

# Fuel-Optimal Flight in Uncertain Wind

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## An algorithm to guarantee the required arrival time and optimize aircraft fuel usage

Georgia Tech inventors have developed an algorithm to account for forecast uncertainty in arrival time estimates. The algorithm can account for wind forecast uncertainty in RTA calculations by reformulating the speed profile of the aircraft as a multi-stage random process program. This is done using a wind forecast uncertainty model to generate scenario sets for fuel optimization. The method can calculate a fuel-efficient air speed for achieving an RTA over a flight path. This algorithm serves to both guarantee RTA adherence, as well as minimize the amount of fuel needed to operate in uncertain wind forecasts.

### Summary Bullets

- **Accurate:** Process uncertainty model provides more accurate results than current models
- **Efficient:** Optimization model provides fuel-optimal air speed over flight path
- **Novel:** First method to leverage knowledge of wind forecast uncertainty in a random process framework

### Solution Advantages

- **Accurate:** Process uncertainty model provides more accurate results than current models
- **Efficient:** Optimization model provides fuel-optimal air speed over flight path
- **Novel:** First method to leverage knowledge of wind forecast uncertainty in a random process framework

### Potential Commercial Applications

- Aircraft flight management system

### Background and More Information

Aircraft trajectory estimation is a limiting factor in the performance of required time of arrival (RTA) technologies due to the effects of wind forecast uncertainty on estimated arrival times. Inaccurate wind estimates lead to increased required control authority, a pilot's need to command an airplane response to environmental conditions, and in turn, the amount of fuel needed to meet issued RTA.

### Inventors

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## **IP Status**

: US8781651B2

## **Publications**

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## **Images**

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