WORDS Paul Fearnley MAIN IMAGE LAT archive

WING WAR ONE, 1968-'69 **PART TWO**

# FLYING TOO CLOSE TO THE SUN

Ferrari got there first on June 7th, 1968. Brabham got one the very next day at Spa-Francorchamps in Belgium. One month later, Lotus got the bug and went big, really big. Suddenly wings were the thing in Formula 1 and downforce was on the up. Everyone had one by August. Missile maker Matra's moved of its own accord. So too did Ferrari's – unless its driver reckoned he knew better.

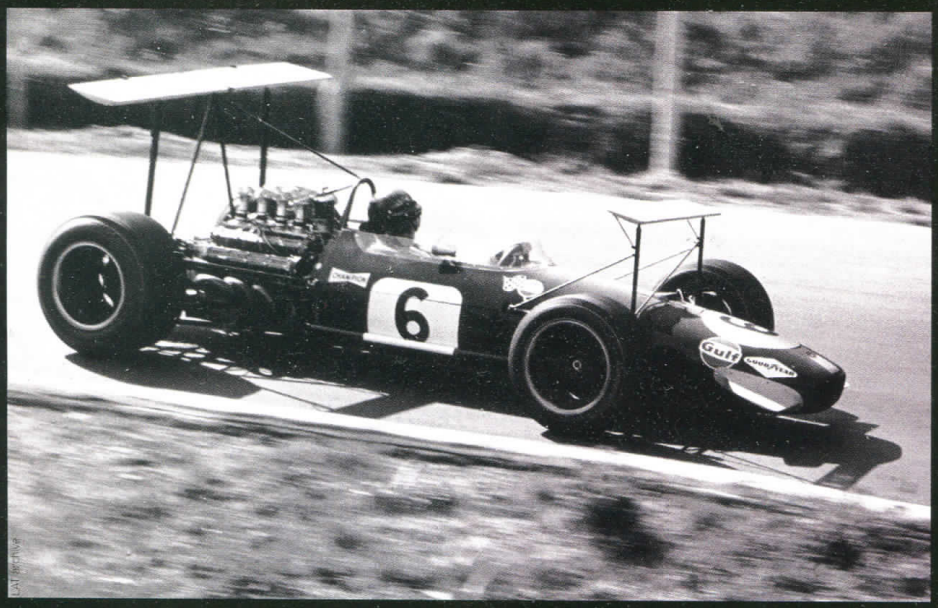
But nobody really knew. Not yet. Designers either held a candle in the wind or threw caution to it as F1 in its wilful ignorance accelerated inexorably towards V1. Already in the midst of its most deadly era, it was about to fly even closer to the Sun...



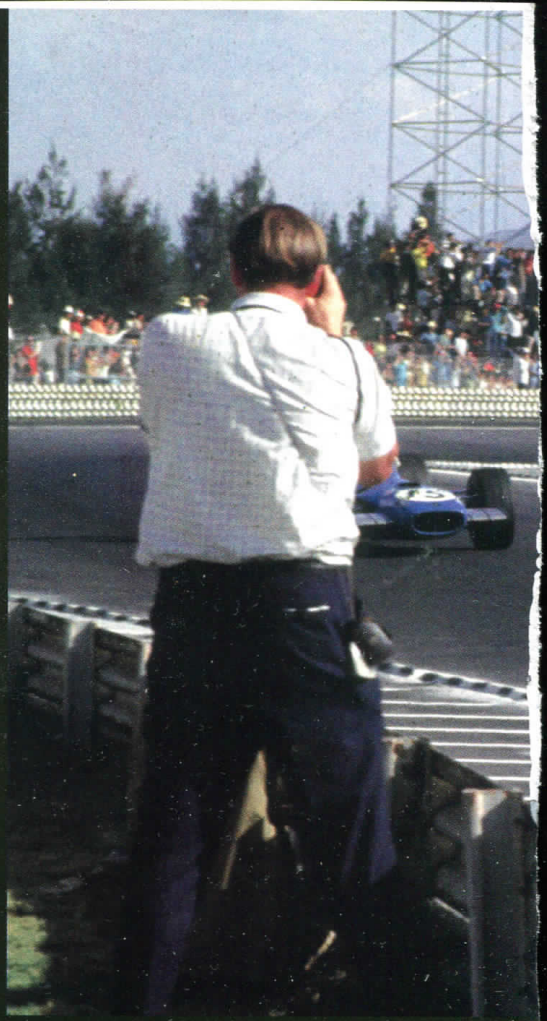
Last hurrah for F1's high wings... John Surtees' BRM enters the tunnel during Thursday practice for the '69 Monaco GP. A day later, moved by a spate of wing-related failures and crashes, the FIA had banned the lofty aero aids.

