not dissimilar to that of the GT40, was manufactured in a honeycomb sandwich aluminium material, which was proving popular in



ABOVE Who would deny Ford the richly deserved acclaim for its achievements with the superb Mark IV? Two races entered, two races won – and by a car which contained so much that was so new

aeronautics because it combined low weight with exceptional strength. Most of the joints between panels were glued rather than riveted, the glue being cured when the entire chassis was baked in an oven at the manufacturers, the Brunswick Corporation.

The J-car's body design was totally new and owed less to the wind tunnel than to the stylists. Ford's styling department was responsible for the new car, which had a virtually flat rear deck, like that pioneered on Drogo's Ferrari 'bread van'. ▶



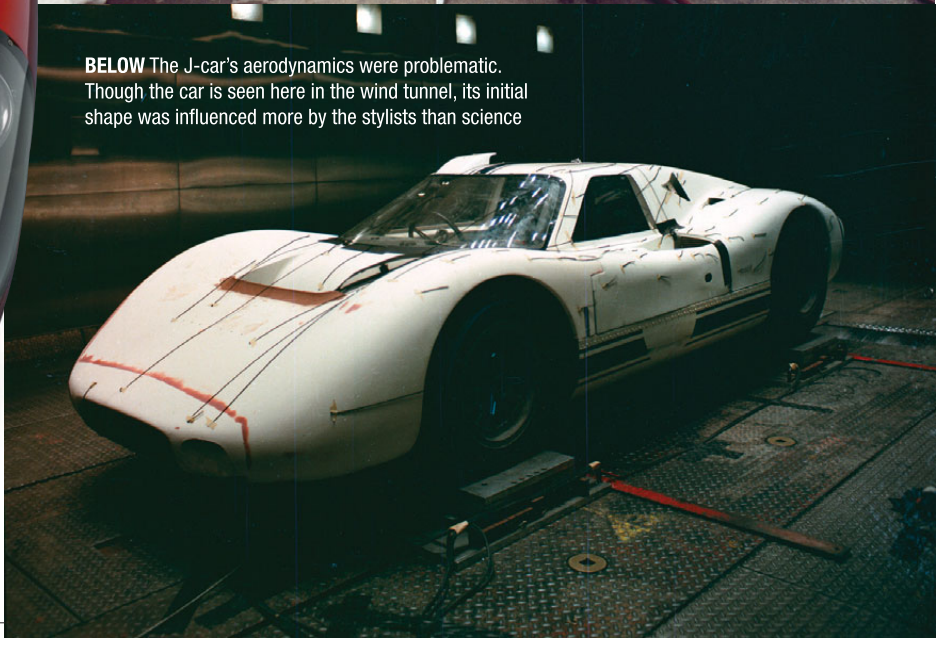
From the collections of The Henry Ford

"The J-car's tub was manufactured in a honeycomb sandwich aluminium material, which was proving popular in aeronautics"

Years ahead of its time

BELOW Le Mans, test days, 2/3 April 1966. The J-car, resplendent in Ford's American colours of blue and white, set new standards for racecar technology. Its honeycomb aluminium chassis was a bold and innovative feature which showed that Ford was taking its racing very seriously. The J-car was, quite literally, years ahead of its time. On its one and only public appearance, at the 1966 Le Mans test days, the car hardly qualified as beautiful, but its futuristic lines were certainly unmistakable. The car never raced in the guise of a J-car as the aerodynamics left a lot to be desired, but it went on to form the basis of the successful Mark IV. Two nose configurations were tried – with or without the 'Manta-Ray' extensions. Despite handling not being perfect, the car set the fastest time of the test days, at 3min 34.4sec.





BELOW The J-car's aerodynamics were problematic. Though the car is seen here in the wind tunnel, its initial shape was influenced more by the stylists than science

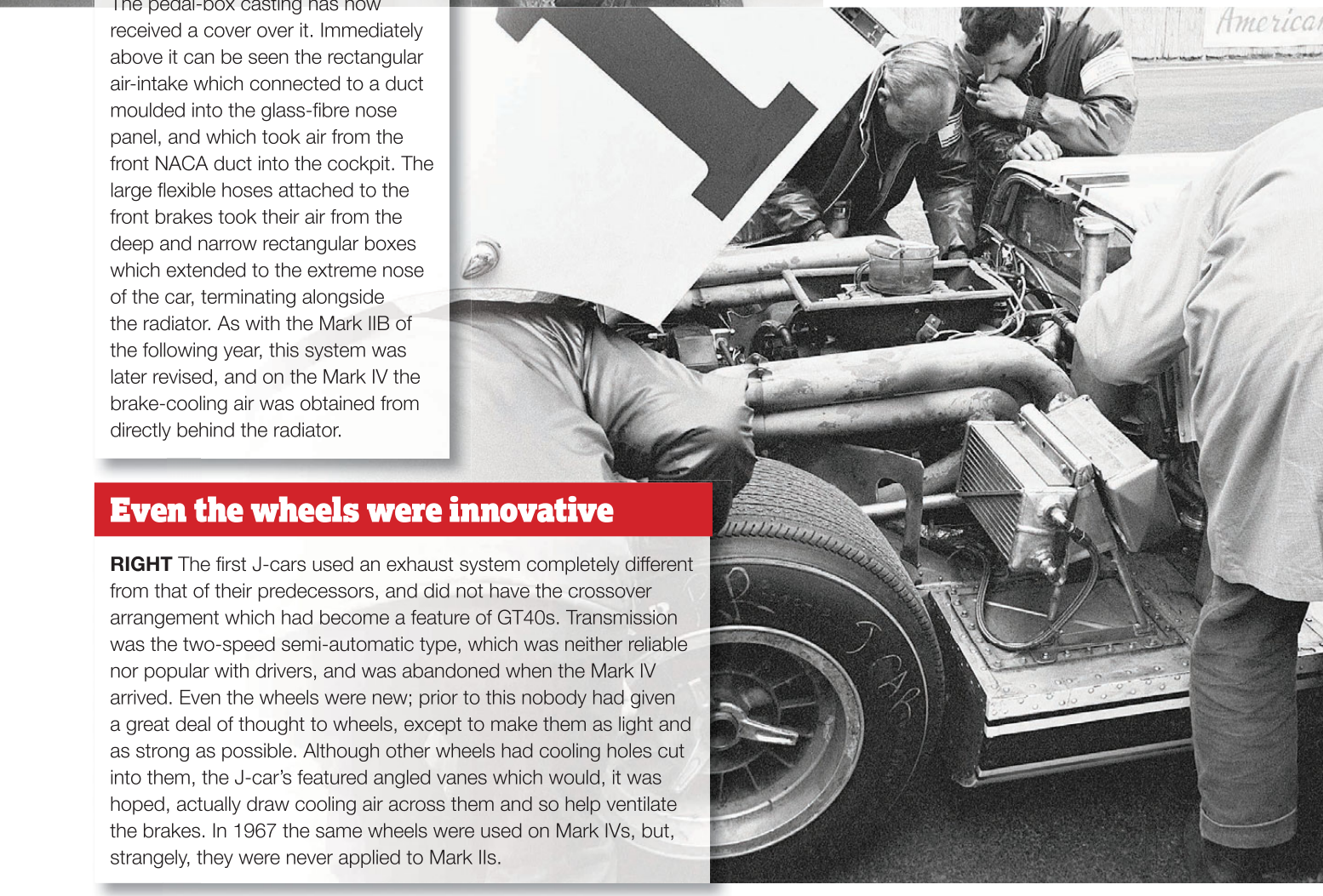


Air control

ABOVE Le Mans test days, 1966. As can be seen from this photograph, the front of the 1966 J-car chassis was completely different from that of the Mark IIA which preceded it. The pedal-box casting has now received a cover over it. Immediately above it can be seen the rectangular air-intake which connected to a duct moulded into the glass-fibre nose panel, and which took air from the front NACA duct into the cockpit. The large flexible hoses attached to the front brakes took their air from the deep and narrow rectangular boxes which extended to the extreme nose of the car, terminating alongside the radiator. As with the Mark IIB of the following year, this system was later revised, and on the Mark IV the brake-cooling air was obtained from directly behind the radiator.

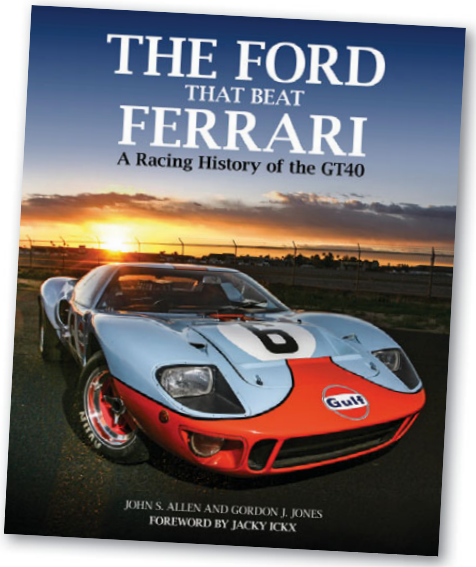
The cockpit was considerably narrower than on the GT40, and accordingly more cramped. A most unusual feature was the nose design, with a low-set rectangular air intake flanked by two thrust-forward extensions.

