Economic, Safety, and Efficiency Benefits of Air Traffic Control Towers at Small Airports
(Technical Topic)

Sources of Air Traffic Control's Funding and Innovation Issues in the United States
(STS Topic)

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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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Introduction

Beginning approximately ninety years ago in the United States, air traffic control has become one of the most sophisticated systems in the United States, both systematically and technologically. The concept of a system for assisting air traffic began in the 1920s after a series of accidents occurred. The government took full control of air traffic control operations in 1941 and more recently established the Federal Aviation Administration (FAA) in 1958 to run air traffic control (Eno Center for Transportation, 2016). Ever since the government took full control, there has been a constant issue with the funding and innovation for new technologies (Van Beek, 2017). Much of the technology on which the system relies has not changed in decades, especially in the control towers, and there were even threats to close down existing air traffic control towers. These issues have led to debates on whether air traffic control should be corporatized or not, as it has been in several countries apart from the United States. Some members of congress have proposed bills for corporatization, but none have gained enough political support to be put into action (Eno Center for Transportation, 2016). Air traffic control towers, which facilitate takeoffs and landings at airports, are an integral part of this system. The FAA gives grants to many of the larger airports for building and operating these towers. However, countless of the smaller airports have a much harder time receiving these grants and instead rely on pilot-to-pilot communication (Carey, 2014). In addition to increased safety and efficiency, the smaller communities want these towers and because they allow for more commercial and corporate planes to fly into their airports, which bring more people and business to their towns.

In order to lower costs, improve efficiency, and enhance business in smaller communities, the technical project outlined in this prospectus will look at the benefits of building

air traffic control towers at small airports, with a special focus on remote towers. Remote towers serve this same function as regular air traffic control towers, but use superior technology and have lower costs. My capstone team plans to build a computer model that will be able to determine and quantify the benefit of a tower at a given airport. The STS research will focus on the root causes of the issues within the air traffic control. The research will involve looking at the changes in the structure of the system in the past, the different air traffic control stakeholders' incentives, and the implications for future changes in the overall structure.

Technical Topic: Economic, Safety, and Efficiency Benefits of Air Traffic Control Towers at Small Airports

Currently, in order for an airport to get funding for an air traffic control tower from the FAA, it needs to have a benefit-cost ratio of above one, according to an FAA handbook (AOPA, 2005). The benefits include, but are not limited to, reducing delays, increasing air traffic capacity, and improving passenger comfort and convenience, while the costs mainly result from building and operating the tower (AOPA, 2005). Unfortunately for these smaller airports, this ratio makes it very difficult for them to get a desired tower. The issue has gotten to the point where almost no airports have used the ratio for years. Air traffic control towers are expensive to build and have an average yearly operating cost of $450,000 (AOPA, 2005). Communities either have to live without a tower or raise the funds themselves if they do not meet the threshold. The cost is too great for almost all of the airports that do not currently have a tower to fund themselves.

