TECHNOLOGY FOR MOTORSPORT

The International Journal

Racecar engineering™

AOL Keyword: Racecar Engineering

THE LOST PROPHET
The Allard J2X lacked results but it changed prototype design

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July 2005 · Vol 15 No 07 www.racecar-engineering.com UK £4.50 · USA $8.95

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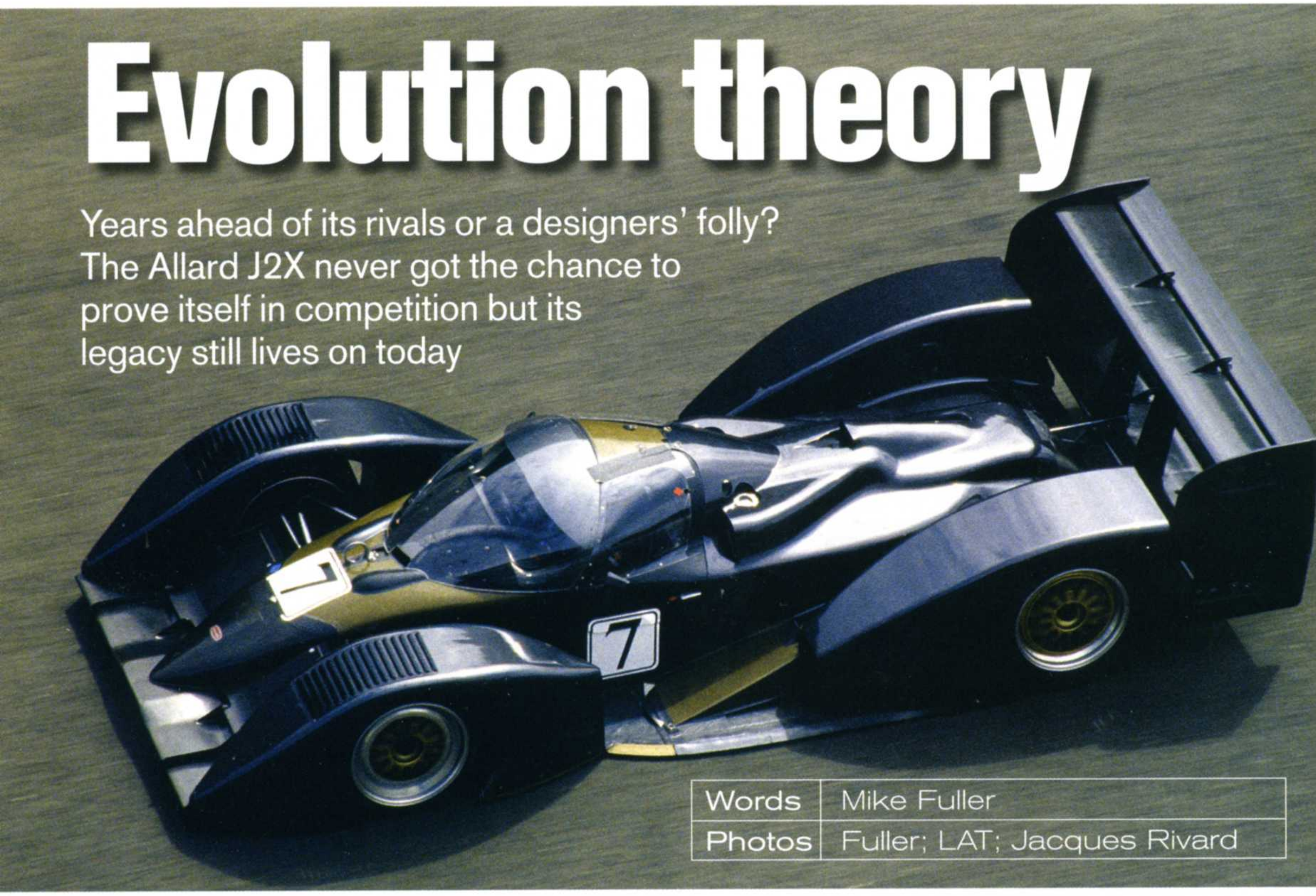
Evolution theory

Years ahead of its rivals or a designers' folly? The Allard J2X never got the chance to prove itself in competition but its legacy still lives on today



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Photos	Fuller; LAT; Jacques Rivard

Some of the most advanced sports prototypes ever designed were born out of the 3.5-litre Group C championship. The 3.5-litre cars relied on superior aerodynamic efficiency and ever increasing downforce to produce lap times eclipsing those of the previous Group C era and it was into this environment that the independently designed Allard J2X was born – a car that accelerated the pace of thinking at a time when the development graph was already quite steep.