It was not surprising that the new car should suffer from its share of teething troubles, these being sufficiently severe to keep it out of action right through 1966. Its sole public appearance that year was at the Le Mans test weekend, where it circulated quickly but not particularly impressively. The car's troubles stemmed partly from its shape, which was futuristic but very inefficient, its drag being worse than that of the Mark II, despite the J-car's lower frontal area. There were problems with the chassis too; after the second prototype crashed, killing veteran test driver Ken Miles, its chassis was found to have structural damage far in excess of what could

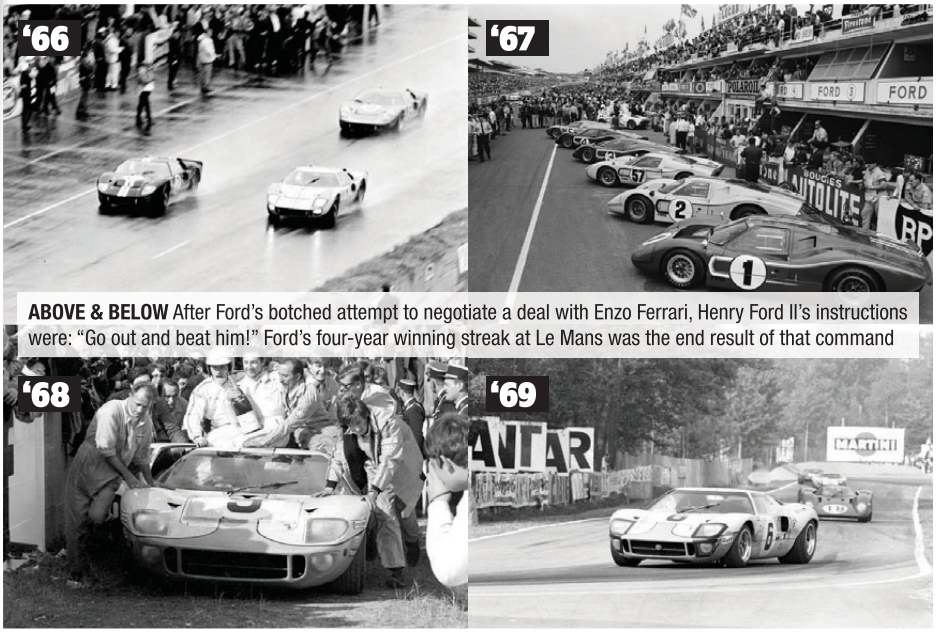


Even the wheels were innovative

RIGHT The first J-cars used an exhaust system completely different from that of their predecessors, and did not have the crossover arrangement which had become a feature of GT40s. Transmission was the two-speed semi-automatic type, which was neither reliable nor popular with drivers, and was abandoned when the Mark IV arrived. Even the wheels were new; prior to this nobody had given a great deal of thought to wheels, except to make them as light and as strong as possible. Although other wheels had cooling holes cut into them, the J-car's featured angled vanes which would, it was hoped, actually draw cooling air across them and so help ventilate the brakes. In 1967 the same wheels were used on Mark IVs, but, strangely, they were never applied to Mark IIs.



ABOVE The new edition of *The Ford That Beat Ferrari* is published by Evro Publishing, (£90.00/US $120.00/CAN $150.00), written by John S. Allen and Gordon J. Jones



ABOVE & BELOW After Ford's botched attempt to negotiate a deal with Enzo Ferrari, Henry Ford II's instructions were: "Go out and beat him!" Ford's four-year winning streak at Le Mans was the end result of that command

have been expected. The cause of the crash was never determined beyond question, but one theory is that the car struck a kerb, causing the chassis floor to buckle, so distorting the structure.

Ford did not allow themselves to be beaten by the J-car. Development continued at their Kar Kraft facility in Dearborn, the winter of 1966/7 seeing the car transformed into the vastly improved GT Mark IV. Wind tunnel testing resulted in new front and rear body panels, longer and sleeker than before, grafted onto the original centre section. The chassis had its glued joints reinforced with wide, riveted aluminium strips, to prevent any recurrence of the structural failures which had been evidenced on Miles's car.

The Mark IV entered its first race at Sebring in 1967, exactly one year after its hoped-for debut. Its only real opposition came from the Chaparral 2F of Jim Hall and Mike Spence, who managed to stay with the Ford for six hours, until the Chaparral's transmission finally succumbed to the strain of racing flat out for nearly 800 miles. The Mark IV had been victorious in its first race, and it was selected to carry Ford's hopes for Le Mans in 1967.

> "Ford did not allow themselves to be beaten by the J-car"

There were four Mark IVs present for the type's second and last race, les 24 Heures du Mans 1967. Two of them survived, with the all-American team of Dan Gurney and AJ Foyt taking an American-powered, American-built, car to a historic victory ahead of a pair of Ferrari 330P4s. The Mark IV of McLaren and Donohue came in fourth, but every other Ford – Mark II, Mark IV and GT40 – retired.

The Mark IV had won both of its races, so it cannot be judged as anything other than a success. Whether or not it was really necessary is another story. It was hoped that the Mark IV would be significantly lighter than its predecessor, but the tell-tale scales at Le Mans showed that the four Mark IVs weighed in at an average of 2,616 lb, a mere 75 lb less than the average of the three Mark IIs. The best Mark IV practice time amounted to 3min 24.4sec, with McLaren at the wheel, just 1.4 seconds better than Paul Hawkins in a Mark IIB. One is forced to wonder how good the Mark II might have been if the Mark IV's development effort had been directed into it – a hybrid Mirage/Mark II could have been well-nigh unbeatable. HRT



ABOVE Le Mans, 1967. Though its development was marred by a number of setbacks, including the death of Ken Miles during testing, the J-car did eventually achieve its objective

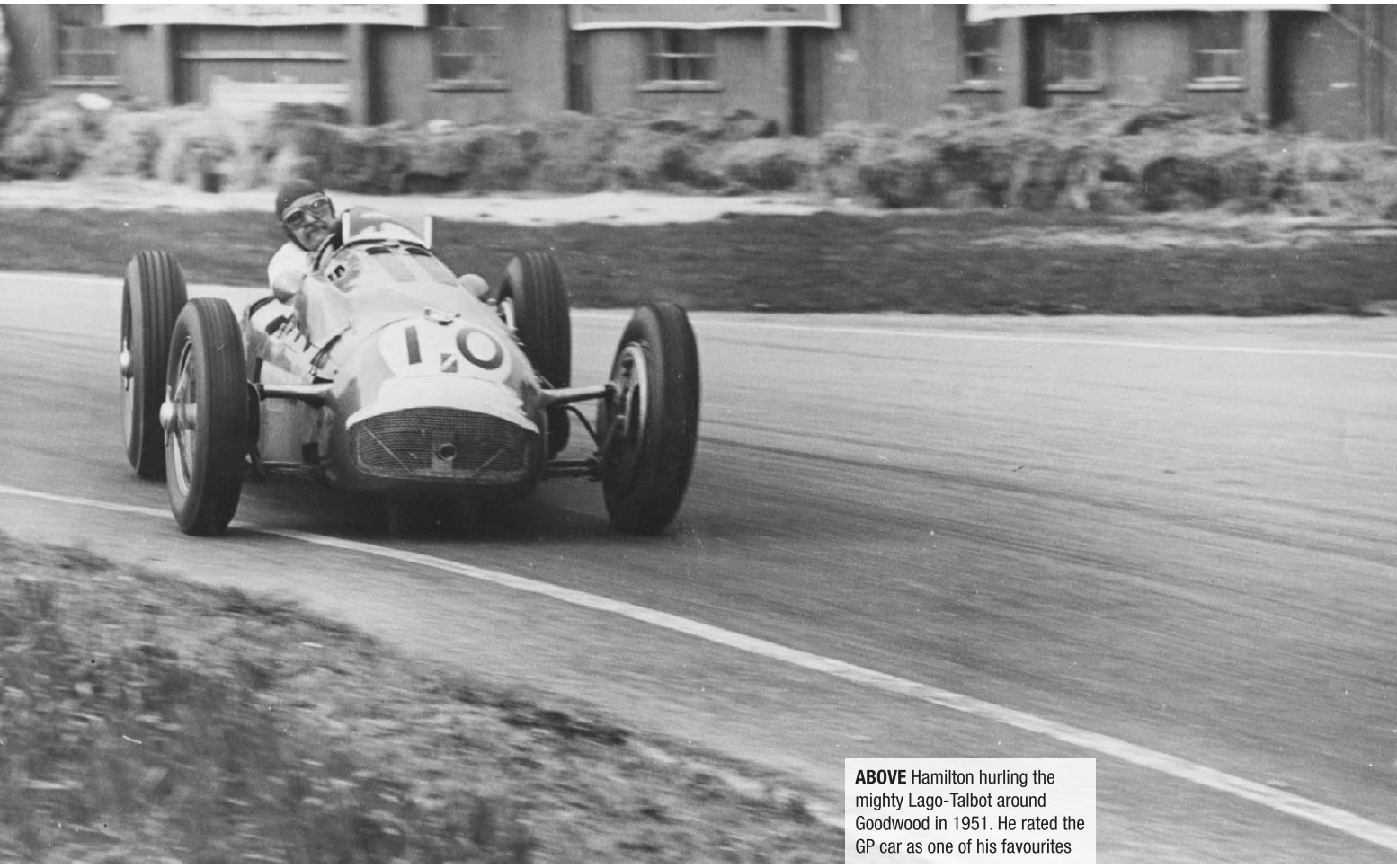
"They feared nothing and were determined to enjoy every minute"

