

# 05 - AmpAir Regional Air Taxi

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With global warming becoming more and more of a concern and regional air travel skyrocketing, immediate action is essential to reduce the carbon footprint of the aviation sector. The call for people to bring down their short-distance travel emissions is becoming significantly urgent. AmpAir provides the first step to a greener future. The team has developed a revolutionary air taxi that is easy to pilot and combines innovative technology and environmentally conscious design into a special travel experience. AmpAir offers an air travel service different from any other existing service, allowing customers to fly using increased autonomy at any time to any location for a competitive price. This optionally piloted aircraft allows to eliminate the pilot costs while being adaptable to future developments. This summary will shortly elaborate on the goals of AmpAir and its means to achieve these goals.

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## Mission Objective

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For this design exercise, AmpAir has the goal to provide a sustainable private air transport service that is less expensive and more environmentally friendly than current options. Therefore, during the design, the cost and sustainability were driving factors in making decisions. Current modes of air travel are not emission-free and private air travel is only accessible to a small group of people. By getting rid of these limitations, AmpAir will be an addition to the existing market. AmpAir aims to provide a unique experience by letting passengers pilot the aircraft themselves, while also ensuring safe travel. Based on this mission objective, the team was able to come up with a suitable design concept.

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## System Design

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The air taxi has been designed to address the market of business travellers, tourists and flight enthusiasts. The most constraining aspect of the design is the need for an emission-free aircraft, for which the team has decided to use battery-electric propulsion. This provides low complexity while staying affordable and allowing other favourable design options. One of these is the use of distributed propulsion for high-lift performance. Currently, battery technology is not powerful enough to perform the desired mission. At the same time, current certification imposes constraints on the autonomy of the design. From this, the need for a future-proof design arises and thus a timeline has been arranged, describing how the concept advances. To make it future-proof, a light, optionally piloted aircraft was chosen, suitable to carry 500 kg of payload for 400 km with  $900 \text{ Wh kg}^{-1}$ . The aircraft is now designed with a battery density of  $450 \text{ Wh kg}^{-1}$ , since this is more realistic in the near future. Because of the less powerful battery, the aircraft could, in the first years of operations, take less payload at a

lower range. To reduce the cost, passengers will fly the aircraft themselves and the empty legs will be flown autonomously. For this, a special licence can be obtained by doing a theory exam and following a one-day course, after which the piloting passenger can earn stars by gaining experience and passing exams. This way, the customer can take on as much responsibility as desired, while making piloting accessible for everyone. For safety reasons, it was then decided to introduce a ground station with remote monitors and remote pilots to ensure smooth operations. In the future, when certification becomes less constraining, less and less remote monitors and pilots will be required, which will reduce the cost. In conclusion, AmpAir will be the first affordable, optionally piloted and green means of air transportation.