In the late 1980s, a designer named Chris Humberstone revived the Allard name. Humberstone had a flair for tackling and managing complex engineering projects, having previously worked with various racing teams and manufacturers, including Beatrice/Force F1, Benetton, and Brun Technics. He approached Alan Allard, the son of company founder Sidney Allard, about licensing the family name for a future road car project. Though delayed a number of years, in the early '90s Humberstone finally formed Allard Holdings with the intent of moving forward.

Starting late in 1990 he quickly amassed a group of young, enthusiastic (if somewhat inexperienced) designers and engineers for the project, starting with Brun Technics' Hayden Burvill. The Australian born Burvill became chief designer for the J2X, with John Iley, also from

Testing at Le Mans in '93 proved the J2X unsuitable for the race itself, due to its clear performance deficit

Brun, joining him as the car's aerodynamicist in early '91, and conceptualisation began straight away. 'We had seen people do maximum cross section for chassis stiffness (Brun C91) and we knew about the XJR-14 being very low profile. Our approach was to optimise the package to allow maximum volumes for investigating the aero solution,' says Burvill. John Iley adding, 'you always look for targets, areas for improvement, areas of strength with existing designs and ways to get the most from the category's regulations... There is also the difficulty of striking the right balance during development of very original new concepts versus iterative steps.'

From the start, the primary goal was minimal frontal area and the maximisation of aero development area, and the J2X's radical look was a direct result of this. Some 1/10 scale study models were built to evaluate ideas, with Burvill and Humberstone contributing and Iley joining a few months later. What began to emerge was a combination of all the best elements – a narrow tub and bubble canopy, detached front pontoon wings, a complex front wing, and very low profile rear bodywork.

Two 1/3 scale wind tunnel models were used to evaluate as many ideas as possible. It would have been preferable to use the Imperial College wind tunnel in London, but McLaren was the favoured customer and there wasn't any tunnel time available for the Allard group. Clearly the J2X concepts were unlike anything that was racing at the time, and there was some question over whether they would produce results in the wind tunnel. The MIRA wind tunnel in Warwickshire, England, was chosen instead and testing began in earnest. Iley: 'We tested in regular short and intensive three-day test sessions, starting from the very first test with the radical minimal layout, to see if we could get it to work. It showed sufficient promise to persevere, with gradual improvements being made test by test, to produce a strong, distinctive and legal aero platform.'

Front wing design, with its secondary flaps between the wings, was way ahead of its time, and worked too

Eliminating understeer

The quest for front-end downforce was nothing new in a closed bodied prototype, as sportscars have historically been hampered by a lack of front grip. The design goal has always been to dial in as much front grip as possible to reduce or eliminate the car's understeer without affecting airflow to the rear wing. Splitters had been the predominant device used to increase front load throughout the Group C and GTP era and were proved effective, if somewhat limited in their scope of adjustment, while early experiments with front wings on sportscars gave less than satisfactory results. The March GTPs actually ran an adjustable wing element between the so-called 'lobster claws' and below the radiator. The Grid S1 further accentuated the idea by mounting a front wing, again between the front fenders, but well ahead of the intake ducting and various Porsche 962 teams mounted ungainly wings on the noses of their cars, also in the search for downforce. The concept had been revived most recently by the Jaguar XJR-14 and was also subsequently used on the rival Peugeot 905 Evo 1.