Recalling the extraordinary life and times of Le Mans winner Duncan Hamilton, born 100 years ago

He crashed numerous cars and aeroplanes, did his best to drown an admiral, and his dog delayed a critical wartime convoy for four days by eating top secret naval documents. Yes, Duncan Hamilton was certainly a larger than life character, but was also one of Europe's premier racing drivers of the post-war era, who subsequently penned the funniest motor racing autobiography to date, *Touch Wood*.

James Duncan Hamilton was born in Cork, Ireland. Aged two he knocked himself unconscious by crashing his pram down a flight of 38 steps. Later, while studying at Brighton College, he drove a master's car through a wall – arguably all useful preparation for his later years as a competition driver of notable skill and bravura.

His introduction to the world of motorsport was gained at Brooklands. By donning overalls and carrying a bucket of water he used to blag his way into the pits, where he would offer assistance to the bona fide mechanics, ultimately working on the cars of such noted drivers as bandleader Billy Cotton. Brooklands also opened his eyes to aviation, and his eventful war years were spent in the Fleet Air Arm, where he was most frequently seen at the controls of Supermarine Seafires. Post-war life was inevitably boring by comparison, and it was then that the



ABOVE Hamilton hurling the mighty Lago-Talbot around Goodwood in 1951. He rated the GP car as one of his favourites

ABOVE Hamilton en route to overall victory for Jaguar at Le Mans in 1953

> **"He spotted a Bugatti in the mirror, so moved over and waved it by – only to realise it was driverless, and in fact his own car that he'd been towing"**



ABOVE Hamilton (left) and Tony Rolt celebrating their famous Le Mans win

motor racing bug really bit.

Works Ferrari driver Froilán González described him as "the world's fastest wet weather driver". However, he was no slouch in the dry either, and his many achievements behind the wheel included: outright victory with Tony Rolt (of Colditz fame) in the 1953 Le Mans 24 Hours, and the 1956 Reims 12 Hours with Ivor Bueb – both of which results were achieved aboard works Jaguars. The Hamilton and Rolt pairing very nearly eclipsed the 1954 Le Mans race in a factory-supplied Jaguar too, finally losing out to González's far more powerful Ferrari by the race's narrowest margin for 23 years.

In 11 seasons of top class motorsport, Duncan competed against such all-time greats as Fangio, Ascari, Villoresi, Castellotti, Moss and close personal friends Collins and Hawthorn. He drove Grand Prix cars from Lago-Talbot, Maserati, HWM and ERA, and works team sports cars for Jaguar, Ferrari and Healey. He also contested Le Mans, the world's most arduous of all motor races, on no less than nine consecutive occasions. ▶

The countless incidents that befell him are equally legendary. When transporting his ex-Malcolm Campbell R-Type MG to the Brighton Speed Trials he spotted a Bugatti in the mirror, so moved over and waved it by. It was only when it drew level he realised it was driverless, and in fact his own car that he'd been towing behind the MG – the story ended with a felled lamppost.

It was when dicing for the lead during the 1953 Oporto Grand Prix that he was forced off the track at 125 mph, causing him to demolish a steel pylon and eliminate the city's electricity supply; not to mention break nine of his ribs, neck, jaw and a collarbone.

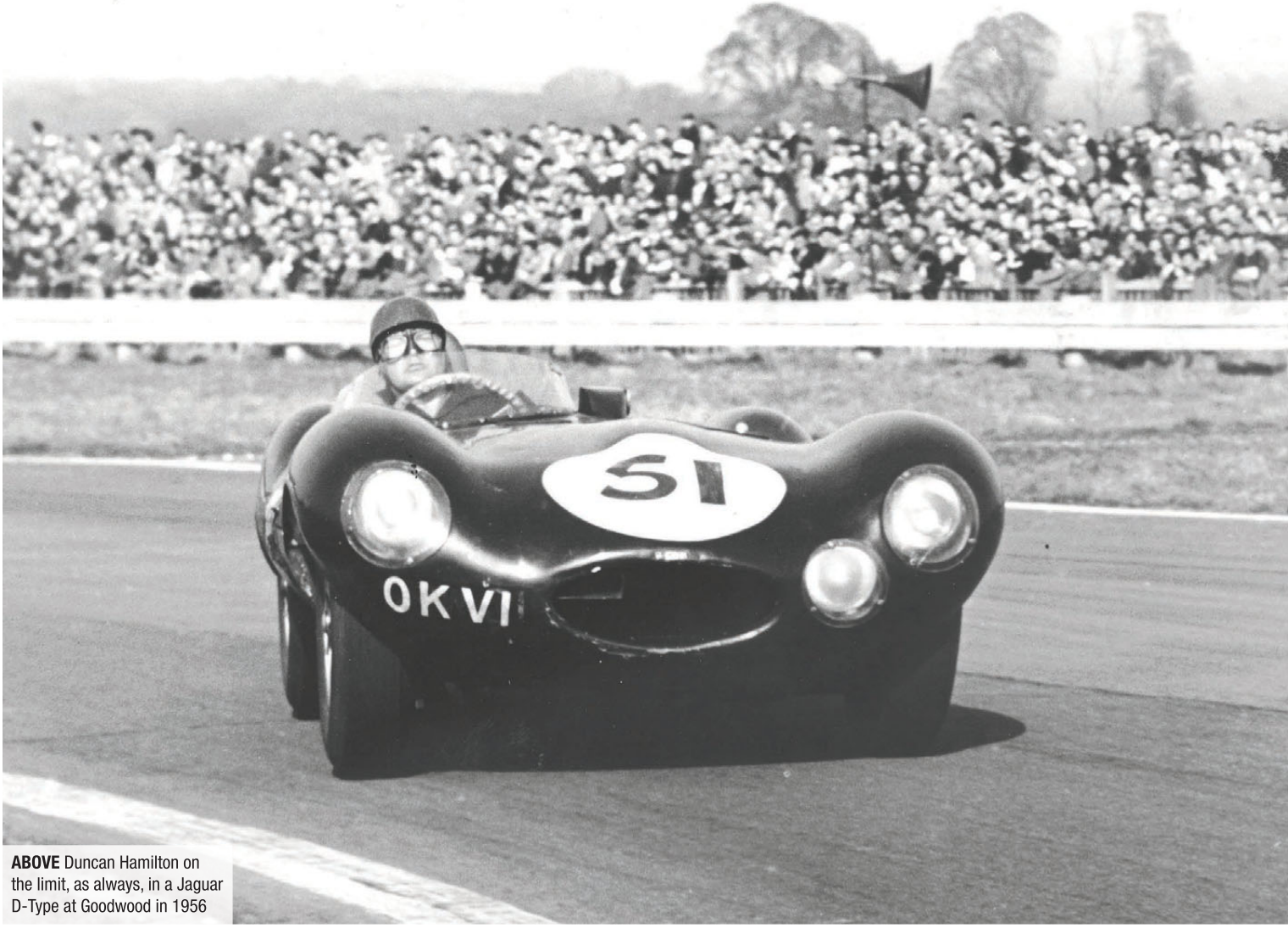
Even his famous Le Mans win was not achieved without pain, as he suffered a bird strike on the Mulsanne Straight that smashed both his Jaguar's aero-screen and his nose. Arguably only Duncan Hamilton could have got himself fired for winning the Reims 12 hours (he was deemed to have breached Jaguar team orders), only to promptly join Ferrari as a team-mate to none other than Juan Manuel Fangio. He's almost certainly also unique in being stopped for speeding while en route to participating in a TV programme on road safety.



ABOVE Larking around with close friend Mike Hawthorn, following a good lunch, in Miami in 1956

Hamilton was understandably highly respected by Jaguar, for whom he achieved many successes, and was therefore the first privateer to be granted racing examples of both its C-Type and D-Type models. However, looking back on his extraordinary driving career, he rated his Lago-Talbot Grand Prix car as the favourite among countless competition machines. Despite such fondness, it was only when he came to sell his faithful racer that he recalled storing it in a 'coal-hole' in Dieppe many years before. Initially even unsure of the house concerned, he eventually found the car buried but unharmed under a ton of domestic coke.