## DOUBLING DOWN(FORCE)

(BELOW) Jochen Rindt put his Brabham-Repco BT26 on the pole for the 1968 Canadian GP at Mont-Tremblant. Designer, Ron Tauranac, had trialed the car's high, suspension-mounted front wing at Monza as F1's "wing war" reached a new level of complexity *and* fragility. (BELOW RIGHT) Two weeks after Canada, in practice at Watkins Glen, Rindt suffered a rear wing failure.




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Brabham designer Ron Tauranac, though somewhat more wary than Lotus' Colin Chapman of unchecked development in an unexplored area, upstaged his rival at the Italian Grand Prix in September 1968. Not only did he introduce a radical new rear wing, but he also repurposed the old, lower item across the front of his BT26. (This just one year after trying a drag-reducing bubble canopy at the same Monza circuit.)

Conceived with British Aircraft Corporation (BAC) aerodynamicist Ray Jessop, the new wing hinged at the centre of its span and its loads were shared between sprung and unsprung elements via canted inner as well as outer vertical struts. A wire from its trailing edge to a cockpit lever (calibrated in Jack Brabham's case) flattened its incidence – a process reversible only in the pits – but even when "locked," the wing oscillated from dihedral to anhedral under braking.

"Tauranac was a canny bugger," says Peter Wright, who joined BRM from Cambridge University in 1967 and was responsible for its aerodynamic R&D. "He may have set the wing so that the incidence changed according to ride height; when the rear comes up under braking it may well have increased the incidence and given more downforce. Who knows?

"Everybody was experimenting. Tasked with a self-adjusting wing, my solution was electro-hydraulic, with a button on the steering wheel. John Surtees tested it at Silverstone [in 1969]. He did a couple of laps before pressing it. Then came straight back in: 'Hmm, interesting. The car jumped from one side of the track to the other.' That's how it was then."

Brabham's front wing, mounted to the suspension's inner pivots, was shelved after a few laps of Monza. But a fortnight later Jochen Rindt, canards removed (because of overheating), used one to set pole for the Canadian GP at Ste. Jovite, Quebec.

Chris Amon, overriding his Ferrari's automatic adjustment of its rear wing at two points on this undulating track – for a total of three seconds – equaled Rindt's time and dominated much of the race, despite a failing clutch that eventually broke the gearbox. Thus Denny Hulme, fixed wing restored above his



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"Those [hub-mounted] struts were my idea. They redirected load into the middle of the contact patch"

PETER WRIGHT




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## SPANISH FLY

**Both factory Lotus 49Bs had huge accidents in the '69 Spanish GP when their suspension-mounted rear wings failed. Graham Hill crashed first, but Jochen Rindt came off worse (ABOVE), breaking his nose and fracturing his skull.**

## PUTTING THE GENIE BACK IN THE BOTTLE

Lotus's wreckfest at the Spanish GP was the final straw, but the FIA didn't ban high wings until part-way through the following Monaco GP. Cars ran in the Thursday practice session with high wings, but were shorn of them by Friday's running.




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collapsed during the race.

But this is what it took now. Stewart's winning Matra ran a high front wing as well as canards, both with endplates, to balance a higher rear wing without endplates that feathered electronically when fifth gear was selected.

Privateers on tight budgets had to be creative. The wings of Rhodesian John Love's Lotus were feathered – when fifth was engaged and fourth pedal pressed – by compressed air held in cylinders adapted from a propeller of a crashed Vickers Viscount.

And wings were fluttering down to the junior formulae too, high aerofoils front and rear deemed beneficial to – yet still failing on – cars with half the power of F1. Rindt had tried an outlandish box-kite design on an F2 Brabham in October 1968.

This free-to-air free-for-all jarred with the mandating in F1 of a full onboard extinguisher system and stronger roll hoops. But the governing body did nothing.

Yet...

Hill's pole position for the non-championship Race of Champions in March, set without a front wing likely to cause blind spots in Brands Hatch's dips, was seven-tenths beneath his July 1968 mark. Rindt lapped 1.4sec faster still in the race, and almost 3sec better than Siffert's July best, despite a fixed rear wing on shortened struts after yet another failure – toppling sideways rather than falling backwards – during practice.

