Chapter 5
Selection of US Regional Electric Air Routes for Public Benefit Maximization

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ABSTRACT

With electric commuter aviation a likely actualization within a few years, there exists an opportunity to utilize this technology to address externalities in the aviation sector. This study aims to answer the question of which US regional air routes would provide the most public benefit should they be operated by an electric fleet. Public benefit is considered along three dimensions: emissions reduction potential, noise reduction potential, and community alignment. The community alignment category contains tax base, workforce, economic development, and political priority considerations. The alternatives considered are the communities of the Essential Air Service, excluding Alaska. A comprehensive scorecard is developed for these candidate air routes, with a tier of nine top scoring air routes identified by this methodology. A potential short haul network appropriate for aircraft electrification is also identified. Recommendations are provided as to how a federal implementation authority may use these results to inform strategy around aircraft electrification policy.

INTRODUCTION

Aviation is an important segment of the transportation industry, connecting communities without the infrastructure cost necessary for rail or road. However, the climate crisis imposes a need to reevaluate aviation and its impacts, given the significant carbon footprint of this sector's activities. Policy options such as taxes and short-haul flight bans have been proposed in different parts of the world to reduce aviation activity (Gössling & Lyle, 2021, pp. 643–658); however, these tend not to be applicable for every community, especially where rail is not a feasible clean travel alternative. For many rural communities in the US, air travel is necessary for social inclusion and economic development. As such, a

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more promising pathway towards reducing the carbon footprint of aviation is aircraft electrification, an exciting industry milestone likely only a few years away. While the technology is imminent, what still needs development is a realistic implementation plan for public benefit maximization.

Electric aircraft bring benefit to communities not only through emissions reduction but through noise pollution reduction and social and economic development. This study explores the extent to which these factors should be considered in evaluating air-routes for electric aircraft implementation and develops a scorecard for alternatives as a comparative analysis of the total benefits possible. The existing body of knowledge will inform the details of this scorecard methodology, and as a result recommendations about which areas are ideal for aircraft electrification will be provided. This will be contextualized with existing federal programs that could incentivize such an airspace transformation once electric aircraft are certified and available on the market.

BACKGROUND

Technology adoption is an area in which the role of the public sector may largely vary case by case. Often it is appropriate for market forces to drive the integration of new technology into community life as firms make choices that allow for better operating efficiency and consumers select new products with the most perceived value. However, new technologies may also pose solutions to problems with larger community impacts, giving rise to the case for public sector involvement in technology adoption. The modern aviation industry presents such an opportunity to address community issues. A correlation between air travel access and economic growth and social inclusion has been repeatedly established (Smyth, Christodoulou, Dennis, Marwan, & Campbell, 2012, pp. 53–59) but this benefit is paired with the existence of negative externalities, specifically noise and emissions. As these impacts are borne by members of the community not involved in the transaction of air travel, public sector intervention is appropriate in better distributing these costs.

While economic intervention can address these externalities, they may also be largely reduced by technological improvement and adoption. Specifically, new electric aircraft designs promise zero-emission regular operation and a significant reduction in aircraft noise. The technology needed to realize this vision is no longer a hypothetical; though they are currently awaiting FAA and ICAO certification they have a realistic path to commercial operation by 2025 (Schwab, Thomas, Bennett, Robertson, & Cary, 2021). These aircraft are ideally sized for regional travel, connecting rural communities to hub airports. The model most likely to enter the market first is Eviation's Alice, with test flights slated for 2022 (Anderson, 2019, pp. 10–11) but notably Bell, Pipistrel, Boeing, and Airbus also have proposed designs (Moua, Roa, Xie, & Maxwell, 2020, pp. 48–59). The Eviation design and competing prototypes of comparable performance would seat 8–19 passengers and an operating range approaching 1000 km (Secretariat, ICAO, 2019, pp. 124–130). Globally, flights under 1,000 km constitute more than 17 percent of all airline emissions (Esque, Riedel, & Riefer, 2021) so the substitution of existing craft with all-electric designs would have a significant impact. Studies in other countries have found net emissions reduction of over 60 percent when considering all operations of regional airports (Baumeister, Leung, & Ryley, 2020). Other designs under consideration include hybrid electric aircraft, which would also reduce the intensity of the negative externalities of emissions and noise to a significant degree (Prapotnik, Kamnik, Marksel, & Božičnik, 2019, p. 1864).