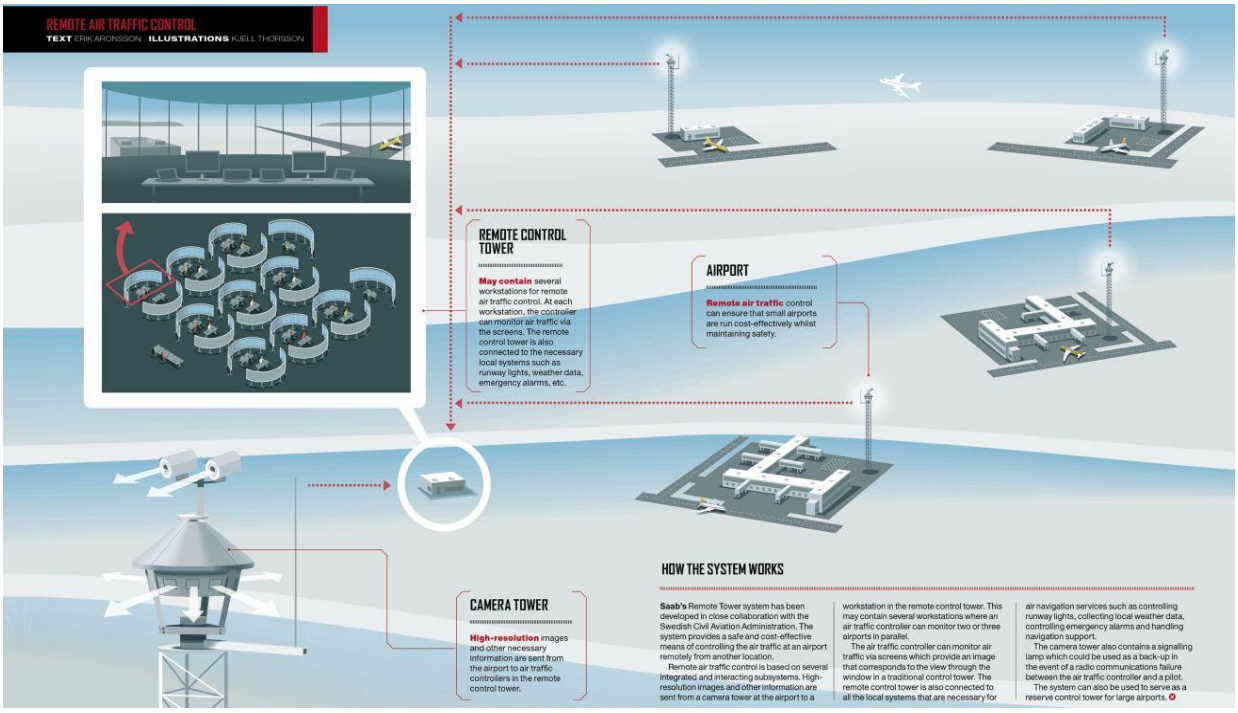

Figure 1: An overview of how the remote air traffic control system works for airports, including cameras, control room, and information flow with descriptions (SAAB, 2015)

Remote towers are essentially a system of cameras and sensors that serve the same purpose as a brick and mortar tower. The data goes to a control room operated by an air traffic control crew. The control rooms can be up to hundreds of miles away, and one control room can facilitate takeoffs and landings for several small airports (Reason Foundation, 2017). In addition, these remote towers are much cheaper to build and operate than the traditional air traffic control towers, especially when many airports are connected to one control room. Unfortunately, remote towers are not currently approved for use by the FAA. Many European air traffic control systems have implemented remote towers into their airports in recent years and more continue to do so. The remote tower systems that exist outside of the U.S. today have been successful in terms of safety, efficiency, and economy (Van Beek, 2017).

If the FAA does not change the benefit-cost ratio grant system or neglects to implement the remote tower technology, thousands of these small airports will not be able to get a tower in

the foreseeable future. Without a tower, airports usually do not meet the requirements to allow for large corporate and commercial planes (AOPA, 2005). While a tower is not always necessary to meet these requirements, many airlines are reluctant to fly to non-towered airports. Therefore, there is no way for these communities to allow the air traffic for the business and growth they desire. The FAA remains behind on remote technology, as many European countries have begun using remote tower systems, including Germany, Sweden, and Norway (Van Beek, 2017). Projecting further ahead, the lack of new technology in air traffic control it will make it ever more difficult to deal with the continuously increasing air traffic volume.

If the FAA and airlines can understand the benefit of air traffic control towers, and more specifically remote towers, at these small airports, they can begin to make strides in helping these communities. The remote tower alternative is feasible and has proved successful. There is even testing underway from remote towers at the airport in Leesburg, Virginia, and, while the FAA is not running the experiment, they have become a partner (Klopf, 2018). The main challenges involve the protocols and safety standards for air traffic control in the US, but with sufficient data and continued testing, this can be overcome. The deliverable for our capstone project will be a model to quantify the benefit of air traffic control towers at given airports. We will be able to insert an airport with its data into the model, which will output a score on how much a tower can benefit airport, considering factors like efficiency, safety, potential for more air volume and larger planes, among others.

