Team 2 Final Report: Sustainable Aviation with Innovations in Electric Aircraft

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Executive Summary

With climate change growing as a global concern, there has been an increasing need for more environmentally friendly aviation. As the technology for electric propulsion develops, this is becoming a feasible option to fly with higher efficiency and no operating emissions. This paper examines the feasibility of electric aircraft and provides recommendations for the government and the aerospace industry to facilitate their development.

After analyzing the current state of the art, it was determined that the limiting factor in the technology is battery capacity, as the low energy density requires heavier batteries to be used. A feasibility study focusing on battery technology concluded that battery energy density would continue to improve by 5-8% per year.

A major obstacle for the adoption of electric aircraft is the large investment required in clean energy infrastructure. Significant infrastructure upgrades are required for regional airports to accommodate the mass adoption of electric aircraft. Another major component of the political infrastructure required to support the adoption of electric aircraft is the creation of a certification guideline for electric aircraft. Also, future infrastructure initiatives must be focused on creating a development platform for electric aircraft in order to attract further investments from the private sector.

The economic, environmental, and social impacts of the electric aircraft were analyzed. Based on the findings, it was concluded that operating costs for airlines are projected to be between 10-20% higher depending on the design configuration of the aircraft. With regard to the environmental impact, the processes needed to power the electric aircraft result in 20% higher CO2 emissions compared to a modern jet, but the overall warming intensity of the electric aircraft is 30% less than a modern jet given the reduction in other greenhouse gas emissions. Moreover, the electric aircraft is projected to be up to 36% quieter during landing and takeoff, thus causing less disturbance to surrounding communities of the

airports whilst also extending the operational hours of airports. Assurance of safety will be key for the social adoption of electric aviation.

Regulators are recommended to streamline the certification process in order to enable manufacturers to begin the process of recouping the front-loaded costs associated with the development of electric aircraft. Through completing the guideline to certification that is currently being developed by the FAA and MagniX for electric engine manufacturers, regulators will open the door for countless retrofitting and fleet upgrade projects.

A recommendation for aircraft manufacturers is to make the necessary investments now to ensure that they have access to competitive battery technology as breakthroughs are developed. This can be achieved by either increasing internal research and development expenditure or by developing lasting relationships with leading battery manufacturers. Furthermore, manufacturers must also review the aircraft design requirements necessary to install electric motors and the supporting equipment for it to function.

A recommendation for governments and airlines is to encourage funding and investment in aerospace research programs. Secondly, governments and airlines are recommended to inform the public about the benefits of electric aviation. At the same time, they should conduct passenger surveys on their concerns and expectations for electric aviation.

The recommendation for governments and energy suppliers is a progressive and controlled shift towards a cleaner energy generation mix with energy costs being strongly considered at every stage. Following the analysis, nuclear power generation is recommended as the most suitable option for the current landscape. The recommended action is for the governments to subsidize the clean energy rates for energy intensive operations such as aviation.