

Group 1 - Cutting Edge Low-Emission Low-Noise Aircraft

June 8, 2022

Undeniably, the dawn of flight marks one of the greatest engineering feats in human history. Over the course of a single century, taking to the skies evolved from a brotherly bonding moment on the beaches of North Carolina to a lavish luxury for the ultra-wealthy, to an accessible form of transportation to substantial portions of the population and cargo alike. Commercial aviation has been a driving force behind the rapid increase in social and economic welfare around the globe and undoubtedly is an integral part of modern-day civilisation.

Despite the abundance of positivity modern day air travel has brought to society, it cannot (and should not) outpace the ominous cloud forming above it, the defining problem of the current generation: climate change. The pertinent project requirements are in line with the roadmap put forth by the European Commission's visionary "Flightpath 2050" document; ambitious goals supplemented by the client's desire for a financially attractive investment to ensure a competitive, seamless entry into the currently A320/B737 dominated short-haul market segment.

The Design Synthesis Exercise started with the development of the project plan, procedures, and framework. Subsequently, an exhaustive list of requirements was generated which formed the basis on which initial concepts could be designed. This set the stage for a design trade-off based on emissions, noise, adjustability, design time risk, and weight. The ultimate design choice favoured a blended wing body concept, powered by a system of distributed electric ducted fans driven by hydrogen fuel cells.

Unfortunately, the limited DSE timeline necessitates narrowing the design scope. The selection of (sub)systems designs deemed worthy of particular attention was based on the intersection between set requirements and critical differences between the blended wing body and conventional fuselage-wing configurations. With respect to aircraft systems, the focus lies on designing the fuselage, wing box, cryogenic hydrogen tank, wing planform, and a propulsion system where the emissions (including noise) are predicted using preliminary models. Currently, the project is in its iterative phase, pending convergence to a final design.

Complementary to aircraft systems, particular attention is granted to providing a sustainability and adjustability plan, to ensure the continued relevance and competitive nature of the designed aircraft. It is that which makes this project worthwhile: the amalgamation of the call upon engineering ingenuity and the essential, viable plan to truly implement it, to ensure not only the survival of the sector but its continued thriving.

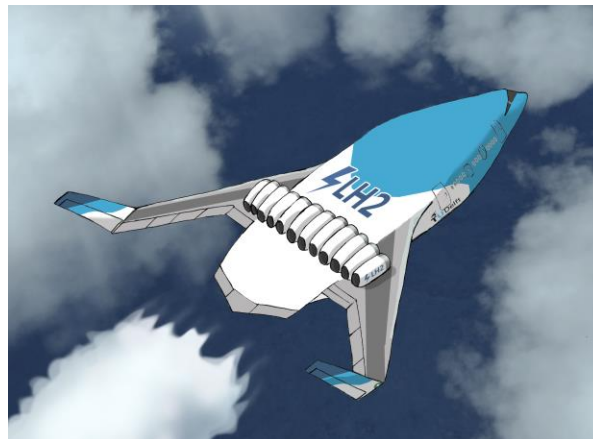


Figure 1 – Lightning2