STS Topic: Sources of Air Traffic Control's Funding and Innovation Issues in the United States

The underlying causes of issues with the FAA and air traffic control are unfortunately not as obvious as the issues themselves. There have been many changes in the precise structure of the FAA and other organizations in air traffic control over the years. After the FAA started in

1958, the United States Department of Transportation (USDOT) was formed in the 1960's. The FAA then became a modal administration, or sub-administration, within USDOT. Soon after, funding difficulties began to arise due to a rapid increase in air travel, leading to the creation of the Airport and Airway Trust Fund (AATF) in 1970. This fund established a set of taxes on the aviation tickets and fuel. Problems persisted and talks began about the corporatization of air traffic control by the Reagan Administration. Congress then signed the Aviation Safety Commission Act of 1986 which formed a committee to study how the FAA could be more efficient. The final report recommended that, "FAA be transferred from USDOT and be established as a user-funded authority." (Eno Center for Transportation, 2016 n.p.). Over the next two decades, studies within the government concluded that major reform was necessary to keep up with advancing technology and lower costs. One report suggested the creation of a government owned corporation to run air traffic control, and in 1995, a congressman actually proposed a bill to make a separate corporate entity for air traffic control. However, lack of support from airlines and the rest of congress led to the bill not passing. In 2000, Bill Clinton signed an Executive Order to create the Air Traffic Organization (ATO) as a performance-based organization within the FAA (Eno Center for Transportation, 2016 n.p.).

Although there have been many changes and attempts to improve the system in the past, the core issues with air traffic control persist. The AATF has helped with funding, but still only covers around 80% of the budget for air traffic control, while the rest comes from general fund appropriations (Eno Center for Transportation, 2016 n.p.). In the event of a Federal government shutdown, air traffic control funding is among the first issues to arise. During the 2013 shutdown, 189 operating towers were scheduled to stop service. Congress, however, stepped in quickly and issued a transfer of funds, keeping those towers under operation (Van Beek, 2017).

Small communities have been particularly damaged by these issues, as many flights to small airports are not profitable for airlines. The only reason many of these smaller flights remain in service is due to government subsidies (Cagri Ozcan, 2015 p. 24).

Figure 2: Annual subsidies for select small airports in Minnesota and North Dakota and the effect of potential budget cuts, which could make it much more difficult for airlines to provide service to these remote towns (Ingersoll, 2017 n.p.)

In addition to budgeting issues, the United States also lags behind many European countries in air traffic control technology, even outside of the remote towers. Not only does the advanced equipment improve the safety of the system, most also drive down operating costs (Eno Center for Transportation, 2016).

In order to better understand the causes of the underlying issues with air traffic control in the United States, I will conduct deep research into the history of air traffic control, the structure of the organizations that help run the industry, and different stakeholders within the system. With

the help of Actor-Network Theory, how the issues have arisen and persisted will become clearer when looking into the evolution structure of the air traffic control system. With a better understanding of the roots of the difficulties, the government and aviation industry will know where to begin to create a new alternative.

Conclusion

My capstone group plans to build a model used to quantify the benefit of an air traffic control tower would bring to a small airport. Data for a given airport will be required for the input of the model, including amount of air traffic, delay rate, total budget, among others. The model output will estimate the improvement of efficiency, economy, and safety that a tower would bring to the airport. For the STS research, my thesis will involve an analysis of the causes of the underlying issues of the national air traffic control system.

For our technical work, if our group can develop a reliable model involving all of the important benefits of the towers, the FAA and other leaders in aviation can begin to discuss further implementation. In addition, the lower costs and high effectiveness of remote towers can be more widely understood and put into action. In the STS research, I hope to clear up uncertainty surrounding the budgeting and innovation issues of air traffic control in the United States. Do the government and FAA deserve most of the blame? To what extent have airports and airlines contributed to the problems? By looking at the events that have shaped the system today, a better understanding of how to correct many of the issues can become more apparent. In addition, with the help of effective model systems in other countries, a better system with less budget and technological shortcomings can be attainable in the not-so-distant future.

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