Victory, however, went to Stewart in Matra's new MS80 that featured a tall fixed rear wing and canards pivoted by links from the front anti-roll bar. Two weeks later, Brabham won the non-championship International Trophy, dual wings deflecting alarmingly in opposite directions through Silverstone's fast, constant-radius corners.

Rindt was going cold on wings and his employer's attitude to risk – even though Chapman had consented (from Brands Hatch) to triangulation of the rear wing by flexible rods from the roll hoop. But nobody wanted to win more in F1 than did Jochen; it had been far too long. So he watched bemusedly as mechanics scurried to widen his wing (by 12in.) to beyond the rear track and add a

"We were in an unknown area and didn't have the tools. Calculations were slow, but the need for a wing pressing"

PETER WRIGHT

(MAIN) Wings were clipped, not outlawed for 1970. The grid for the German GP shows the lower, smaller aero that followed the excesses of F1's "wing wars." (BELOW) Jacky Ickx's Ferrari 312B is the epitome of the new package's enhanced aesthetics.

trailing lip to its section between the struts.

Chapman told his aghast rivals that he was breaking no rule. After all, as things stood, there was no rule to break...

Rindt's improvement on Saturday, May 3rd, at Barcelona's sinuous Montjüich Park street circuit earned him pole by 0.5sec. Chapman was unsatisfied and furious to discover that the last piece of aluminum sheet had been used for another purpose.

Rindt led, but the wing began to droop and crease. Suddenly his teammate's folded up into a vee cresting a rise on the ninth lap. Shocked but unhurt from pinballing between barriers, Hill sent warning word. Too late: Rindt suffered a copycat crash.

"People had calculated aero loads," says Wright. "But because those wings were attached to the unsprung element they received high-frequency loads from the suspension, too. It had performance benefits but was unsafe, the geometry changing as struts moved up and down. Nowadays we'd make them work, no problem."

Broken nose and cheek, facial cuts and a hairline skull fracture seemed small mercies for a driver levered out from so twisted a monocoque. Rindt aired his dirty air in an open letter, published in full by *Autosport* magazine: the Barcelona crowd, it intoned, had escaped by inches.

His original Spa 1968 wing had had a trimming effect at maximum speed; his Montjüich version was of an entirely different and unanticipated order. And Rindt wanted it banned. The governing body was inclining to agree, officials unimpressed by "confetti"



"There was a sigh of relief [when the high wings were banned]. Back then, cars had a 'guillotine' on the front"

DEREK BELL

(MAIN) Graham Hill clinched the 1968 F1 title at the season-ending Mexican GP. His Lotus 49B featured a drag-reducing, feathering rear wing that the driver operated with a fourth pedal.

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McLaren's M7A engine – he'd won at Monza without it – claimed a consecutive victory.

Everyone had a rear wing by now.

Cooper joined the club at the Nürburgring in August, its Vickers Aerospace aerofoil mounted amidships on tall, close-coupled struts and, by Monza, self-adjusting via sprung plungers that held it shut until overcome by air pressure as speed increased.

BRM's BAC wing – a thin aluminum skin on a balsawood core, autoclaved in a mold – was fitted first to a P126 at England's non-championship Oulton Park International Gold Cup that same month. Hub-mounted via inclined struts, it was braced laterally and also by cables running from the roll hoop.

"Those struts were my idea," says Wright. "They redirected load into the middle of the contact patch without putting a tilting load into the uprights. Not having endplates wasn't necessarily a mistake. It would generate more downforce, yes, but more drag too. A decent span didn't need an endplate was the theory.

"There was a wonderful book ["Theory of Wing Sections" by Ira Abbott and Albert von Doenhoff, first published in 1949] that collated all the research, mainly NASA's. It was our bible before simulation, finite-element analysis and data systems."



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### RON TAURANAC

When 1959 F1 champ Jack Brabham started building racecars in '60, fellow Aussie Ron Tauranac was his go-to designer. Never as "out there" as, say, Colin Chapman, Tauranac's strength was in honing existing concepts. Not that he wasn't averse to thinking outside the box if the opportunity arose.

Hulme had drawn level with Lotus' Graham Hill with two rounds remaining. His title challenge, however, would end with a brace of accidents – the second caused by rear suspension failure, despite running without a wing – whereas Jackie Stewart's United States GP victory in October halved his gap to Hill, runner-up at Watkins Glen, to three points.