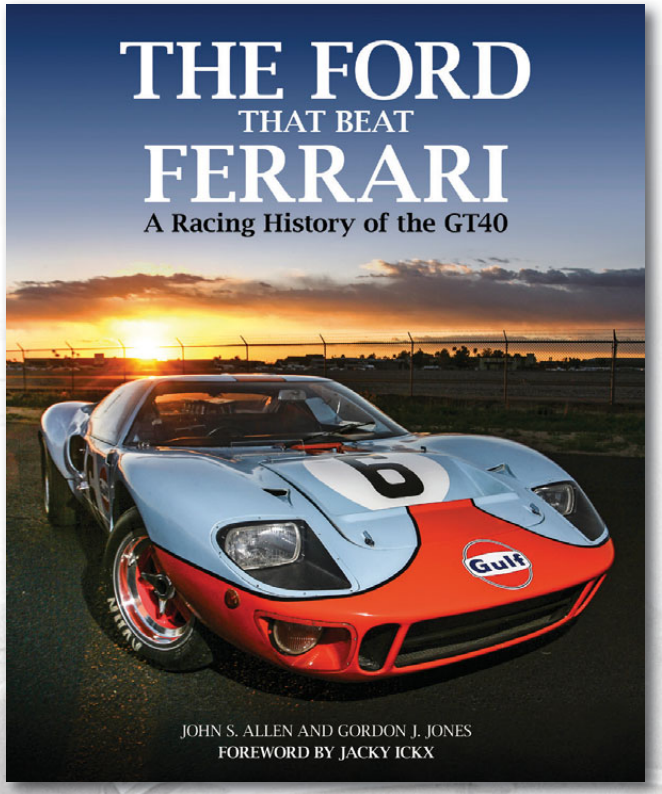
Following the tragic death of his close friend Mike Hawthorn, Duncan ▶



ABOVE Duncan Hamilton on the limit, as always, in a Jaguar D-Type at Goodwood in 1956

KIMBERLEY
MEDIA GROUP LTD

The Ford That Beat Ferrari



THE Ford GT40 was without doubt the most impressive of all Ford racing cars, a car which caught the imagination of everyone during the 1960s and subsequent years – a classic car from the Golden Age of sports car racing.

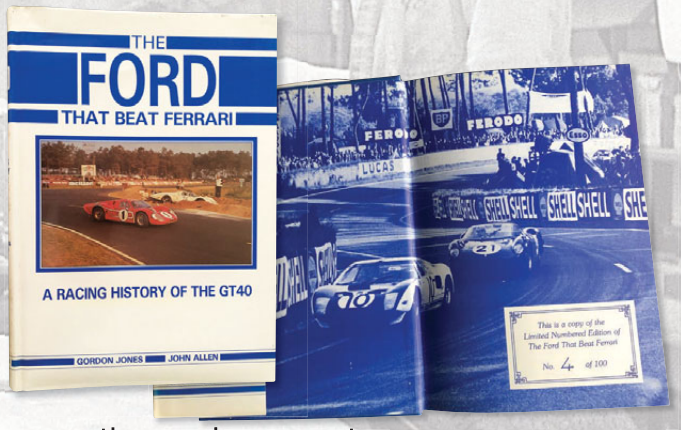
The racing history of every GT40 chassis is traced in pictures between 1964 and 1971. We see the development of the first works cars at FAV, Shelby and Alan Mann, the rise of the 7 litre Mark II and its successes followed by the all-conquering Mark IV.

The works car, though, are only half the story. The majority of cars were raced by private teams and every major team and private entrant is portrayed.

The book is the result of many year's patient research by the authors John Allen and Gordon Jones.

496 pages

Price: £80.00 / US $112.00 / €105.00 plus p&p



A rare brand new copy of the original 1985 edition, one of the 100 special editions and signed by the authors

Price: £950.00 / $1250.00 / €1150.00

To order this fine book and many others, please go to www.kimberleymediagroup.com/shop or phone +44 (0) 20 8446 2100 where our friendly staff will take your order.

kimberleymediagroup.com

RACE TECH Motorsport Engineering
racetechmag.com

HISTORIC RACING & Technology
historicracingtechnology.com



ABOVE Hamilton would have been 100 on April 30

officially announced his retirement from motorsport in April 1959, whereupon he concentrated his energies on sailing and growing the highly regarded car dealership he had founded 11 years earlier. Nowadays known as Duncan Hamilton ROFGO, it has been run by his son Adrian for the past 45 years, and is renowned as one of the world's premier traders in competition and classic cars. Duncan passed away on Friday, May 13, 1994, aged 74 – surely the most apposite of dates for a man that lived life at full throttle from day one!

Said Adrian Hamilton: "My dad was one of the last of that extraordinary band of post-war drivers who, hardened by the hostilities, feared nothing and were determined to enjoy every minute of their lives to the maximum.

"Their enthusiasm for racing was only matched by that for partying afterwards, and we'll never see their like again. I am fiercely proud of all he achieved and am sure I won't be alone in raising a glass to him on April 30, the centenary of his birth." HRT

> **"Stopped for speeding while en route to participating in a TV programme on road safety"**



ABOVE Team Hamilton: Duncan and son Adrian, aged two

KIMBERLEY
MEDIA GROUP LTD

Gordon Murray
ONE FORMULA
50 years of car design

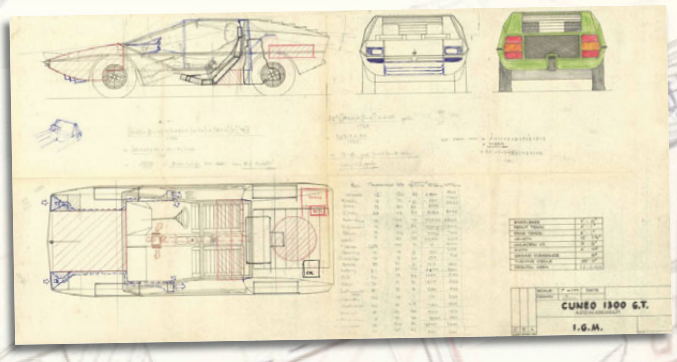


One Formula - 50 Years of Car Design is a brand new retrospective from renowned Formula 1 designer Gordon Murray.

It is a two-volume blockbuster that has taken more than two years to complete. Covering in detail every one of Murray's 70+ designs, including those he never built, the books are comprehensive, detailed, punchy and fascinating.

Apart from the design story – much of it in Murray's own words – the books are packed with illustrations from his extraordinary archives, including pages from his notebooks, original sketches, correspondence, drawings and behind-the-scenes photographs. These are supplemented by stunning period racing shots by many leading motoring photographers.

£235





To order this fine book and many others, please go to
www.kimberleymediagroup.com/shop or phone +44 (0) 20 8446 2100
where our friendly staff will take your order.

kimberleymediagroup.com

RACE TECH Motorsport Engineering
racetechmag.com

HISTORIC RACING & Technology
historicracingtechnology.com

TrackCar performance
trackcarperformance.com



Jeff Bloxham

The ultimate Lotus Elan?

What do you get when a former touring car ace commissions a crack BTCC squad to build a car for historic racing? The fastest Lotus Elan around, reports **Chris Pickering**

THERE'S no better illustration of the level of professionalism in modern historic racing than the Lotus Elan that you see here. It was commissioned by former touring car and sports car star Steve Soper, built by BTCC frontrunners Team Dynamics and developed with no expense spared for the FIA Masters sports car series.

As with a lot of historic racers these days, this Elan is a completely new build from the ground up. The 26R-spec body and chassis both came from Elan specialist Tony Thompson Racing, where they were manufactured using the original moulds and tooling.

Everything on the car had to comply with the FIA's Appendix K regulations and the period homologation for the Elan, so the basic requirements for the build were largely pre-determined. That said, there are still a few tricks of the trade that the engineers and mechanics at Team Dynamics have been able to employ in order to ensure that the car is as competitive as possible.

"There's a little bit of flexibility in things like dashboard layout and hose routings, but the fundamentals such as the engine and differential positions have to remain exactly as per the original homologation," explains chief mechanic Craig Smith. "There are lots of little things that you can change, though. Moving the steering rack by the tiniest amount can change the bump steer characteristics, for instance, and a driver of Steve [Soper's] abilities will notice that."

The build process essentially began with a kit of parts, Smith explains. The roll cage comes from Custom Cages, Koni supplied the dampers and Neil Brown Engineering provided the engine. Other parts were fabricated in-house, though. The fuel tank, for instance, is inspired by Team Dynamics' touring car design.

Due to the Elan's backbone construction it was possible to get the rolling chassis to a state where it was virtually driveable on its own. With that in mind, Smith aimed to get as much done as possible while the fibreglass

body was off being prepared and painted. He even attached weights to the chassis to simulate the mass of the body and began looking at the bump steer characteristics front and rear.

