

## Group 18 – Sustainable Air-Taxi

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Climate change represents probably the most serious crisis faced by the aviation sector. While change only happens slowly in the industry, the demand for solutions that lower the environmental impact of air travel becomes more dominant. This change needs to occur throughout all fields of civil aviation and will likely happen from smaller to larger aircraft. The *Sustainable Air-Taxi* of DSE group 18 is a six-seater, made to lower the environmental impact of aircraft throughout all life cycle stages: production, operations and end-of-life.

This environmentally friendly aircraft can fly up to 1500 km far and carry 800 kg of payload while cruising to your destination at an altitude of 5.000 metres and a speed of 475 km/h. It uses hydrogen fuel cells to cut the direct greenhouse gas emissions to nearly zero. Being stored in a liquid state at -253 °C, the hydrogen has a higher volumetric energy density and requires a less heavy tank than for gaseous storage, which would need to withstand pressures of up to 700 bars. By converting the hydrogen's energy into electricity in the fuel cells, an electric propeller driven system that emits mostly water vapour and reduces toxic emissions is created.

Next to that, the *Sustainable Air-Taxi* is one of the first to treat the problem of aircraft recyclability. In an era where modern aircraft are made of fancy-sounding but wasteful materials and make recycling them a nightmare for responsible companies, solutions need to be found that tackle this issue in a holistic manner. The devised design philosophy is founded on two pillars: firstly, the employed materials should be recyclable, and secondly, distinct sections of the aircraft should be made out of preferably only one material. This solves one of the main problems faced by aircraft recycling companies, namely that separation of different materials within sections is too labour intensive to be economically viable. Aluminium was identified as the most suitable material for this purpose, as it is highly recyclable and thereby opens the gates to a circular material stream within the aircraft industry. In order to demonstrate that aircraft structures can be developed according to this design philosophy, DSE group 18 designed a fully recyclable wing box structure using sheets, spars, stiffeners and rivets made out of one aluminium alloy (Al-7050).



Figure 1 - The Sustainable Air-Taxi