MOLSHEIM
6/1/2023

BUGATTI BOLIDE UNDERTAKES EXTREME TRACK TESTING TO PERFECT HIGH-PERFORMANCE AERODYNAMICS

Incredibly fast. Uncompromisingly extreme. A hyper sports car like no other. The vision of creating the ultimate track-only Bugatti is even closer to reality: having finalized its design and built the first

prototypes, the Bolide is now proving its advanced aerodynamic capabilities during high intensity testing at some of the most dynamically challenging racetracks. The results, so far, have been breathtaking.

The most ambitious endeavors are often born from the purest ideas, and in the Bolide[1] the aim has been unambiguous from the start: to create the lightest car possible, reduced to the essentials, around the iconic quad turbo 8.0-litre W16 engine. The appeal was obvious, sparking huge customer interest globally, and prompting Bugatti to produce a limited run of just 40 units. Two-and-half-years after the Bolide concept was unveiled and after countless simulated laps, the car is now being refined on real, revered racetracks as part of an uncompromising test program that focuses on realizing top motorsport levels of performance.
The tests are exhausting and relentless, as must be the case for a car of this nature, delivering 1,600 PS and a dry weight of only 1,450 kg, in the process achieving an unprecedented weight-to-power ratio. Lap after lap is being spent pushing the Bolide to the very limit in pursuit of achieving the optimum handling performance, but in line with Bugatti's philosophy that the two-seater must be manageable for drivers of all abilities.

Among the keys to this is ensuring the correct level of downforce, and that has been one of the priorities of Bugatti's expert engineering team. Challenging turns and straights are providing final validation points after months of complex development work focused on the aerodynamics that saw simulations created on some of the world's most revered racetracks — all with very different characteristics — to tune the Bolide as close as possible to its physical limits. Christian Willmann, Chief Engineer for the Bolide, explains: ''This extensive aerodynamic work usually only takes place in the top level of motorsport, but has allowed us to meticulously develop the Bolide for ultimate performance and drivability.''

The effort has paid off: the demanding program, which is ongoing, is demonstrating the extreme cornering speeds the car is capable of, with up to 2.5 G possible laterally and nearly three tons of downforce generated depending on the speed — testament to the groundbreaking aerodynamics, wide track, low center of gravity and mighty 16-cylinder powertrain.

The extraordinary performance the Bolide is delivering demonstrates Bugatti's unrelenting commitment to the bespoke treatment required for a car of this type. This is evident at the front, where a front diffuser has been developed to improve drivability. The air flowing in is compressed under the front splitter, and then expands under the diffuser, creating suction that pulls the Bolide downward. At the same time, the diffuser is also able to direct the passing air to the left and right until it exits behind the front tires.

A number of other technical innovations are also integral to the Bolide's performance. Specially designed air curtains in front of the front wheels help the air to flow perfectly around the car, reducing overall drag. Winglets on the outer edges of the front splitter develop a spiral air flow, generating a vortex that energizes the air flow to the diffuser, helping to improve rear downforce. And the narrow cab allows ideal airflow to the side intercoolers, where large inlets and deep shafts help to ensure an optimum operating temperature for the engine. Even the wing mirrors have been precisely designed to exact specifications to divert air towards the intercoolers, increasing their efficiency.

But it's not just the increased efficiency that led to Bugatti's decision to incorporate a physical rear view mirror rather than a camera system. Physical mirrors allow drivers to estimate distances between other cars more quickly, which is important on a track. "It is these small but crucial details that will allow a Bugatti Bolide driver to have a holistically fulfilling circuit experience," says Frank Heyl, Deputy Design Director at Bugatti Automobiles. "Design and technology flow into one another in the Bolide. Every technical consideration has been translated directly into an aesthetic design. The Bolide perfectly demonstrates how a symbiosis of design and technology can work in synergy and in harmony."

The highly focused Bolide performance tests are proving crucial for assessing the hyper sport car in action in real time on the track. Many of the highly technical and innovative solutions employed on the Bolide as part of its intense motorsport-focused testing program — ensuring the car delivers outstanding peak performance — were first created and tested virtually via advanced simulation methodologies. One such example of this seamless Bugatti virtual to real-world tech development and transition process relates to the geometry of the Bolide's front splitter, which was meticulously optimized across several design iterations during advanced simulation R&D cycles.

The challenge was to ensure that the front splitter always performs optimally in all driving conditions. This was especially the case for when the Bolide switched between varying driving environments, such as rapid straight-line driving into hard braking. The nose of the Bolide lowers when the driver brakes hard, allowing the front splitter to be even closer to the ground which in turn creates even more downforce. However, for a car of this stature to be easily controllable on track, it's important not to create too much downforce at the front when braking in order to maintain aero balance. As with every other facet of the Bolide, meticulous attention to detail and an unrelenting strive for perfection was undertaken by the Bugatti engineering team to optimally shape and hone the front splitter until the aero balance was perfect, even under the most extreme conditions.

The same intricate process also informed the precision engineering advancement of the Bolide's rear wing, which can be adjusted according to each track's specific characteristics. To set the car up to the exacting needs of the driver, the Bolide's highly focused aero package can be adjusted to the precise correct balance between downforce and drag, allowing each of the Bolide owners the unique opportunity to drive and experience a car with top motorsport level of performance on the racetracks of the world.

First deliveries of the Bolide will commence in 2024, with production limited to just 40 units at a net unit price of four million euros each.

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[1] Bolide: Not subject to Directive 1999/94/EC, as it is a racing vehicle not intended for use on public roads.