

# Flight Option Generation for NextGen Automation

Craig Wanke

(703) 983-3634 • [cwanke@mitre.org](mailto:cwanke@mitre.org)

MITRE Sponsored Research (MSR)



# Problem



- **Trajectory-Based Operations (TBO) is a foundation element of the Next Generation Air Transportation System (NextGen) concept.**
- **In TBO, traffic is managed to meet system constraints by negotiating flight-specific trajectory plans, but there is no accepted mechanism or metric for generating or evaluating flight trajectory options.**
- **Options can involve new routings, altitude constraints, ground delays, time constraints at a point, etc.**
- **A flexible, fast, multi-constraint algorithm is needed to develop and evaluate flight options for NextGen automated traffic management systems.**



# Objective



- **Develop a standard framework and algorithms for generating and evaluating flight options to enable the highly collaborative and automated TBO envisioned in NextGen**
  - **Establish option desirability factors and model them**
  - **Develop option generation methods in this context**
  - **Prototype methods and couple to CAASD decision-support research platforms for evaluation**
  - **Test and develop requirements for NextGen systems.**
- **In the first year, we will focus on prototyping the first-generation of NextGen decision support systems currently being specified by the aviation community.**

# Activities

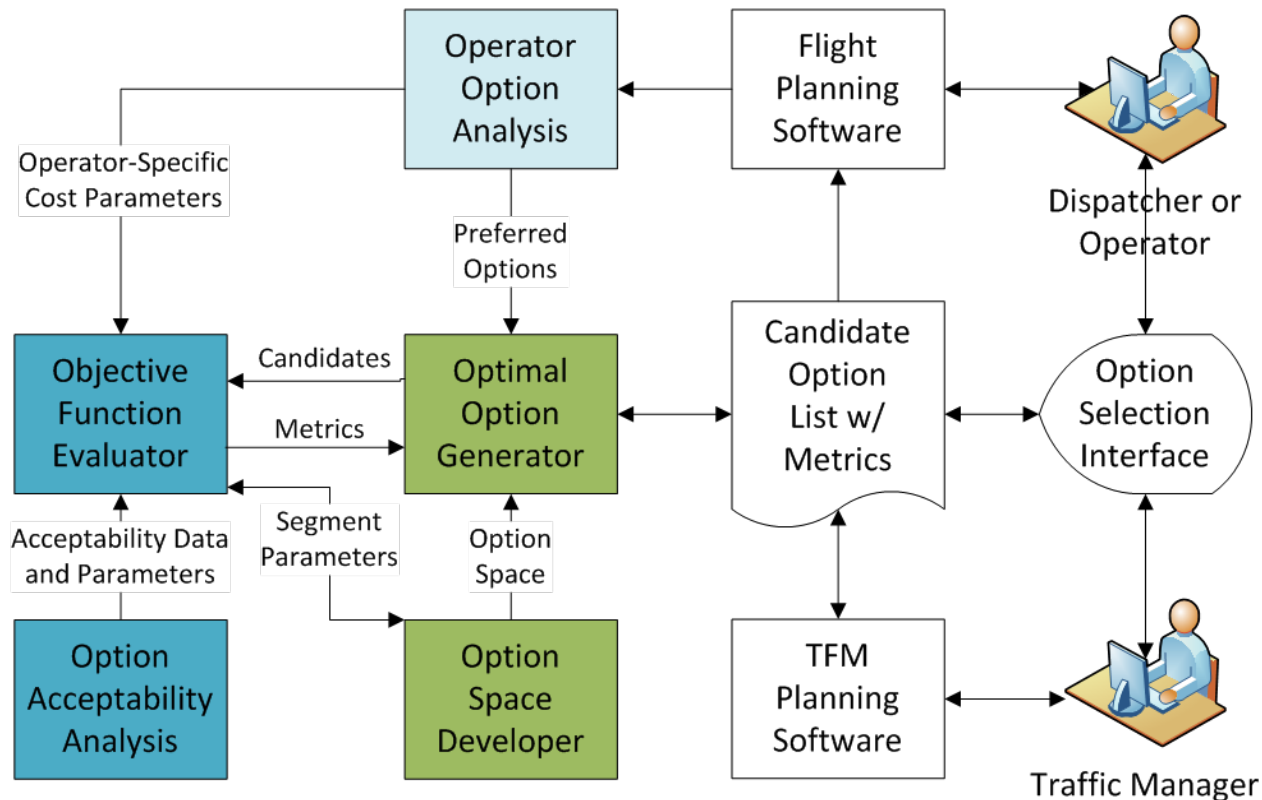


- Interview operational personnel (traffic managers, controllers, pilots, dispatchers) and review literature to determine measures of flight option desirability.
- Formulate a parameterized model of option desirability.
- Construct an algorithm to “grow” options for consideration in specific situations.
- Build, test, and compare to predefined choice methods.
- Apply result to current CAASD research in TFM decision support, to improve operational acceptability.
- Derive requirements for first-generation NextGen systems.
- Extend results to support TBO-based NextGen systems.
- Derive requirements for TBO-based NextGen systems.