"The bodywork was probably the hardest part," he recalls. "We don't generally do a lot of fibreglass in-house, but on this occasion we did almost all of it ourselves. The original Lotus moulds were never perfect. Nothing fits first time, so you've got to get the body mounted on the chassis and then there's a certain amount of work involved in filling and re-finishing the shell. It's akin to what Lotus would have done in-period, but we apply a lot of attention to detail."

Simple things can take a lot of time. The door apertures, for instance, were found to be subtly different sizes from side-to-side, as were the headlight fittings. ("At first glance, everything appears fine, but once you notice little issues like that you can't not-see them," notes Smith.)

Some areas needed to be built up with additional fibreglass, whereas others were trimmed away. Once the fibreglass work was complete, the shell was sent to Soper's own bodyshop at his BMW dealership in Hampshire for prep and paintwork. The whole thing comes off as one unit, with only the boot lid, doors and bonnet separate to the main tub.

Fitting the roll cage was a somewhat fiddly job, Smith recounts. It bolts through the body into the chassis, which meant that it had to be carefully threaded in once the bodywork had been installed. Initially, though, this was only carried out as a dry build.

"We effectively built this car twice," comments team manager James Rodgers. "The first time was to check that everything fitted as it should; then we dismantled it and sent the various parts off for surface preparation and painting or powder coating."



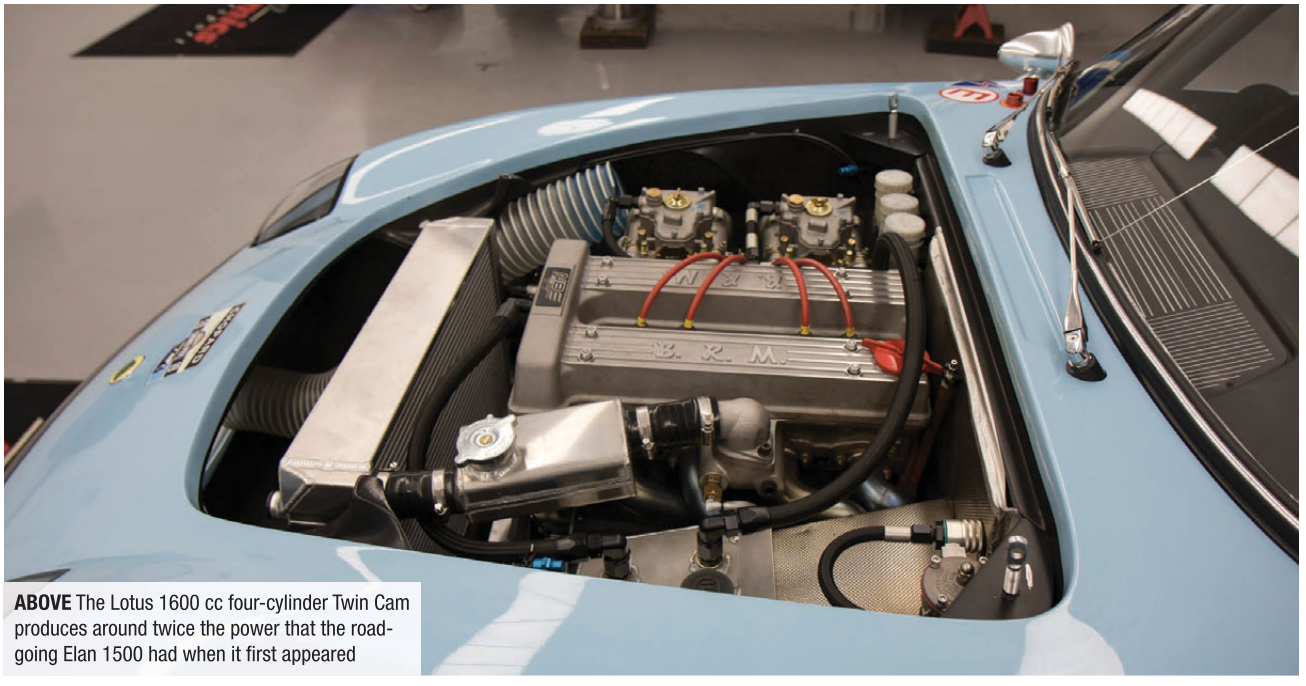
ABOVE The Elan can give the bigger cars a run for their money

Jeff Bloxham

CHASSIS SETUP

The chassis is a simple tubular structure, with double wishbone suspension at the front and Chapman struts at the rear. By the time of the Elan, Chapman had abandoned the earlier designs, which used the driveshaft as part of the lateral location for the suspension. Instead, it's essentially a MacPherson strut paired with a tubular steel lower wishbone. This offers toe and camber adjustment via the lower wishbone on the rear. At the front, meanwhile, there are trunnions to adjust the height, while the top ▶

> **"The laser geometry system utilized for the BTCC title-winning cars was used for some work; other jobs used good old-fashioned string!"**



ABOVE The Lotus 1600 cc four-cylinder Twin Cam produces around twice the power that the road-going Elan 1500 had when it first appeared

wishbones are fully adjustable.

Team Dynamics has a pair of carefully laid 'flat patches' in its workshop for setup adjustments. Some of the work was done using the laser geometry system that's also used for the team's championship-winning touring cars, but other jobs used good old-fashioned string. The aim of these investigations in the workshop was to map how changes to the adjustments would affect the setup; measuring the number of turns on a particular Rose joint, for instance, that would be required to get a specific change in toe measurement.

In order to measure the bump steer characteristics, the springs were removed from the dampers and the two ends of the chassis were raised and lowered on jacks. Using a set of turntables on the flat patch, Smith then measured the resulting steered angle.

"When the body went away I had quite a lot of time to spend with the chassis itself," he recalls. "Without the body on, everything is easily accessible, so as long as you remember to compensate for the extra weight [and its effect on the ride height] it's a really good time to get a preliminary setup. Thanks to that, we literally put the body on and then went testing."



ABOVE The fuel tank was inspired by Team Dynamics' touring car design

It's here that Team Dynamics' trackside expertise really starts to shine through (not to mention Soper's driving experience). "Steve [Soper] is the kind of driver who can go out, do two laps and know exactly where he wants to go with the setup," comments Rodgers. "Pretty much every time he came into the garage we would make little changes. That's similar to the way we work in touring cars – there are three sessions on a Saturday and three sessions on a Sunday and never once does the car go out the same."

Under the Appendix K regulations, the Elan's dampers are limited to single-way adjustable items, but Team Dynamics developed their own internal valving ▶

> **"At first glance, everything appears fine. But once you notice little issues, you can't not-see them!"**