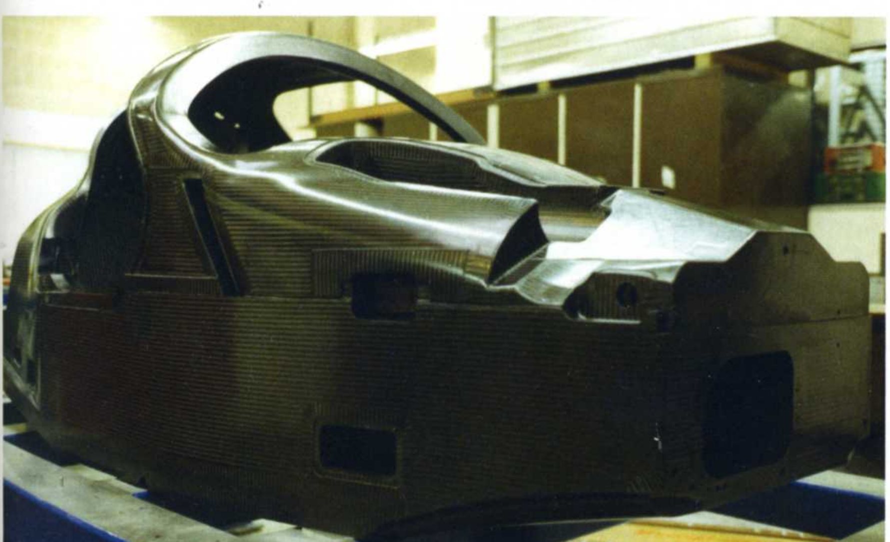
Typically, the front wing element spoiled the airflow to the rear wing, though ironically this produced the desired result – a forward balance shift – but was undeniably detrimental to overall downforce, especially at the rear. The J2X's complex front wing, with its secondary flaps situated between the front pontoon fenders, was squarely aimed at eliminating the historical sportscar understeer condition.

'We could generate up to 43 per cent front aero balance if we wanted to. This was a combination of having clean airflow between the chassis and the front wheels and careful treatment ahead of the wheels,' says Iley. Burvill: 'The front wing definitely worked in isolation. The impressive L/D figure would not have been achievable otherwise. What you cannot see is some quite sophisticated air management under the nose.' The J2X features a raised front nose and tub that the front wing drooped from. Burvill admits to being influenced by the Tyrrell 019 F1 car when it came to the drooped, or anhederal, front wing. 'It seemed logical to increase the air gap under the nose to reduce the volume change under the nose with pitch and ride height change, the Tyrrell offered the first working version of that.' The raised nose and subsequent air management aft of the front wing allowed air to flow onto the top surfaces of the floor just behind the front wheels. Burvill continues: 'This air was then managed rearward over the extremely low profile rear deck. This was to make the rear wing work harder, not suffer.'

> **"THE PRIMARY GOAL WAS MINIMAL FRONTAL AREA AND THE MAXIMISATION OF AERO DEVELOPMENT AREA"**

Additionally, the front wing flaps performed a rules compliance function by masking the suspension components, as seen from the front. 'The launch version of the car, which was in a maximum downforce configuration, had probably about 10 settings, the problem being to keep the suspension covered in elevation at the same time.' The rules function of the front wing flap did limit its amount of travel somewhat, in that at lower flap angles it would have been possible for suspension components to be seen (thus rendering the car illegal), but within the practical range of flap angle versus balance, it was not an immediate issue.

Interestingly enough, additional front downforce could be dialled in by adjustments made at the rear of the car. The Allard's twin-tier rear wing was found to be a powerful device to tune aerodynamic balance front and rear. With the primary suction peak of the diffuser being forward in the underbody, any increase in flap angle of the lower wing at the rear of the car would increase overall downforce and in turn increase front downforce as well. →



Full length monocoque had bonded in roll hoop and, without its gearbox sub structure, weighed just 85kg