Since its victory in the dry of Oulton Park, Stewart's Matra MS10 had worn short canards with endplates and, since Monza, a tall, fixed rear aerofoil, hub-mounted on Siamese struts attached to its endplates' outer faces. Lower and narrower than Lotus' and braced from the roll hoop by rods, it struck the speed-safety balance that the Scot demanded.

In contrast, Chapman's decision to feather Hill's wing for the power-sapping altitude of the Mexican GP was made gung-ho late – despite a four-week gap between races. His method, however, was simple: Bowden cable

(BELOW) Lotus showed up at the 1969 season-opening South African GP with the most extreme high-wing combination yet seen. (ABOVE) The non-points 1969 Race of Champions at Brands Hatch. By now, all had wings, but size, height and complexity of their trimming devices varied considerably.

attached to a thin fourth pedal beside – and with a toe bar above – the 49B's clutch pedal pulling against rubber bungees attached to the leading edge that otherwise held the wing shut; one of Hill's bungees snapped on the third lap.

"[The wing] couldn't come back to the maximum download position at the end of the straight," he wrote in "Life at the Limit," "but, as the speed dropped, it came into the right position of its own accord and stayed there. A bit hairy...but it held."

He and Stewart were running 1-2 when the latter suffered fuel starvation and slipped out of the points. Thus the 1968 title was Hill's.

And Lotus won the constructors' championship, too – even though Team Lotus had just one win since the outbreak of wings in June; 29 of its 62 points had been earned without a wing. And both Mario Andretti – on pole at the 'Glen for his GP debut – and privateer Jo Siffert had been faster using fixed wings that were lower and narrower than Hill's.

Was bigger better? Chapman thought so.

Lotus arrived at Kyalami for the South African GP in March 1969 with a high front wing as well as canards. Attached to the outer ends of 49B's rocker arms, it was feathered by the four-pedal arrangement that pivoted the rear. Within minutes during practice, Rindt and Andretti suffered collapses of the latter. Remaining struts shortened to the height of the fronts, Andretti, with rear wing only, was fastest until his gearbox failed.

It wasn't just Lotus. Brabham, his BT26A now with reliable Cosworth power and on pole, had "the nastiest fright of his [long] career" when the rear wing, no longer hinged,