BELOW The Elan in the thick of the action at Donington Park



Jeff Bloxham

Driving Technology Into Pole Position

INTERNATIONAL

RACE TECH

Motorsport Engineering



SUBSCRIBE TO OUR DIGITAL EDITION

3 issues £9

6 issues £17

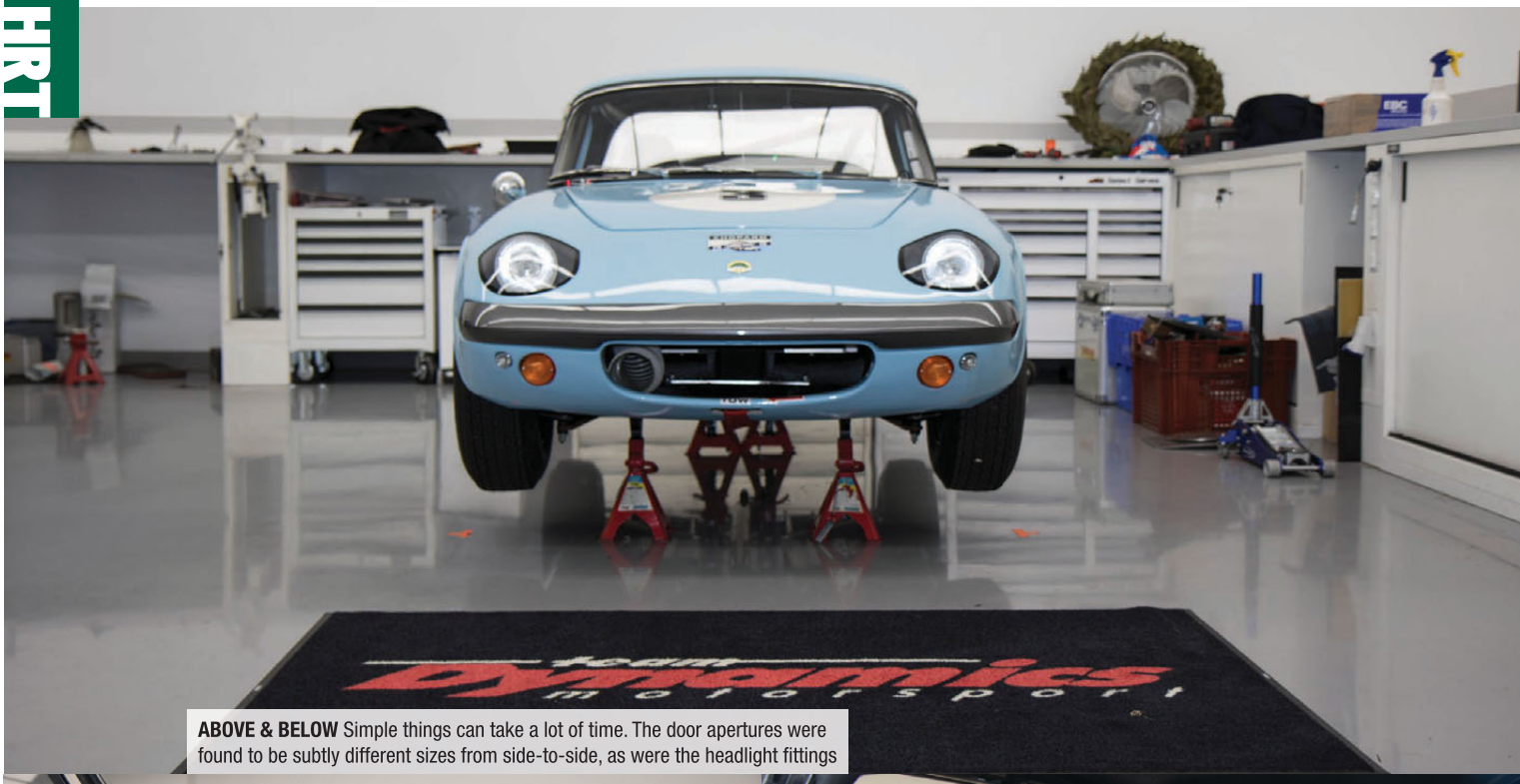
RACE TECH is the only technology led motorsport engineering magazine that focuses on every aspect of the racing car, from the drawing board to the race track. News reactive and highly topical in its content, it covers everything from the design and manufacturing processes to the cutting edge products that are constantly being developed for racing. To be kept up to date on the hottest technology in the motorsport world, subscribe to **RACE TECH**.

Available on the App Store

ANDROID APP ON Google play

available on kindle fire

racetechmag.com



ABOVE & BELOW Simple things can take a lot of time. The door apertures were found to be subtly different sizes from side-to-side, as were the headlight fittings





using an ingeniously simple approach. For testing – where the race regulations don't apply – they used a set of multi-adjustable dampers. The damper curves developed in testing were then used as the basis of the valving for the single-way adjustable race dampers. This can be quite an expensive process, Rodgers admits, but it's a well-proven process that ensures that both the team and the drivers are happy with the car.

Spring choice is free. Many hours had gone into spring selection on the Lotus Cortinas that were the team's first foray into historic racing, Smith recalls, but that was partly due to the fact that the springs there were quite easy to change. It's a rather more time-consuming job on the Elan, although fortunately the initial setup proved almost spot on and the springs have only been changed once since then.

"Understanding what happens to the Dunlop tyres over their life is important," notes Rodgers. "There's a sweet spot, but understanding exactly where that is, so you're not chasing your own tail, is tricky. They're not at their best when they're new – you need to lose some tread to stop tread shuffle and get a few heat cycles through them."

The braking system was another crucial area to understand. The callipers, discs and pads all have to conform to period designs and dimensions, although the friction materials are free. Initially, the Elan had a tendency to snatch a wheel under braking, but experimenting with different pad compounds seems to have alleviated this. The tricky thing, we're told, has been matching them from front to rear, as a change on one end of the car can sometimes have unintended consequences on the other.

ON TRACK

Under the bonnet lies Lotus's familiar 1600 cc four-cylinder Twin Cam. The 26R engines were prepared by BRM in period, but these days that job falls to Neil Brown Engineering. "One of the great things about working with Neil [Brown] on this car is that he races a Cortina himself, so when there's downtime in the workshop he can often be found tinkering with Lotus Twin Cams," notes Rodgers. "We carry out regular servicing – the oil is changed and inspected every time it's run – but ▶

from the publishers of **RACE TECH**

HISTORIC RACING Technology

FREE access to digital edition with all print subscriptions

UK £6.99 USA $12.00

www.kimberleymediagroup.com

Today's technology in yesterday's cars



Subscribe

Delivered directly to your door

	6 Issues	12 Issues
UK	£42	£77
Europe	£66	£119
USA & ROW	£81	£146

Including post and packaging



HISTORIC RACING TECHNOLOGY brings a unique perspective to the business of restoring, preparing and maintaining historic competition cars in the 21st century, with in-depth technical articles on the engineering and craftsmanship behind this fast growing industry.

Where **Historic Racing Technology** differs from existing titles is a clear focus on the challenges and opportunities of running these cars in the modern era. From laser scanning through to five-axis CNC machining, historic racing specialists are increasingly blending modern methods and traditional techniques. As a result, it's now possible to produce authentic parts with an unprecedented level of accuracy. In some cases this goes a step further, re-engineering aspects of the car to deliver improved safety or reliability... and sometimes performance.

Featuring technical articles from some of the industry's most experienced journalists and engineers, **Historic Racing Technology** is dedicated to the classic motorsport scene across the globe. It takes a fresh new approach, looking at the future of historic motorsport as well as the past.

Available in Print

Available on the App Store

ANDROID APP ON Google play

available on kindle fire

www.kimberleymediagroup.com

Suppliers

Build and preparation	Team Dynamics
Body and chassis	Tony Thompson Racing
Engine	Neil Brown Engineering
Exhaust	BTB
Gearbox and differential	Quaife
Analogue gauges	Farrington
Tyres	Dunlop
Roll cage	Custom Cages
Seat	Tilet
Dampers	Koni
Video logger	Racelogic
Fire suppression system	Lifeline

ABOVE Soper is the kind of driver who can do two laps and know exactly which direction he wants to head with the setup

Jeff Bloxham

for anything beyond that the engine goes back to Neil. In general, he's there at the races so we also get the added benefit of trackside support."

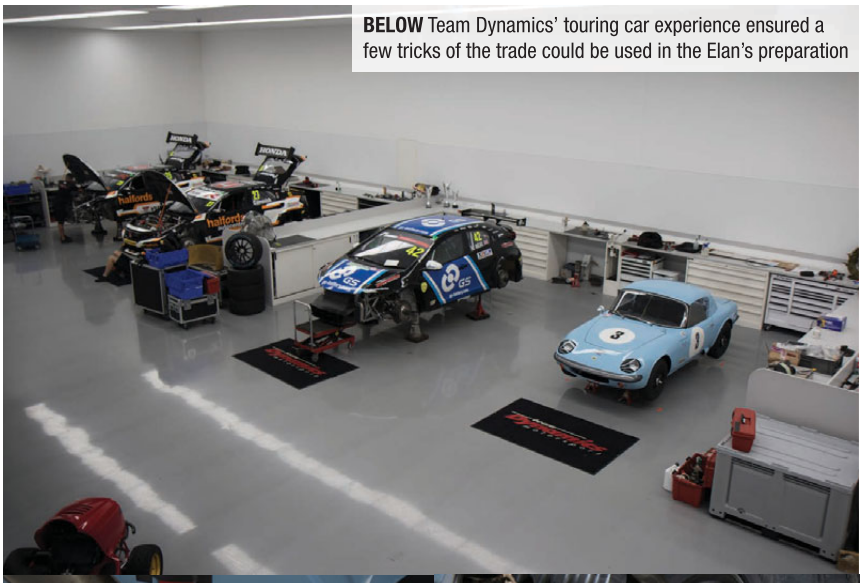
The Team Dynamics engineers are remaining tight-lipped as to exactly how much power the current unit produces, but we would expect it to be in the region of 200 bhp – around twice the power that the road-going Elan 1500 had when it first appeared. That might not sound like a huge amount, but bear in mind that the FIA Masters homologated weight for the Elan 26R is 600 kg. In fact, like other carefully prepared Elans, the Team Dynamics car is understood to be comfortably below that limit before ballasting. The end result is truly explosive performance – enough to keep up with a well-driven E-Type or Cobra over the course of a lap.

"It's a quick car, although it does deliver its performance in a different way to the bigger GTs," comments Rodgers. "The larger capacity cars take it in their stride when we go to a quick circuit like Zandvoort or Portimao. We're flat out the whole time with a 1600 cc screamer so that does become a concern. We can compete against the bigger cars, but they're quicker on the straights."

An original gearbox casing has to be used, along with period-spec ratios

LEFT TO RIGHT A tendency to snatch a wheel under braking was finally alleviated after experimenting with different pad compounds





BELOW Team Dynamics' touring car experience ensured a few tricks of the trade could be used in the Elan's preparation



ABOVE The car features a BTB fabricated stainless steel exhaust system



ABOVE The front suspension has trunnions to adjust the height, while the top wishbones are fully adjustable

> **"The original Lotus moulds were never perfect. Nothing fits first time"**

and differential (both supplied by Quaife in this case). The propshaft is a bespoke item – manufactured in the original material, but carefully optimised for weight and balance. As Rodgers explains, "It's about ensuring that any slack that might have been present in an original car isn't there in this one."