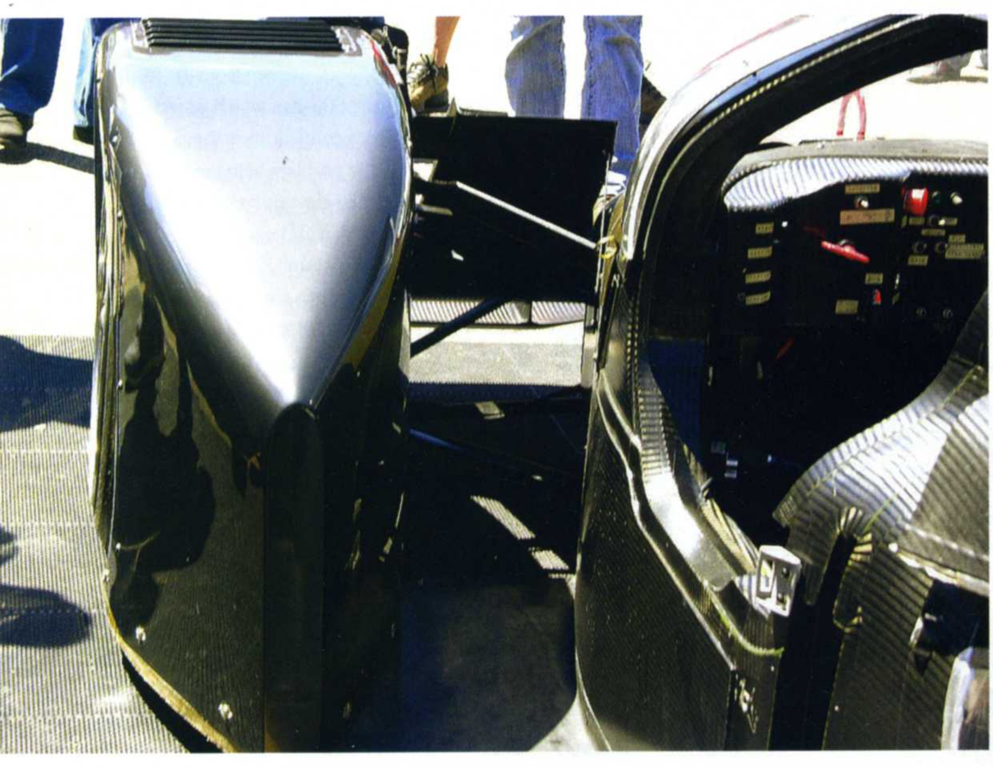
The pontoon fenders were perhaps the most unique element of the entire design and also an integral part of the aerodynamics package. Perhaps surprisingly, the Allard's design didn't evolve towards that solution, it started there: 'Quite simply, I shaped up the first version based on experience. We tested it, it worked great and we never discarded it,' says Burvill. To cover their bases the Allard team did try a much more conventional front end but found it seriously lacking when compared to the direction they had initially headed in. By encouraging airflow around the fenders instead of over them (simply by the nature of its planform shape) helped reduce top surface lift generation.

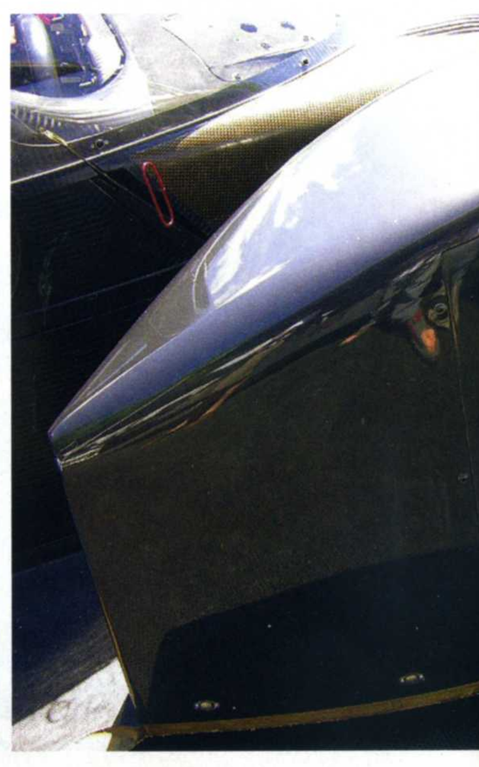
It should be noted that the Allard is streamlined in plan view, to encourage air to go around and not over the bodywork. There was also thought to be a functional benefit of the pontoon fenders in the case of a tyre failure as damage would be limited to the pod and not the surrounding bodywork, making repair easier.

As previously mentioned, the achievement of the ultra low rear deck height of the Allard was driven by the desire to feed the rear wings with airflow as unobstructed as possible. Additionally, the exhaust gas was piped into the trailing edge of the tunnel exit, but for a purpose other than aerodynamics. Iley: 'As a rule I am not a supporter of such a system [exhaust activated diffusers] as it makes the car's performance too throttle dependant, which does not provide the basis for a stable platform. However the location on the J2X was far enough rearward that its effect was greatly reduced. The main drive to route the exhausts this way on J2X was just to achieve an incredibly low and tidy rear deck for the lower rear wing, not to utilise a blown diffuser principle.' Ultimately the designers were able to achieve a rear deck height just 10mm above the rear tunnel exit.

