“Tower, this is Ghost Rider requesting a flyby” – Establishing a Benefit Case for New Airport Traffic Control Towers

(technical research project in Systems and Information Engineering)

The Rise of Flight Shaming in Europe: How Peer Pressure is Reshaping Transportation

(STS research project)

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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General research problem

How can the impacts of growing aviation travel on surrounding communities be improved? As civil aviation expands, so do its latent functions. Smaller airports are handling more traffic. The International Air Transport Association suggests that global annual passengers could double to 8.2 billion by 2037 (IATA 2018) given current growth. Increases in private and commercial air traffic are greatly increasing pollution. Carbon emissions from commercial aviation rose nearly 30% from 2013 to 2018 according to the International Council on Clean Transportation (ICCT 2019). These impacts must be monitored and improved.

Establishing a Benefit Case for New Airport Traffic Control Towers

What justifies a small airport to build a new, raised Air Traffic Control Tower? The project is in the *Systems and Information Engineering* Department. The technical advisor for this Capstone project is Dr. Cody Fleming. The project collaborators are Austin Anderson, Toby Handsford, Mason Jordan, Sragi Khakurel, Micheal Quinn, Katherine Taylor and Amy Xie.

Small airports frequently look to expand their operations by building new air traffic control towers (ATCT). New ATCTs improve safety and efficiency of an airport, allowing for an increase in traffic flow. These changes bring jobs and economic growth to the surrounding communities. When looking to build a new tower, small airports attempt to receive funding from many sources. The first choice for funding is the Federal Aviation Administration (FAA). If an airport can meet certain criteria set forth by the FAA, full funding will be given to them. When these criteria are not met, airports must look to local communities or private donors for funding. The criteria for receiving a tower last updated by the FAA in 1990 in a document titled

"Establishment and Discontinuance Criteria for Airport Traffic Control Towers" (FAA 1990). These criteria are outdated and need to be adjusted to reflect the changes in cost and technology in the aviation industry. The current model lacks a robust benefit case.

My team's task is to update and create new guidelines measuring the benefits of new tower construction. We will create a quantitative model that measures the costs and benefits of building a new tower. Our model will be built using case studies to help define metrics and data driven analysis to help formulate an equation. We will us RStudio to analyze our data. This model will be used to decide whether or not a new tower should be built. Our project will be constrained to considering non-towered airports looking to grow. We will not be able to directly observe a tower before we create our model, limiting our first hand experience. We will be limited to public sources for our data given the expense of collecting our own.

If we succeed, we will finish with an improved method of determining whether or not an airport should expand by building an ATCT. This will guide many smaller airports in their decision to apply for funding by giving them a simplified set of guidelines.

The Rise of Flight Shaming in Europe: How peer pressure is reshaping transportation

How do advocates of reducing carbon emissions from aviation advance their agendas?

Transportation is currently the leading contributor to greenhouse gas (GHG) emissions in the United States (fig 1), and the fastest growing sector in terms of GHG emissions (Rhodium 2019). Without counteracting measures, CO2 emissions aviation may grow from 2% to 25% of the worldwide carbon budget by 2050 (ICCT 2019). Schafer & Waitz estimate GHG pollution from aviation costs nearly $10 billion annually in global damages (Schafer & Waitz 2014), and would

only continue to rise given current projections. Aviation is becoming a major detriment to the global environment.

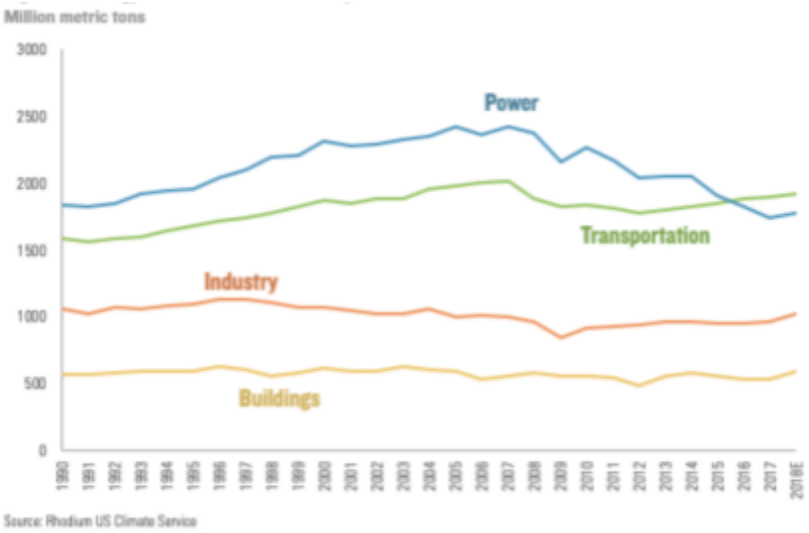

Figure 1. "Energy related CO2 emissions by sector" (Rhodium 2019)

The aviation sector is a major contributor to the global and U.S. economies. The FAA (2016) found it was responsible for $1.6 trillion in economic activity, supported 10.6 million jobs and accounted for 5.1% of the total GDP in 2014. The Air Transport Action Group (ATAG 2005) estimates that aviation globally accounts for roughly 29 million jobs, produces $3 trillion in economic activity and accounts for 8% of GDP. The ATAG (2005) also estimates that 40% of international tourists travel by air (ATAG 2005). Cao, Galinsky and Maddux(2014) have found that international travel builds trust among nations. Aviation plays an important role in global economies and relations.

Advocates of reducing aviation carbon emissions have engaged social awareness campaigns and boycotts. Members of Fridays for Future have boycotted flying in favor of alternate transportation (Thunberg 2018). Members of We Stay on the Ground encourage others to sign a pledge promising to not fly in 2020 (Free Flight UK 2019). Both groups also spread aviation pollution facts.

Six participants are the Air Transport Action Group (ATAG), Fridays for Future (FF), the International Air Transport Association (IATA), the International Civil Aviation Organization (ICAO), the International Council on Clean Transportation (ICCT), and We Stay on the Ground (WSG). ATAG is a not-for-profit association representing the aviation industry. They "work to promote aviation's sustainable growth for the benefit of our global society" (ATAG). Funded by aviation industry leaders such as Boeing and Rolls-Royce, the association publicizes industry efforts to reduce its climate impact. FF are organized advocates of climate conservation (FF, n.d.). Its members aim to raise awareness through protests and campaigns. They have recently drawn the awareness of the United Nations through their efforts. IATA is a trade association representing many of the world's largest airlines. They work to promote the wellbeing of aviation by publishing industry standards. ICAO is a UN agency established to "achieve sustainable growth of the global civil aviation system" (ICAO, n.d.). It is a forum for UN member states to promote their aviation industries. ICCT is an independent not-for-profit organization. Their goal is "to improve the environmental performance and energy efficiency" (ICCT, n.d.) through research. Members of WSG "spread awareness about the climate impact from flying and work for reduced air travel" (WSG, n.d.). They aim to spread awareness using the media and the internet.

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