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



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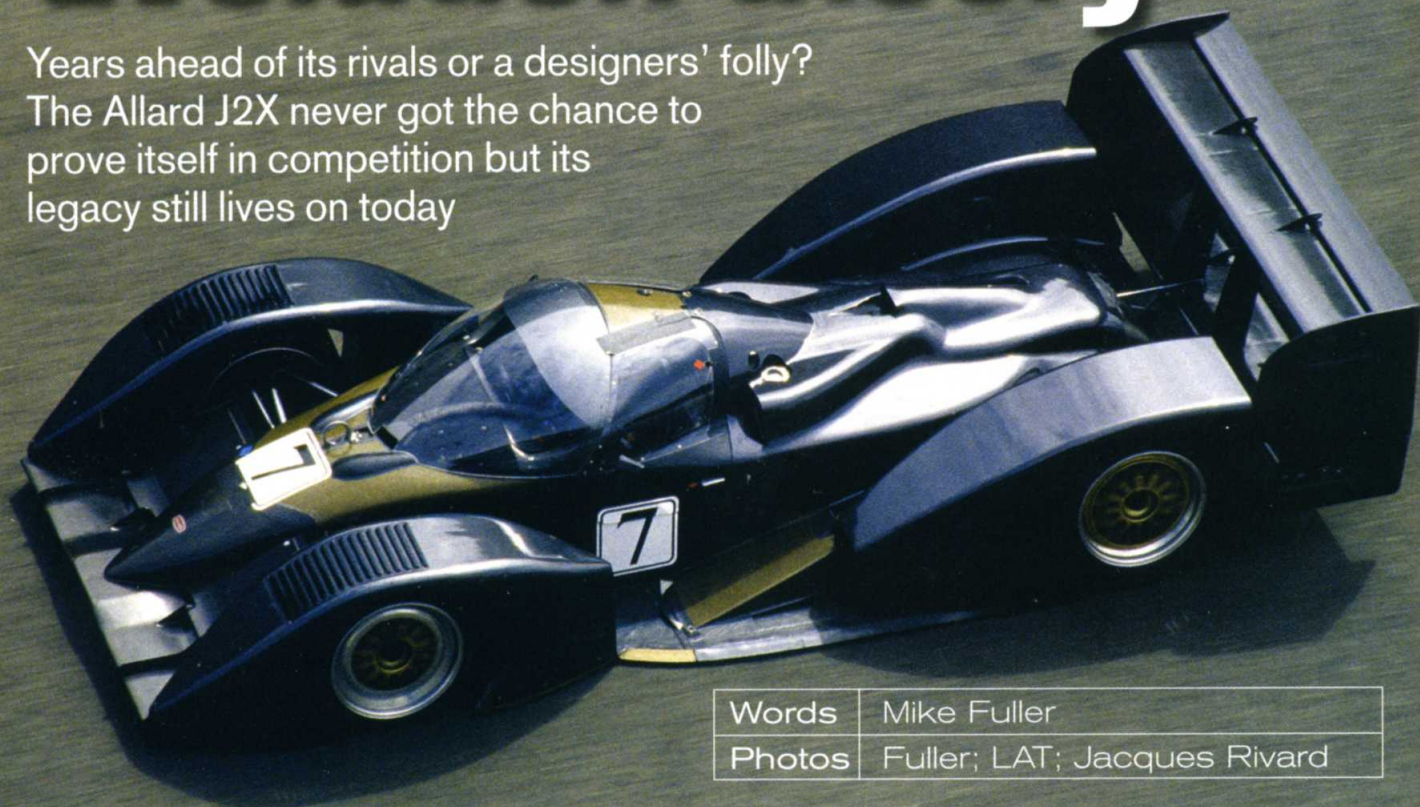
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Years ahead of its rivals or a designers' folly?
The Allard J2X never got the chance to
prove itself in competition but its
legacy still lives on today



Words	Mike Fuller
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.'

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 Si 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



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

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.

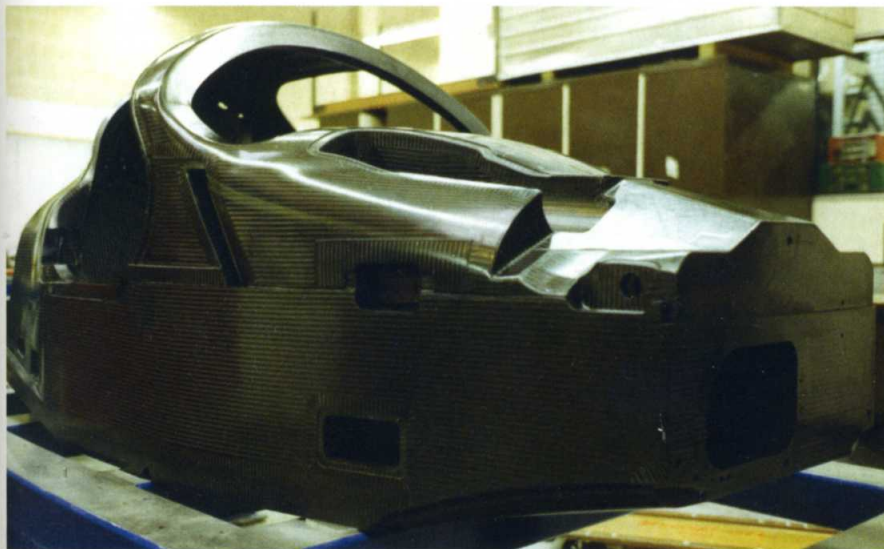
'We could generate up to 43 per cent front aero balance if we wanted to. This was a combination of having clean airflow between the chassis and the front wheels and careful treatment ahead of the wheels,' says Iley. Burvill: 'The front wing

“THE PRIMARY GOAL WAS MINIMAL FRONTAL AREA AND THE MAXIMISATION OF AERO DEVELOPMENT AREA”

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 anhedral, 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.'

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