According to John Iley, the J2X developed approximately 5500lbs of downforce for 916lbs of drag at 150mph (L/D 6.0:1). 'Yes, our loads were huge and what little correlation work we did to the tunnel numbers seemed to agree with them well.' The anticipated downforce loads also called into question the viability of tyres and wheels, as well as overall car structure, in the end driving the design of the car's monocoque. That 5500lbs equates to a theoretical 9778lbs of downforce at 200mph. With so much downforce on hand 200mph would have been a very optimistic speed given the drag consequence. Peak downforce was achieved at a 35mm front ride height and a 48mm rear ride height, with good high ride height performance and low overall pitch sensitivity. With only 560-580bhp on tap from its 3.5-litre

J2X design was driven by aerodynamics – dramatic pontoon wings were always part of the package, as was the low rear deck height. Anhederal front wing was influenced by the Tyrrell 019 and the car could generate up to 43 per cent frontal aero if needed





Ford DFR, a low downforce package would have eventually been developed, though it was clear that a more powerful engine would have greatly benefited the project.

With such high aerodynamic downforce, a power steering system was also deemed a necessity, though it was never developed or installed, as the front suspension would have required re-working to allow for fitment. Instead it became a future project and a simple active suspension system was installed for the J2X's testing, though it was never optimised.

It was the anticipation of the car's massive downforce that led to the design of its full-length monocoque structure, incorporating a rear composite chassis that housed the gearbox. This rear chassis was designed so that the gearbox could be swivelled within the structure to allow for easy change of the gear cluster. The entire tub, minus the gearbox sub structure but including the FIA mandated steel rollover hoop, weighs around 85kg. Burvill: 'The chassis comprised a closed box section 100mm wide on each side, running the full length of the footbox and sills. The roll hoop could not be fully integrated or made of anything but certified diameter and wall thickness steel, unless we had subjected the tub to a potentially destructive crash test. We had the roll hoop inspected and then bolted and bonded it into the chassis before the top section of the chassis was bonded – so it did become fully integrated.'

Unfortunately, the rear composite chassis turned out to be a potential liability, compromised by the use of an off-the-shelf gearbox (Leyton-March). According to Paul Burgess, detail designer engineer for the J2X's rear chassis, the design was 'constrained by using an existing single-seat gearbox with integral rocker and suspension mounts. It was complicated to mount and access the gearbox internals. A much neater solution would have been to design and build a separate and easily changed gearbox, without any suspension mounts on it.' On-track testing would later bear out the need to re-think the gearbox housing, if not the need to re-design it.

A 3.5-litre Cosworth (Ford) DFR engine was chosen for the Allard, given the commonality of the engine in Group C at the time. The first J2X

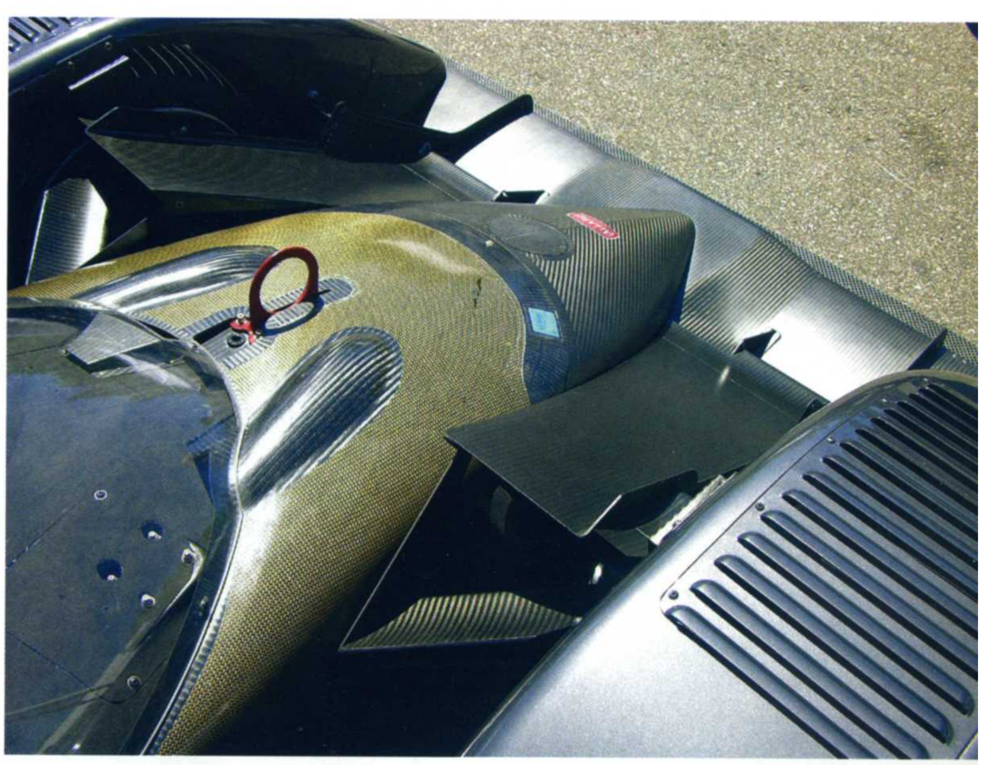
"IT STILL WAS MERELY DESIGN EVOLUTION AND NOTHING WAS PARTICULARLY REVOLUTIONARY ABOUT IT"