Again, the packaging on the Elan makes gearbox changes far fiddlier and more time-consuming than they are on the Cortina, which uses the same basic driveline. "It's a tiny car," notes Smith. "You look at the engine bay and everything seems very smart. It is neatly done, but the packaging is very tight by necessity."

The same attention to detail that you find in the build has been applied to running the car. Rodgers stresses the value of preventative maintenance and regular inspection: "We apply the same sort of mentality to the touring car, but that's a lot more robust – there are some areas we don't normally need to inspect – and we can tell if the drivers have been hammering the kerbs by looking at the data. With the Elan, there's not much that you wouldn't check. The faster the driver, the more difficult that is too, because they tend to put higher stresses through everything."

Trackside support was provided by the same mechanics and engineers who look after the team's works-backed BTCC cars. For them, the historic projects provide an interesting change of scene. "It's nice because it's different," comments Smith. "We know the touring cars inside and out because they're our bread and butter. A car like the Elan should be simpler, but it has its own challenges. It's nice to refresh your mind a bit."

Historic racing may be something of a sideline for the crew at Team Dynamics, but it's one that they approach with typical zeal. Likewise, Soper may have retired from professional racing, but you get the impression that his determination to win remains every bit as strong. And win he did, taking the Elan to a string of class victories in the FIA Masters series. What's telling, however, is that even a team and driver pairing of this calibre doesn't have things all its own way in historic racing. Such is the level of competition now that nobody has an easy ride. HRT



Jeff Bloxham

Showing off

There was plenty of exciting technology for historic racers on show at Race Retro this year. **Alan Stoddart** details some of the products which caught his eye

WITH the Coronavirus pandemic having stopped all racing in its tracks, fans of classic motorsport at least had memories of Race Retro to tide them over.

Outside, in the chilly winter weather, a fleet of snarling rally cars put on a show for the packed crowds. Inside meanwhile, many of the industry's most exciting companies were kept busy fielding questions, demonstrating products and offering customers solutions from their stands.

Among the companies showing off new products was **Raceparts**, which has been working with its American office to bring Flexus silicon tool trays over to the European market. The trays come in several sizes, and are all made out of silicon so, unlike magnetic metallic trays, there is no risk of them scratching bodywork. What's more, the flexible material means they can securely rest on the contours of even the most curvaceous '60s sportscar.

"I think the trays will be popular with a lot of teams," commented Matthew Wright, Raceparts' technical sales manager. "The small size will be perfect for nuts and bolts; a lot of the mediums will be used by mechanics for keeping their tools together; and the large one with the laptop tray will be great for people doing engine mapping and data engineers.

"Afterall, we have all seen people trying to balance laptops on cars where they probably shouldn't, so this will give them the right protection."

As well as being versatile, there is also a range of accessories to improve their usefulness even more. For example, one of the accessories is a mobile phone or tablet holder. So if a mechanic was rebuilding a gearbox or something similar, he could put the manual up on the tablet, freeing up a hand.



ABOVE The soft Flexus tool trays available at Raceparts keep things organised without risking damage to a car's finish

Bringing not just a new component, but a whole new car to Race Retro was **Great British Sports Cars**, which was showing off the second generation of its Zero.

"It has loads of refinements and improvements on there," said GBS director Richard Hall. "Every bracket has been optimised so there is a weight reduction, there is increased stiffness on the chassis, and all the panels' fit and finish has been improved.



ABOVE Great British Sports Cars' second-generation Zero aces on its engineering pedigree

Jeff Bloxham



ABOVE These ex-Russell Brookes rally cars were observing social distancing rules long before their owners were required to

> "Taking the Chapman concept to the next level and bringing it bang up to date"

"We have also complemented that with all new billet aluminium hubs which are manufactured in-house, 300 mm floating discs and four-pot aluminium callipers.

"Add to that the 2.5-litre Duratec which starts at 200 hp and 200 lb of torque, and is pretty awesome for the entry-level car, and a car that is just shy of 600 kg and it's fairly lively!"

These tweaks and improvements for the second generation Zero have been made both from ideas within GBS, as well as feedback from customers. The upshot, says Hall, is "taking the Chapman concept to the next level and bringing it bang up to date."

Also boasting about its engineering prowess was **Pro-S**. A Maltese company, itself made up of racers and competitors, it can offer both standard and bespoke motorsport products to customers, depending on their needs.

One of the new products it was showing off was its fuel regulator. The company had realised that some customers wanted more inputs or outputs and were having to use the fuel regulator alongside another fitment in order to use some sensors or gauges, but the new model incorporates it all in one.

Another new product on display was the company's height-adjustable handbrake lever. It means that drivers can get a comfortable fit, while its billet construction ensures that it is strong enough for drivers to depend on.

Elsewhere at the show, **Gradient Engineering** was explaining the benefits of its engine technology to visitors.

"We design throttle body and inlet systems for a variety of different engines," explained director Paul Griffin. "We do everything from the direct to head setup for ▶



RIGHT Pro-S's adjustable handbrake lever is as tough as it is versatile



BELOW Gradient Engineering is setting itself apart in terms of appearance, as well as technology

normally aspirated motorsport, to inlet manifolds for turbocharged engines, as well as modernising some older engines.

"So for example we are making electronic fuel injection systems for things like the Triumph Stag engines, that were traditionally carburetted. But people want better fuel economy, emission control, driveability, reliability and all that sort of thing, so we are helping them with that as well."

The company offers some bolt-on kits for commonly asked for applications, but is also happy to help develop bespoke systems for unusual engines or particular uses.

The result is that Gradient's products end up in all sorts of places, from hillclimbs, to circuit racing, historics and road cars.

Another company at the show whose products end up everywhere was **Bilstein**, which was talking to visitors about its classic range.

The company offers an off-the-shelf motorsport range, but it also has a custom build service centre in the UK. This means that customers with unusual or very specific demands can sit down with a Bilstein engineer, and discuss their options, before the damper manufacturer goes away and realises the concept.

"It really depends on the application, but we build for a real mixture of cars," said Aaron Quilter, Bilstein's sales manager for the UK and Northern Europe. "We still have core stuff of course, like old Porsches and old Mercedes, they are always big for Bilstein, but we also seem to be doing a lot for the Mongol Rally and other big distance stuff, but then we are also getting a lot of requests for things like the Escort Mk1 and Mk2."

Another well-known company exhibiting at the show was **Revolution Wheels**, which supplies wheels for all kinds of cars, and had many products to talk about from new 13-inch race wheels for '70s Formula cars and new race wheels for modern cars, to racing wheels for old Lotuses and three-piece modular wheels.

Despite the wheels all looking as they did in-period, however, they actually rely on some very modern technology. This is very important, explained director Warren McKiernan.

> "Modern technology packed into traditional designs"

"The lateral loading on wheels is much greater than it was in the '70s," he said. "Cars in the '70s were sliding around on crossply tyres, and now you look at those cars and some have gained a little bit of weight, and the tyres, even the historic tyres, seem to have more grip. These forces have got to travel somewhere, namely the wheel.

"So, all the wheels we make today may look old, and we have kept that theme going forward with the four- and five-spoke racing wheels, but underneath the skin they use some of the highest tech available, like flow forming and the

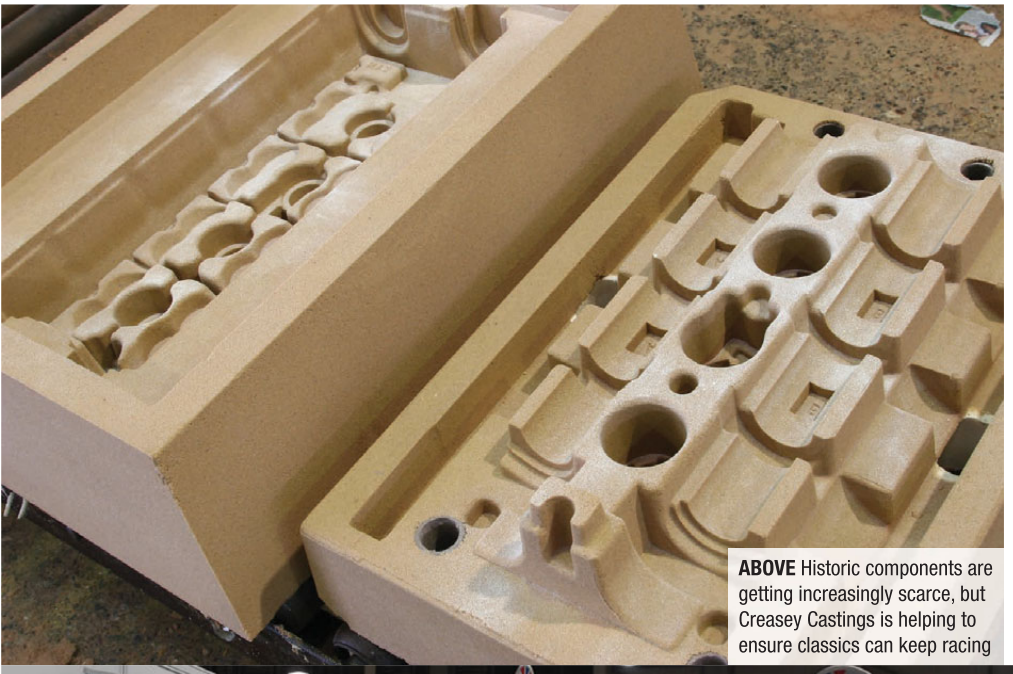


ABOVE The style might be period, but Revolution Wheels' technology is cutting edge

water cooling of our castings."

