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Technofile - the Alford & Alder upright

It began in a modest pre-war saloon, won three F1 world titles and is still made today. Keith Howard reports on a truly remarkable piece of suspension.

In an era of multi-million pound budgets and team headquarters overflowing with the CAD/CAM and finite element analysis tools needed to design and manufacture bespoke components in-house, the notion that a Formula One car should employ a major component a major suspension component at that bor rowed from a humdrum road car is positively fanciful. Yet during the 1950s and into the '60s such a component was so widely used by Britain's new generation of race car constructors to call it ubiquitous is no hyperbole. It originated with the pre-war Standard Eight saloon, introduced in 1938, was designed and manufactured by Hemel Hempstead-based Alford and Alder, but because of its use in a succession of Triumphs including the Herald and Spitfire, it became known simply as the Triumph front suspension upright.

A list of all the racing cars which employed it would be extensive. Here's a patchy selection, Impressive nonetheless, culled from photographs and diagrams showing front suspension components: Lotus Types 11 S2, 12, 15, 16, 18, 19, 20, 21, 22, 23,27 and 31; Cooper T45, 151, T53, T54, T55, T58, T60, T66 and Monaco; Lola Marks 1, 2, 3, 4 and 5; Brabharn BTs 1, 2, 3, 8A, 11, 12 and 20.

Within this incomplete list you'll note a fair smattering of F1 cars and no fewer than three World Championship winners - the '59 and '60 Coopers and the Brabham-Repco BT20 of 1966. The Triumph upright also went to Indianapolis in the BT12 of 1964 and won there the following year in the Dean Van Lines Special copy, confirming that in its heyday the humble Triumph upright pervaded motorsport to the very highest level. Widespread use in Formula Ford was to follow.

In addition it featured in every Lotus road car from the Seven S1 right up to early versions of the Esprit (a list which encompasses the Elite, Elan, Elan +2, Europa, Type 75 Elite and Eclat) - a span of over 20 years - and is still used to this day in the Caterharn Seven. Although made in a number of variants with differing trunnion designs, brake mountings and stub axle sizes, the basic design remained throughout.

All told it's an extraordinary curriculum vitae, unique in the history of motor racing. All the up and coming British-based racing car designers of the period - Broadley, Chapman, Cooper, Tauranac - used this upright in their careers, before progressing to custom-made replacements. So what exactly about the Alford and Alder design attracted them?

To be mundane for a moment, it enjoyed the undeniable twin benefits of being both available and inexpensive at a time when the facilities and budgets possessed by many of the younger racing outfits, even those competing in F1, were meagre by modern measures. As John Cooper remarked in an *Autocar* interview in 1982, "I'm told that today to run a Grand Prix team of two cars costs well over £3 million... We ran a GP team and we won the World Championship twice, but we spent £50,000 a year." In those relatively straitened and more down to earth times, fabricating a component was pointless when a perfectly acceptable one could be bought over the counter.

But that wasn't the whole story. In addition to being readily available the Alford and Alder design also had distinct technical merits.For a start, it was notably lightweight for an EN16T steel forging. In the variant used in the Elan, for instance, the upright itself weighed only 1.15kg, the pressure diecast brass trunnion 266g, the forged steelstub axle and steering arm 466g and 310g respectively, and the upper balljoint 316g, making a mere 2.5 kg in total plus caliper bracket and hub. And this listing itself reveals a further key attraction of the design: the fact it was modular. If the designer wanted to change steering geometry by varying the length of the steering arms or mounting the steering rack behind instead of ahead of the front axle line, or change brake disc diameter or caliper type, it was no problem. All such changes could easily be accommodated.

Books on F1 design of the period make nebulous references to the Triumph upright eventually being sidelined because of geometrical inadequacies, but I've never seen this substantiated and it's difficult to see where such supposed failings might lie. Because of its trunnion lower mounting this upright has the unusual property of changing length as its rotated, but with its 3/4inch UNC thread (pitch 0.1in) a steering angle as large as 30 degrees only lengthens or shortens it by 8 thou hardly significant in an era when relatively large inaccuracies in other suspension dimensions were an unavoidable fact of life.

Mike Costin recalls that the increasing wheel loads brought by tyre technology were mainly responsible for the upright's disappearance from the top racing formula, needing a stronger stub axle than it could accommodate.

Unsurprisingly given the variety of cars in which it was used the Triumph upright remains in manufacture today, by Coventry company ESP Ltd using refurbished original tooling. Alford and Alder itself, with a history stretching back to the early years of last century, ceased to exist when it was absorbed into British Leyland. ESP boss Tony Cook still receives enquiries about the upright from around the world and makes a special variant for racing in which the central bore through the lower section - designed to carry lubricant (strictly engine oil, not grease) from a rear-mounted nipple to the base of the trunnion thread - is eliminated to enhance stiffness, this particularly when the trunnion thread is machined off to accommodate a rod end bearing instead.

So the Alford and Alder upright steadfastly survives 60-odd years after its conception. You couldn't say that, in and of itself, it changed the way people went racing, but by providing the nascent post-war British racing industry with a ready-made solution for a critical suspension component it contributed to that industry's inexorable rise from backstreet to big time. And by any account, that process most assuredly did change the course of motor racing history.