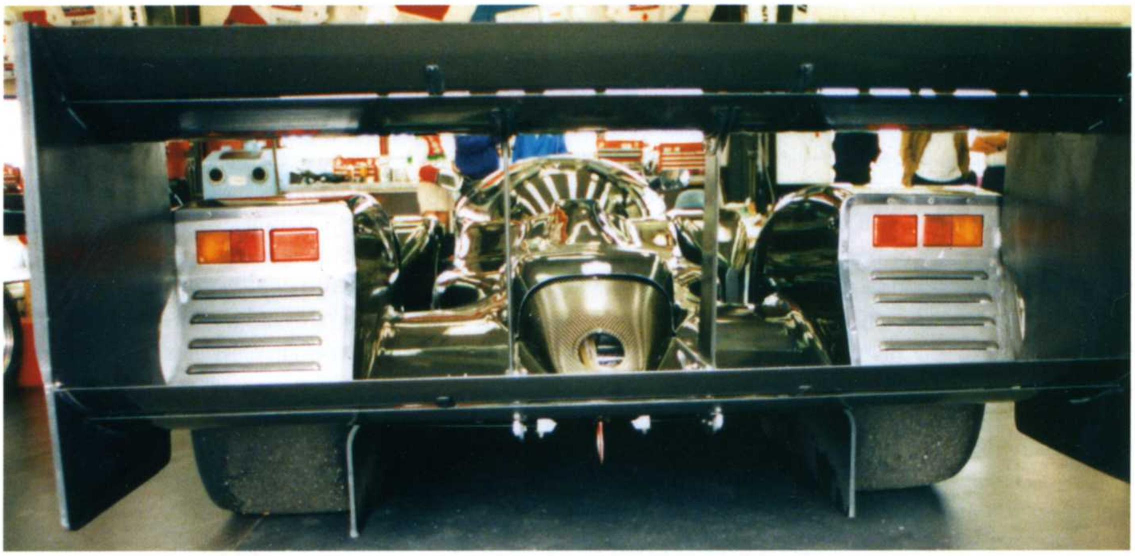
was actually intended to use a small block Chevy, but when a potential customer showed interest in a Group C version of the car, the DFR went in instead. The Chevrolet engine would have required a Hewland DGC gearbox to replace the Leyton-March sourced one – a task that would have been welcomed by the design staff given the problematic March gearbox. Mazda and Porsche engines were also considered and rejected, due to the difficult packaging requirements, even though potential customers in IMSA may have wanted those engines options. Ryan Falconer had even been contacted about the use of a big block Chevy. The Allard's full length monocoque chassis, while appearing to lend itself to the installation of various engines, was actually somewhat compromised by the tight packaging at the rear, meaning that all engines would have to be highly scrutinised in order to determine their suitability, or even whether or not they would fit!

