



HOW F1 CAN HELP AVIATION RECOVER

The aerospace industry helped shape the development of motorsport as we know it. Now, as the aviation sector faces its darkest hour, **Chris Ellis** argues that Formula 1 can repay that debt

MOTORSPORT and the aerospace industry represent two jewels in the crown of UK manufacturing.

When MPs in the House of Commons were commissioned to report on the synergies between the two sectors, they were told: "A Formula 1 racing car is only a low-flying aeroplane, except that the aerodynamics are to keep them down rather than up."

Their report noted that: "The UK is a world leader in the motorsport industry, and boasts the world's second largest aerospace sector after the USA. They have many common characteristics and often work closely on shared challenges. Both industries are knowledge-intensive, utilise a highly skilled workforce and are constantly investing in Research and Development to improve their product and to maintain their edge over international competition."

Initially, motorsport would piggyback the aerospace industry's expertise. That

was the case from the 1960s, when Donald Campbell's Land and Water World Speed Record attempts were shaped in the wind tunnel, through to the discovery of ground-effect in the '70s and pioneering use of composite materials in the '80s. Today, though, that balance has shifted.

Many major aerospace companies now enjoy a close relationship with Formula 1 teams – and the flow of information is now truly a two-way affair. During the course of their report, the MPs were shown several examples of technologies and production methods that had been tested in the motorsport sector prior to their adoption by aerospace companies.

MULTIPLE HITS

Today, the two sectors once again face a common challenge: how to rebuild themselves in the 'new normal' emerging from the COVID-19 pandemic.

If the Coronavirus crisis delivered a financially crippling hit to motorsport – with even successful grandee teams like Williams and McLaren requiring urgent financial investment – it dealt a potentially mortal blow to the aviation industry.

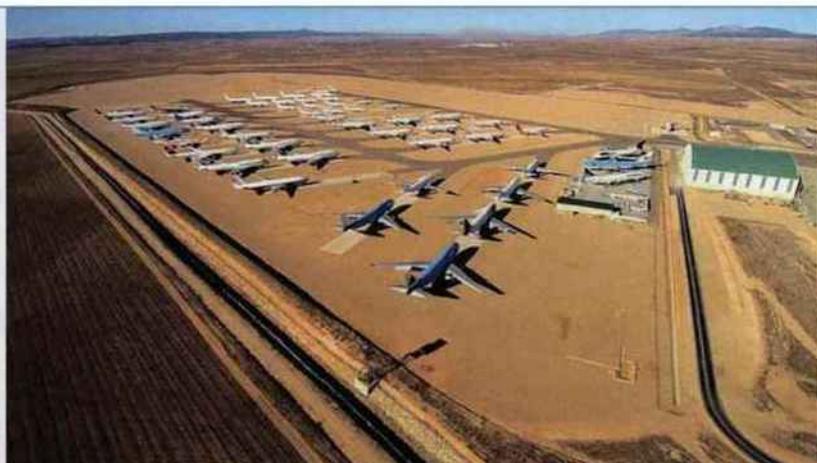
The virus lockdown transformed bustling airports into ghostly 'aircraft parks'. And this isn't temporary, because even the most optimistic airline CEOs have stated publicly they don't expect traffic to return to normal until at least 2023. So I wonder what they are saying in private?

The massive layoffs by most of the major companies involved in manufacturing airliners indicate they already realise the impact on them will be even worse, and last longer. One key reason for a slow recovery is the stigma of aviation's key





BELOW & RIGHT The aviation industry was brought to a standstill by the pandemic, with airports suddenly becoming plane graveyards



RIGHT It is estimated that hydrogen has the potential to reduce aviation's CO2 emissions by up to 50%. F1 offers a powerful shop window to demonstrate the technology that could help many other industries, as well as aviation, meet their climate targets



role in turning a national epidemic into a global pandemic. This is bound to depress seat sales until everyone is confident track-and-trace works reliably at all key destinations, particularly for return flights. Who wants to be the one who brought the next epidemic home?

Another reason is business travel will recover

only partially, because many companies have been forced to become competent at videoconferencing, and now realise how much money they can save by becoming even better at it. Especially when money is tight, as it will be for years, for so many businesses.

Crucially, though, it's not just COVID-19 that threatens the airlines. Climate protesters have increasingly targeted the sector and now they have more ammunition than ever: recent research shows that the planes' contrails have a larger impact on climate warming than previously thought, particularly at night.

The British government's initial response to the problem has been to set up the 'Jet Zero Council', which will probably have the unfortunate effect of delaying any decisions for at least six months. Which is a shame, because its objectives are ambitious. "As part of our mission to reach Net Zero CO2 emissions by 2050, we should set ourselves the goal now of producing the world's first zero emission long haul passenger plane," explained UK Prime



“The goal of producing the world's first zero emission long haul passenger plane”



Minister Boris Johnson. "The UK now has a huge opportunity to cement its place at the vanguard of green innovation."