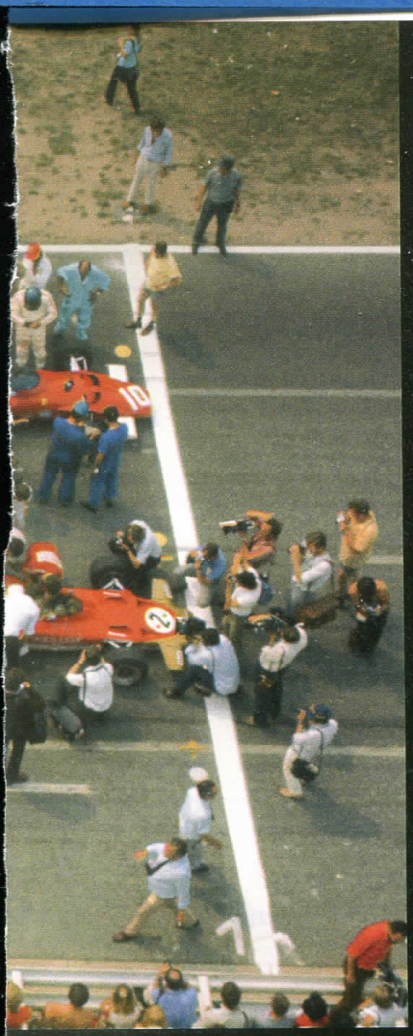


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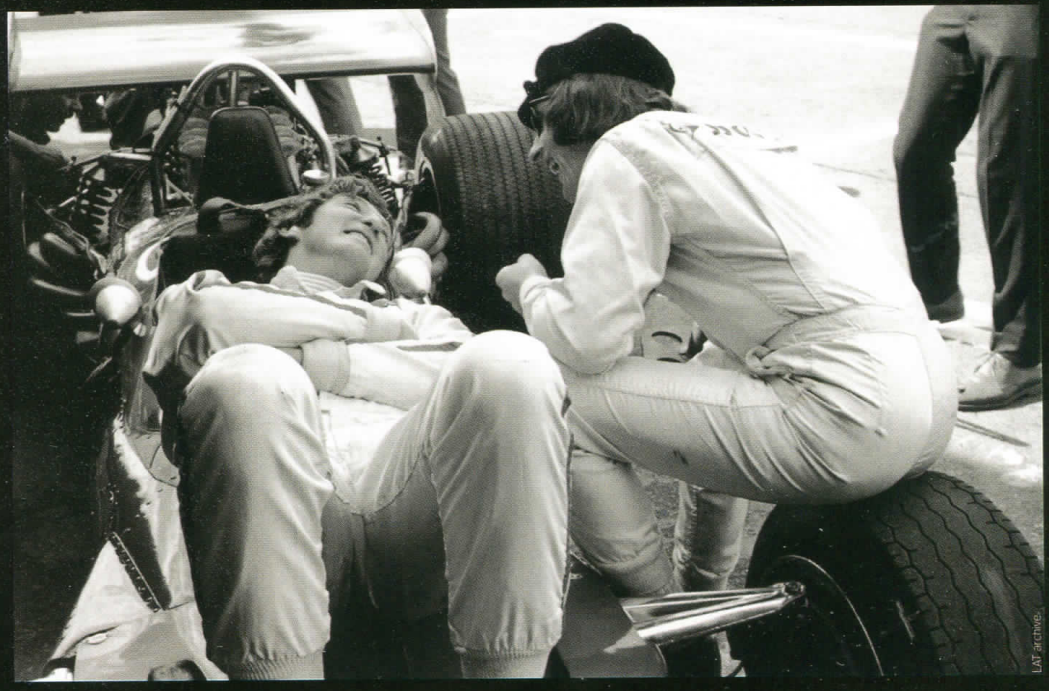
(ABOVE) Aerospace engineer Ira H. Abbott's résumé included key roles on the X-15 hypersonic rocket plane and NASA's earliest space programs. His1949 co-authored book, "Theory of Wing Sections," was *the* go-to reference for F1 engineers trying to get their heads around wings.





## RINDT 1970: A TRAGIC CODA

As F1 took a journey into the unknown with the wing wars of 1968-'69, Lotus founder Colin Chapman was one of the guys pushing the envelope the furthest. Driver Jochen Rindt (BELOW, with Jackie Stewart in Mexico, 1969) was often the unwitting victim – multiple collapsed wings and then the huge accident in the '69 Spanish GP – as Chapman built ever higher and wider. In 1970, with wings now reduced in size and Rindt leading the championship, he was killed when a brake shaft failed on his (front wing-less) Lotus 72 at super-fast Monza (BOTTOM).



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swirling after Ickx's rear wing had blown apart in front of them in Spain.

Peace broke out in Monaco on the evening of Thursday, May 15, when delegates from the FIA's Commission Sportive Internationale evoked a "safety clause" to have high wings removed overnight and times set in first practice annulled.

Ferrari and McLaren were said to be happy; Matra's Ken Tyrrell objected – though pole man Stewart eventually went three-tenths faster than he had with wings; and, crucially, Chapman was at Indy (overseeing an ultimately doomed all-wheel-drive project).

"There was a sigh of relief," says Ferrari driver Derek Bell. "Today's F1 has the halo. Back then, cars had a 'guillotine' on the front!"

Wright: "We were in an unknown area and didn't have the tools. Calculations – best estimates – were slow, but the need for a wing pressing. Chapman had an instinct – later backed by a bit more science – as to why something should work. If he believed in it, he'd stick with it. Sometimes he made things work that others had given up on. But had we known more we would have been scared stiff."



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The competitive spirit continued to burn, however, and Team Lotus cannibalized its transporter to make an extended, curving engine cover for Hill, who won but was doubtful: "Although closely involved [!] in the accidents at Barcelona, I felt the ban retrograde. Wings were a positive aid to suspension and made the cars quicker."

Fear not, Mr Hill.

Wing War Two commenced five weeks later at Zandvoort. The new wording was woolly – smaller, lower wings to be part of the bodywork and fixed – and, according to *Motor Sport* magazine's report: the interpretations of McLaren and Matra were honest; that of BRM's cheating; and those of Ferrari, Lotus and Brabham stretching the imagination. Oh, and the scrutineers were lenient.

Heavily hyped, nascent all-wheel drive was its first casualty – where had all that 1968 rain gone? – and Rindt its most tragic. The brilliant Austrian's wedge-shaped Lotus 72 had been shorn voluntarily of all wings when brake-shaft failure snapped it left into the Monza Armco barriers on Saturday, Sept. 5, 1970.