Driving impressions

Finally, on 9 July 1992, the Allard J2X was shaken down at Pembrey in Wales. Test Driver Costas Los was at the wheel: 'The J2X felt very different to a regular Group C car. It had a different driving position to what I was used to, and an unusually small cockpit... I recall in particular how pointy the car could be made to be, and how it was possible to wind on an extraordinary amount of front-end grip with that wing. Contrary to most group C cars I had driven, it was a lot more tuneable than I was accustomed to.' The J2X required tremendous physical effort to drive and Los re-affirmed the eventual need for power steering. 'Imagine loading a Spice GTP with all the gizmos we developed for it on street tracks, and that's how it started off on the Allard, without having even attempted to get a street circuit type of set-up – no appendages or anything, wings set neutral. On all the Group C cars I drove except the Allard, if you loaded both ends to the maximum you would get an understeering car. It was quite an eye-opener,' he went on to say.

But the Allard was plagued by one fundamental problem – it had no buyers. After feints from the likes of Honda North America (who considered the chassis for the IMSA GTP series, even going as far as testing at three different circuits in the US in late 1992) and Gianpiero Moretti (again →





Twin-tier rear wing allowed adjustments to be made to front/ rear aerodynamic balance and also to frontal downforce

looking at the IMSA GTP series), the prospects were grim, especially with the IMSA GTP series in its death throes, as it were. Allard quickly slid downhill as funding and prospects dried up, only lasting until the end of the first quarter of 1993. Allard Holdings and all its assets were auctioned to pay the company's debtors. John Iley: 'I went to watch the auction of the car in London to close the chapter; £76,000 ($145,000) seemed a small price for all those hours of effort put in by the team.'

Robs Lamplough was the purchaser of the car and he took it to the 1993 Le Mans test days, which just verified the car's lack of suitability for the high-speed circuit. After the test days it was decided not to run at the race, given the obvious performance deficit. The Laguna Seca round of the IMSA GTP Championship came next and, at this point, Lamplough simply wanted to race the car. The J2X went on to qualify 12th and finished in 9th place overall. The Allard was then shipped back to England and there the car's racing history ended. Eventually Lamplough did sell the J2X and it went through a succession of owners during the '90s, ending up in Montreal, Canada, where it is presently completing restoration, including the installation of a new Ford DFR engine.

As radical as the Allard was, it was still merely design evolution and nothing was particularly revolutionary about it. In terms of aerodynamic performance, it certainly was impressive, but even the much more conventional Toyota TS-010 was generating over 9500lbs of downforce with a lift-to-drag ratio also in the 6+ region. Though Burvill admits the Allard was far from optimised aerodynamically, there was more to come and more potential over conventional designs given the use of volumes on the Allard. But Costas Los offers this interesting encounter: 'I ran into Tony Southgate at Le Mans a few years after I retired, and he told me that all the major sportscar manufacturers had toyed with the concept of the Allard. For an independent designer being paid by a manufacturer to design a winning car for such a key race, it was risky to propose an Allard-type car.' Graham Humphries, lead designer at Spice Engineering, also indicated that the idea was considered: 'We developed a 40 per cent wind tunnel model which initially showed promise. The model had a high pointed nose, low front wing and extremely low delta-shaped pods to enclosed rear arches. It was extremely elegant and, whilst it produced the required downforce, drag was just too high. With limited resources, it was decided instead to follow the more conventional route of further developing what we knew.' So while many companies were working towards Allard-esque solutions, it all came down to who was willing to take the risk. Hayden Burvill: 'I am sure many had considered it, perhaps even sketched it, but no one had the guts to step up and design it. I had nothing to lose, nobody knew who I was.'

"THE ALLARD WAS PLAGUED BY ONE FUNDAMENTAL PROBLEM – IT HAD NO BUYERS"

It is perhaps contentious to say that the Allard J2X had direct influence on chassis design trends, but only so much as its design was evolutionary. Rival groups were working towards similar solutions at about the same time but the fact is no one else got their car to the track. Certainly the design brief for the Allard was no different than that of its rivals but the 'nothing to lose' attitude of the J2X project allowed them to contemplate and adopt design ideologies that others were also considering but were unable to execute in their more conventional design environments.

While the J2X never had the opportunity to validate its design on the track, its success can be judged solely by the emulation that occurred after it faded from the scene. One only needs to look at today's Audi R8s, Lola B01/60s and B05/40s and Dallara LMPs to see that emulation still continuing all these years later. RE

Originally designed to use a small block Chevy, the J2X was built with a Group C compliant Cosworth DFR