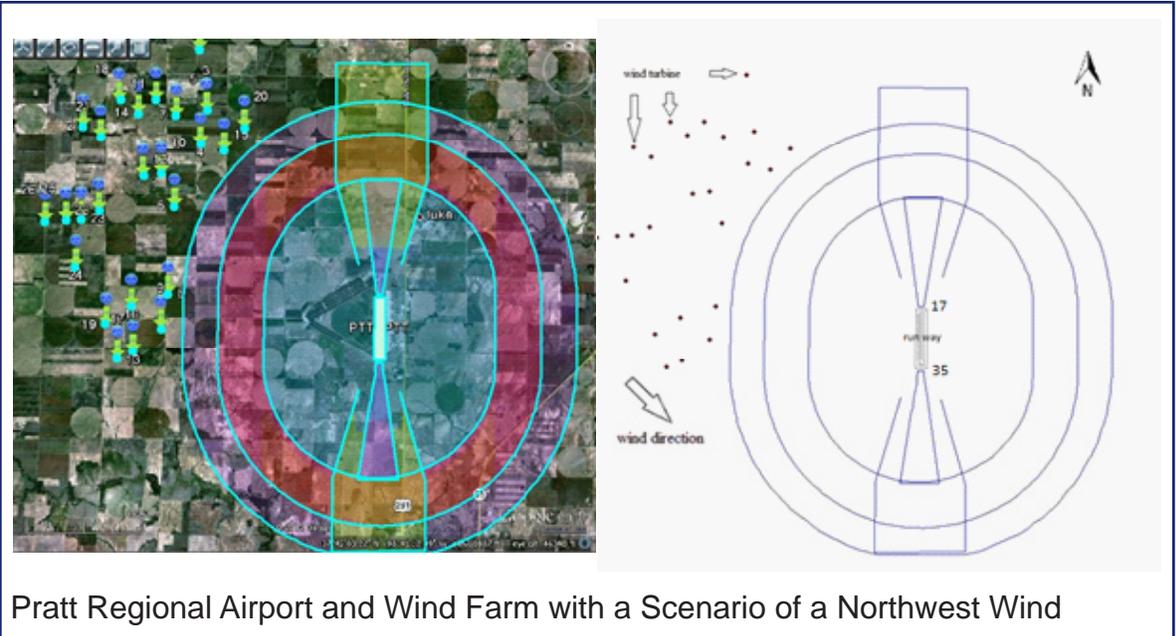


# Wind Farm Turbulence Impacts on General Aviation Airports in Kansas

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TECHNICAL SUMMARY



Pratt Regional Airport and Wind Farm with a Scenario of a Northwest Wind

## Introduction

Wind turbines and wind farms have become popular in the State of Kansas. Some general aviation pilots have expressed a concern about the turbulence that the spinning blades are creating. If a wind farm is built near an airport, does this affect the operations in and out of that airport? Other problems associated with wind farms are their impact on agricultural aviation and their influence on radar detection of aircraft in the vicinity of a wind farm.

## Project Objective

This research project has three objectives:

1. Determine the amount and pattern of the turbulence from a single wind turbine.
2. Determine the amount and pattern of wind turbulence from a wind farm, both in a horizontal direction and in a vertical direction.
3. This information will result in recommendations concerning the location of wind farms and their impacts of the safe operation of airports and other aviation activities.

## Project Results

The results of this project support the findings in the literature search that the turbulence from a wind turbine can impact operations at a general aviation airport. Two case studies were

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used to illustrate the impact of turbulence from a wind turbine on a general aviation airport. This project analyzed the roll hazard and the crosswind hazard resulting from a wind farm located near a general aviation airport. The wind turbine wake model is based on a theoretical helical vortex model and the decay rate is calculated following the aircraft wake decay rate in the atmosphere.

The roll hazard analysis showed that for the Rooks County Regional Airport, the potential roll hazard index is in the high range as far out as 2.84 miles. For the Pratt Regional Airport, the roll hazard index is in the high range as far out as 1.14 miles. These numbers are based on a gust wind of 40 mph that is below the turbine brake wind speed of 55 mph. As the results show, the scenario is different according to the relative locations and orientations of the airport and the nearby wind farm. Therefore, the analysis has to be performed for each specific regional airport.

The crosswind hazard analysis for the Rooks County Regional Airport showed part of the airport in the high range even under the mild wind condition at 10 mph.. The wind turbine wake increases the crosswind component to more than 12 mph which is considered high risk crosswind for small general aviation aircraft. For the Pratt Regional Airport, the crosswind hazard is relatively small under the mild wind condition (10 mph). When there is a gust of 40 mph wind, the turbine wake induced crosswind puts the majority of runway areas to high hazard areas at both of the airports.

It is recommended that additional studies should be performed to draw the proper correlation between the hazard index developed in this study and the safe operation of aircraft at low airspeeds and at low flight altitudes operating near or at a general aviation airport.

## Report Information

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