# Highlight

A functional diagram of the Flight Option Generator.

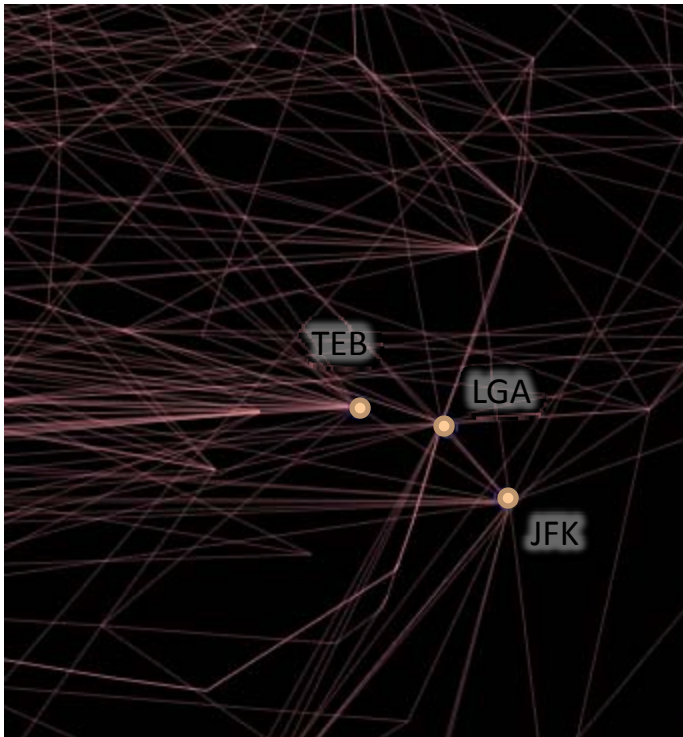
Human decision makers can interact with it through an option list (manually) or through their automated decision-support systems.



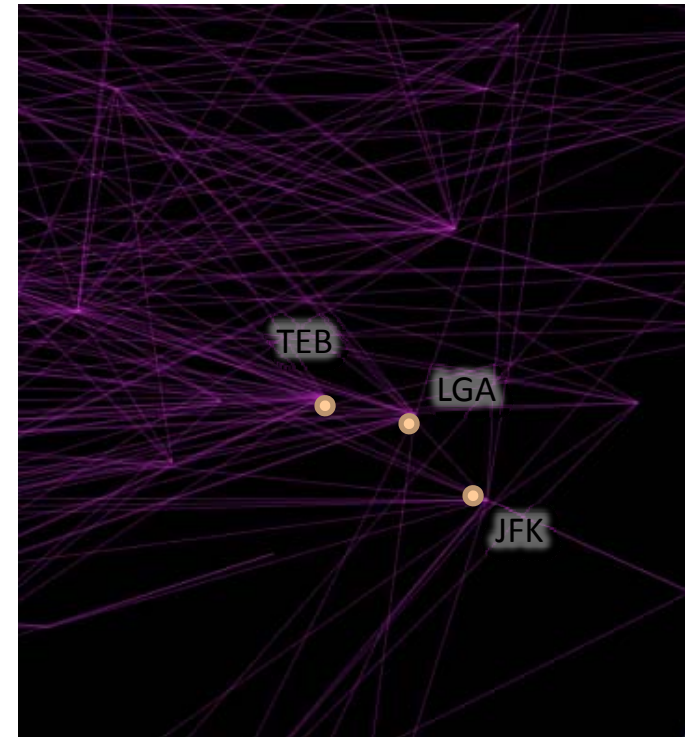
# Highlight

An important factor for reroute designs is how well they conform to dominant traffic flows. These plots show primary traffic flows in the New York area for flights to and from the Chicago metropolitan area. Heavier weighting on a route segment represents higher usage.

Route segment usage from Chicago area to NY area



Route segment usage from NY area to Chicago area



Arrival routes to La Guardia (LGA) and John F. Kennedy (JFK) are clearly defined, Teterboro (TEB) has more variation. Departure routes are more diffuse, since there are more departure routes available.

# Impacts



- **Provides a powerful enabling technology for a variety of proposed NextGen applications**
  - **Allows visualization, analysis, and benefits assessment of NextGen decision-support concepts.**
- **This will accelerate NextGen concept triage, prototyping, demonstrations, and deployment.**
- **If successful, we expect transition to the funded FAA work program in two years.**

# Future Plans