As well as the modern technology packed into traditional designs, Revolution also offers a completely customised service, with there being "no such thing as off the peg," added McKiernan. "We measure you up like you are having a fitted suit."

A completely bespoke service is something that is also offered by **Creasey Castings**. It manufactures castings in magnesium or aluminium alloy for a wide variety of customers asking for a wide range of parts, from cylinder heads and engine blocks, to gearboxes and suspension housings.



ABOVE Historic components are getting increasingly scarce, but Creasey Castings is helping to ensure classics can keep racing

Another of the capabilities the company offers is particularly in demand given the increasing rarity of certain parts for historics.

"We can reverse engineer from an original component," explained sales manager Chris Powley. "We can literally take a part, say for example a suspension upright, scan it, from the scan create a CAD model, and from the CAD model create the tooling and the pattern equipment that is then used to make the final casting."

Reassuringly for the person haring round Goodwood using that suspension upright, Creasey Castings' work doesn't stop after just making the component.

"We also crack detect all of our parts, and we can offer that as well, so even existing parts we can crack detect and refurbish if needed, so from a safety point of view that is good," Powley added. "On top of that all the parts we make are completely qualified in terms of chemical analysis, tensile testing and all the rest. So, when parts leave us, we are confident that things are safe and can be used in any form of racing." ▶



Jeff Bloxham

ABOVE The HRT stand featured the Martin Schanche and Mike Endean-inspired Xtrac which redefined rallycross

Engineering quality was also the reason the show's attendees visited the stand of **B&B Precision Engineering**, a company which, as well as offering a complete manufacturing and machining service, is also able to provide thermal coatings.

"These thermal spray coatings are an engineering process," explained the company's managing director Steven Haigh. "Because we are an engineering company, it seemed like something we could grow into. So as a consequence of the thermal spray, we were able to offer ceramic coatings on exhausts."

B&B does do some of its thermal coating work for OEMs, but most of it is one-off work for people who want to protect their pride and joy and improve its performance. Although the actual materials, the raw powders the company uses, are exactly the same as those of its better-known rivals, what B&B offers is its own unique process, developed using its considerable engineering nous.



ABOVE B&B's thermal coatings are not just for protection, they also improve performance

Racing historics is one form of motorsport where there is a place for the traditional designs alongside cutting-edge technology. This mixture of new and old was represented at the show by **BG Developments**.

Given an almost dried-up supply of original callipers on the second hand market, and ever-increasing stringency from the FIA with regards to period specifications, BG Developments has started recreating some of AP Racing's early callipers.

The company worked to reverse engineer the callipers alongside Warwick University, which scanned originals and created digital assets of them, which BG Developments could then use to recreate the callipers using 3D printing. After the design had been perfected, the company could then go on to produce the final parts from aluminium.

David Fuller, BG Developments director, also highlighted some of the more traditional tools that had been used in creating the perfect recreations.

"AP have been really good," he said. "They have been very helpful in supplying drawings, technical assistance and explaining how the callipers were traditionally made. They even put us in touch with some of the guys who have retired over the last couple of years, who helped us remember what applications they were used for and the likely market for that. They have been really helpful."

The big races of the season may still be a few months away, but thanks to Race Retro, and the companies exhibiting there, at least racers can be better prepared when they do come. HRT



Jeff Bloxham

ABOVE Cobra meets Stratos: The 'Hawk Collection', replicas and re-creations of famous cars from the '60s and '70s, was developed to allow the home builder to own vehicles they may never have imagined were within their means

VBOX MOTORSPORT

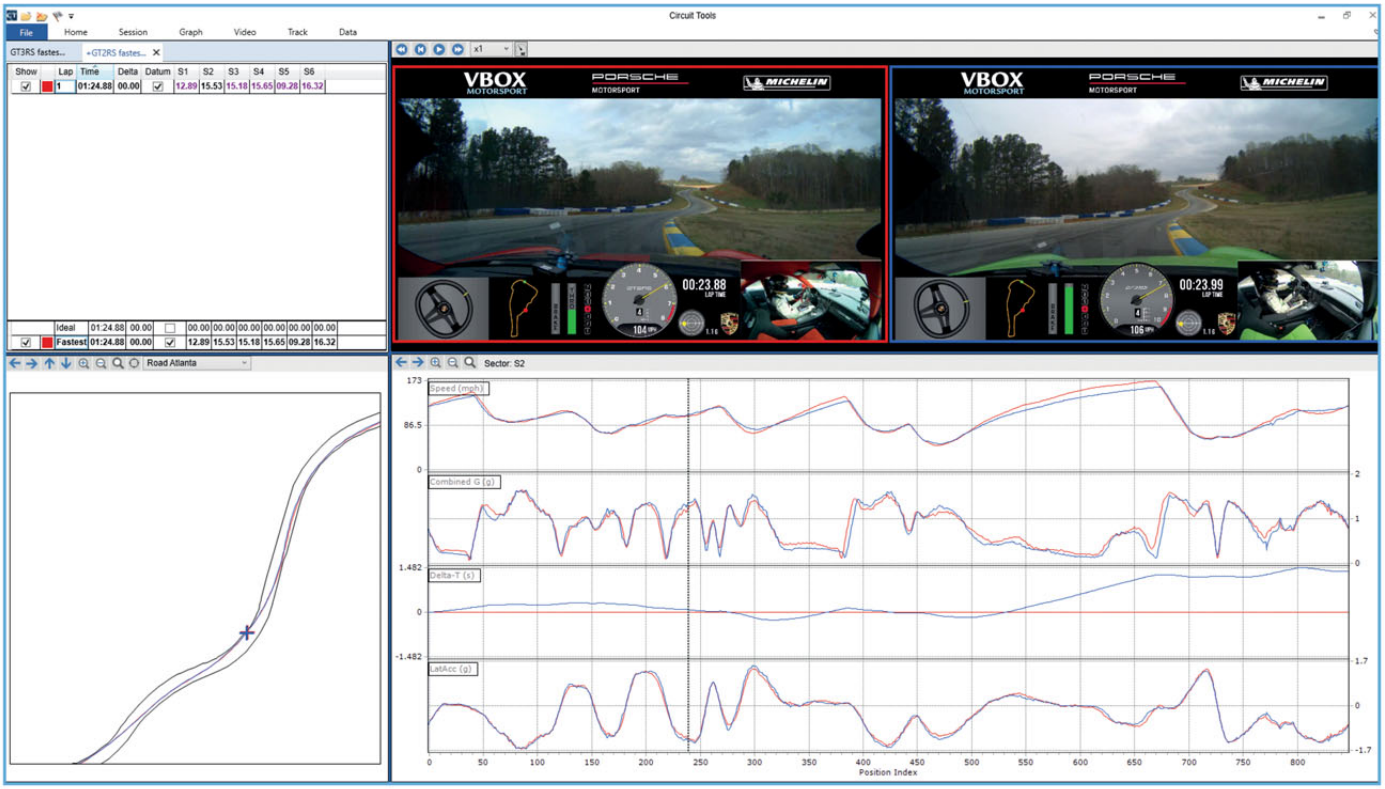
The Quickest Way To Go Faster

"In my experience, drivers benefit most from reviewing 'intelligent' video which has information overlaid on it.

With **VBOX**, this video is automatically synchronized with data, able to be compared side by side to a GPS position, allowing drivers to quickly and expediently coach themselves, towards better performance in less time."

Peter Krause, Professional Racing Coach, Virginia International Raceway.





Professional racing drivers share their experience on advanced circuit driving techniques in our FREE eBook:
vboxmotorsport.co.uk/ebook

vboxmotorsport.co.uk

Performance focused engine components



ARROW PRECISION

For over 40 years we've been manufacturing performance focused engine components. Our British made quality means you'll find us at the heart of the world's most powerful engines.

Call us +44 1455 234 200

OVER 40 YEARS OF BRITISH ENGINEERING

© Arrow Precision Engineering Ltd Est.1974

Discover innovation at **arrowprecision.com**