Group 24 – 100% Guilt-free flying – Jury Summary

Project Summary Urbanisation is causing growing demands on urban mobility and traffic. To both meet these demands and allow for less traffic-dense cities, Urban Air Mobility vehicles (UAMs) are proposed as a solution. However, the past few decades aerial traffic brings the additional guilt. This guilt not only comes from the toll the aircraft industry takes on the environment, but for example also the noise and degradation of air quality near airports. The goal of this DSE is to design a UAM that is 100% sustainable. The mission needs statement is as follows:

"*To provide 100% sustainable air mobility transport to meet growing demands of transport in urban areas*"

The UAM will carry two people with a maximum payload of 250kg. It will have a cruise speed of 100km/h and a range of 2x20km, with VTOL. It will be made from recyclable materials and/or sustainable raw materials.

Design project outcome In the first few weeks, a thorough project planning, outline and goals were created. Alongside the team organised itself, got familiar with the design environment of UAMs and got ready to go into the technical design phases. In the third- and fourth-week various trade-offs were performed, resulting in the design concept shown in Figure 1. The vehicle will make use of differential thrust, distributed propulsion, energy storage in the form of batteries and will have a fully autonomous pilot. The vehicle is similar to the VoloCopter 2X but will distinguish itself by its sustainable design approach and increased range. This formed a good baseline for starting the design of several subsystems. The structure, propulsion & power system, aerodynamics, and performance were all analysed in detail.

Figure 1: VoloCopter 2X, a similar design concept

Up till now the battery has been sized and configured, the aerodynamic analysis has been performed and models were built to test its aerodynamic performance after design iterations. In addition, power & cost budgets were made. A propellor and electric motor, the top structure, the skid and the fuselage structure were designed. Furthermore, a case study, integrating market analysis and operations and logistics concept, was performed. Currently, a life cycle analysis of the vehicle is made, the electrical systems are finalised, and finite element methods are applied to a CATIA-model of the vehicle. In the meantime, design iterations are also performed.

Project future Unfortunately, the DSE only lasts for 10 weeks. Therefore, the design can only be worked out up to a certain level of detail. In the future, each subsystem should be iterated a few more times to converge to a final design and optimise certain subsystems. Furthermore, controllability and stability should be assessed for the vehicle and an autonomous system should be designed and/or adjusted to the vehicle.