We know *already* how to get large zero-carbon airliners into long-haul service before 2030. Or at least a few people do. "There is a role for batteries and fuel cells in small, short-range aircraft, but long-range aviation can only be done cleanly with hydrogen-fuelled turbo-fans, such as the Rolls-Royce Trent," suggests Professor John Coplin.

The chief designer of the RB211 aero-engine that turned Rolls-Royce from a significant player in the aero-engine industry into a global leader, Coplin's words carry weight. What is urgently needed, however, is a way of showcasing the existence of this technology. And that's where motorsport enters the equation.

WHAT'S IN THIS FOR F1?

Formula 1 is already committed to becoming fully sustainable by 2030. To be clear, it's not just about running the cars on the right fuel: this represents less than one per cent of the total problem. Formula

1's own estimates suggest 47% of its direct emissions come from moving the cars and supporting equipment around, plus another 19% for personnel. Consequently, my guess is that flying, alone, is responsible for almost half of Formula 1's direct impact on the environment. So an obvious first step is for all of the teams to insist on the use of SAF (Sustainable Aviation Fuels) for their freight flights, and for Liberty Media to flaunt this when they do.

However, most airlines are still only comfortable using a 50:50 mix of SAF and Jet A-1. So I hope Formula 1 and the FIA might adopt my suggestion in 'Beyond Mission H24' (Race Tech, April 2020) that a 'Formula R' – "R" for 'Research' – race be run during the morning of each grand prix. Formula R could be based on the latest WEC regulations, except for the powertrain rules, with a focus on using hydrogen, including in ICES. This would allow the Formula R teams to demonstrate the latest fuel cell, surge power and hydrogen storage technologies in front of massive audiences of influential viewers.

Another objective would be to inform the process of choosing the fuel and powertrains for F1 in 2026. Whatever the configuration – like Gordon Murray, I'm a fan of V12s, but the cost of COVID could dictate V6s being retained – the ICE powerplant could run on compressed hydrogen. There's a good theoretical case for liquid hydrogen in F1, but this will not be used in (almost) any road cars or trucks because it's not cost-effective, just like exhaust energy recovery.

Harnessing hydrogen could make a reality, again, of F1's claim to be a key source of innovation for the whole car industry. This used to be true, but most people don't believe it any

ABOVE A hypercar-style race, demonstrating hydrogen fuel cell technology to an F1 audience, could accelerate development of a technology that is gaining momentum amongst manufacturers



more, particularly young people. Consequently, the average age of fans is rising rapidly and their numbers are falling, not helped by the reduction in free-to-view coverage. However, if F1 presents FR as the public test bed for the powertrain regulations for Formula 1 in 2025/6, imagine the renewed interest, particularly if FR is free-to-view on the internet and major TV channels. One consequence is that racing at this level will no longer be seen as a wasteful irrelevance if it is genuinely helping to make all transport, on the ground, in the air and at sea, completely free of emissions.

Years ago, in the BRDC enclosure during a British Grand Prix, I was stunned to see Stephen Hawking sitting within 20 feet of Kofi Annan. How long will it take before Greta comes to Silverstone, to have tea with Boris?

HYDROGEN MOMENTUM

The Le Mans 24 Hours organisers' faith in [Mission H24](#) – set to introduce hydrogen race cars to the endurance classic in 2024 – reflects the growing momentum of the technology. Only a few years ago, most European car companies



were dismissive of the idea that hydrogen fuel cells had any role in cars, but now several have openly declared an interest in using them in large SUVs.

Mercedes is in the lead, with the GLC F-CELL already in limited production; BMW is promising something similar next year. And the British government has just provided some funding for Project ZEUS, to help Jaguar Land Rover develop a fuel cell SUV. Perhaps recent research by UC Riverside claiming 'Fast-charging of electric batteries can ruin their capacity after just 25 charges' may have

convinced them batteries aren't good enough?

In the UK, it costs 24 pence/kWh to use a Tesla Supercharger at more than 60 kW. Assuming three miles per kWh, that's £2.40 for 30 miles, roughly half the price of petrol, because over 60% of the price of petrol is tax! So what will happen when tax-free hydrogen becomes widely available, and is cheaper to use than diesel or petrol?

As a rough 'sanity check', assume it will cost only £5,000 to replace the battery pack in a typical large battery-only car after 50 rapid ▶

ABOVE Airbus and Rolls-Royce appeared to have opted for a series hybrid solution when they launched the E-Fan X demonstrator programme in late 2017. It has since been abandoned, with Airbus suggesting a focus on hydrogen might be more productive



LEFT The launch of the Mercedes-Benz GLC F-CELL, the world's first electric vehicle featuring fuel cell and plug-in hybrid technology, illustrates the swing towards hydrogen