Attachment 6

Aston Martin DBX: Aerodynamics

Aerodynamics Highlights:

- **Fixed rear spoiler ensures both aerodynamic and aesthetic look of rear**
- **New DRL ducts reduce drag and assists in lowering rear lift**
- **DB6 towed on trailer included within CFD testing process**
- **Refinement aided by use of computational aero-acoustics**
- **Flat floor utilised to create one of the best undertray systems of any Aston Martin**

The elegant design of DBX is not crafted purely in the name of aesthetics, aerodynamics have played a huge part in how the SUV with the soul of a sports car is shaped. While a car like Aston Martin Valkyrie is designed with downforce in mind, DBX's aerodynamics are primarily about drag reduction, aerodynamic balance, acoustic refinement and efficient use of the air that passes through it for cooling.

In the process of developing DBX, the aerodynamics department created the most advanced wind tunnel model Aston Martin has ever made. The 40 per cent scale model used advanced construction methods and materials such as a 3D printed exterior body with an aluminium chassis and carbon fibre wheels. This enabled the model to be modular, which in turn allowed incredibly swift development through the introduction or alteration of parts.

Perhaps the largest aerodynamic feature is one that can't be seen at first glance. DBX has a flat floor, with one of the best systems of undertrays that Aston Martin has ever produced. This helps DBX achieve its drag targets, which in turn allow it to reach its impressive top speed of 181mph. The undertrays also have a key role in cooling the mechanical components at the rear end of the car. By the strategic positioning of small tabs, the engineers have been able to establish vortices that direct cold, high-energy airflow up towards parts like the rear differential. Furthermore, the undertray plays an important role in wind noise reduction for occupants, further enhancing the refinement within the cabin as well as protecting underbody components in multi-terrain use.

One of the more eye-catching aerodynamic innovations are the front DRL ducts. These work by creating a fast jet of air that flows through the wheel arch, around the front tyres and exits through a vent at the back of the arch. This 'air curtain' helps keep the airflow attached to the side of the car, reducing drag.

At the rear, DBX's most prominent aerodynamic aid is the high level rear wing. This not only provides localised downforce but serves an important role in channeling air over the rear of the vehicle. As air flows over the panoramic glass roof, it passes through the rear wing, remaining attached to the rear window, ensuring that water is self-cleared from the rear screen efficiently. Once the air reaches the base of the screen it meets the rear tailgate which features an integrated spoiler or 'flip', reminiscent of the Vantage sportscar, which manages airflow over the rear on the vehicle in the same manner as it does on Vantage.

The aerodynamics team was also charged with looking at vehicle soiling. Given the wide variety of terrain that DBX is intended to tackle it was important to see where dirt would be most likely to attach itself to the bodywork. In particular these findings led to the implementation of a deployable rear-view camera for the first time on an Aston Martin.

As you would expect, computational fluid dynamics (CFD) analysis was used extensively to hone the aerodynamics and, perhaps surprisingly, it was not just used on the exterior of the car. For example, the interior HVAC duct system was also tested using CFD to optimise air distribution throughout the cabin, ensuring that front and rear occupants receive balanced air flow. CFD was also used to model the aerodynamic effect of DBX when towing a trailer, with one of the more unusual scenarios including modelling airflow when towing a trailer with a 1960s DB6.

Computational aero-acoustic software was also utilised to model wind and road noise. Aston Martin is one of very few companies to employ this expensive and complicated method of research, and by understanding the noise generated by aerodynamic turbulence, it has enabled the engineers to ensure greater refinement for the occupants of DBX.

The final piece of the aerodynamic jigsaw is the utilisation of the airflow entering the vehicle. With aerodynamics and design working closely from the early stages of DBX's development, aerodynamics influenced the design, shapes and apertures of the vents in the iconic front grille, resulting in DBX achieving optimum airflow management. This ensures that the airflow through and around DBX is managed efficiently, avoiding unnecessary drag but also reducing the size and number of cooling radiators required, thereby saving weight.

With the size and proportion challenges faced by a high-performance SUV, careful management of aerodynamics is even more important, with DBX proof of the benefits that intelligent aerodynamic design can bring to this segment.