

Aeronautics

Method and System for Air Traffic Rerouting for Airspace Constraint Resolution

National Airspace System Constraint Evaluation and Notification Tool (NASCENT)

NASA's National Airspace System Constraint Evaluation and Notification Tool (NASCENT) is a dynamic constraint avoidance system that automatically analyzes routes of aircraft flying, or to be flown, in or near constraint regions and attempts to find more time and fuel efficient reroutes around current and predicted constraints. NASCENT provides an evaluation of avoidance routes that save more than a user-specified number of minutes of wind-corrected flying time savings, for all the 20 Air Route Traffic Control Centers (ARTCCs or Centers) in the National Airspace System (NAS) simultaneously. The dynamic constraint avoidance route system continuously analyzes all flights and provides reroute advisories that are dynamically updated in real time. This system includes a graphical user interface that allows users to visualize, evaluate, modify if necessary, and implement proposed reroutes.

BENEFITS

- ➔ Ease of use for all 20-Centers
- ➔ Provides fuel savings and reduced delays
- ➔ Environmental emissions reduction
- ➔ Real-time congestion, Special Use Airspace, Traffic Management Initiatives
- ➔ For airborne and pre-departure flights
- ➔ Air traffic data with one-minute updates (ASDI feed)
- ➔ Agnostic of weather-model
- ➔ Nation-wide simulation and analysis capability

technology solution



THE TECHNOLOGY

NASCENT employs the National Airspace System (NAS)-wide simulation and analysis capability of the Future ATM Concepts Evaluation Tool (FACET), along with weather avoidance algorithms. For individual flights, NASCENT uses the aircraft performance tables specified by the Base of Aircraft Data (BADA) for computing climb, cruise and descent trajectories. Similar to the original Dynamic Weather Route (DWR) automation, reference routes are created that save more than a user-specified number (e.g., five minutes) of flying-time savings. The return capture fix for the reference route is the last fix on the current flight plan within a limit region. These routes are checked against the weather avoidance polygons and auxiliary waypoints are added as necessary to avoid modeled weather. The wind-corrected flying-time savings are recorded for each flight. The NASCENT system evaluates weather avoidance routes based on weather polygons provided by different convective weather products. The weather polygons are first converted into convex hulls and inflated by a user-specified number of nautical miles (e.g., 20 nmi) to account for the FAA-required separation from a weather region. These weather polygons are avoided using a binary tree search for each maneuver along the left-side and right-side, all the way up to the return capture fix, to find a minimum deviation delay solution. The NASCENT system provides notification for congested sectors along the current flight plan and the proposed avoidance route. The system provides sector congestion in one-minute bins to aid the user's decision-making. It also reports traversal of all FAA denoted Special Activity Area (e.g., Military Operations Areas, Restricted Areas, etc.) and flights impacted by FAA imposed required Traffic Management Initiatives (e.g., reroutes).

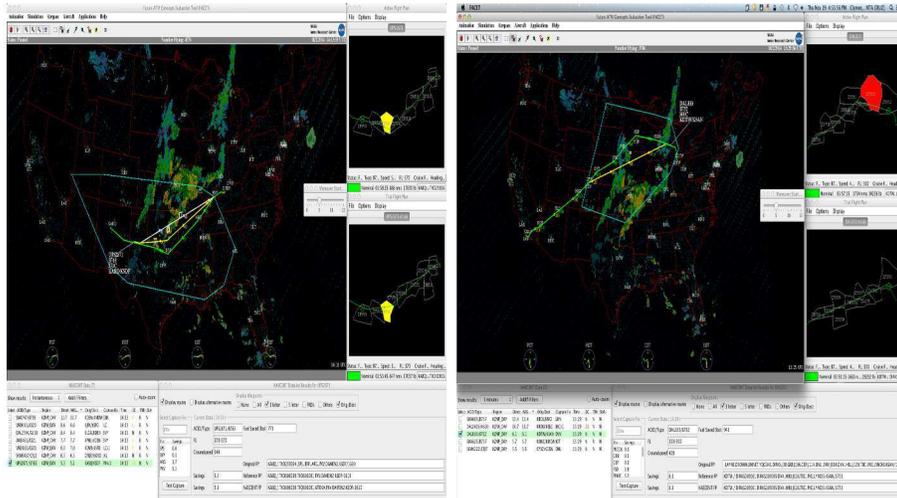
APPLICATIONS

The technology has several potential applications:

- Aerospace industry
- Air Traffic Management
- Airline Dispatchers
- Airline Air Traffic Coordinators

PUBLICATIONS

Patent Pending



L: Current flight plan (green) and NASCENT advisory (yellow), with potential savings of 5.1 min. Fort Worth Center limit polygon (cyan) is used to determine how far downstream a flight can go using this automation. R: Current flight plan (green) and NASCENT advised direct route (yellow) with potential time-savings of 6.1 min. Minneapolis Center limit polygon (cyan) is shown.

National Aeronautics and Space Administration

Technology Partnerships Office

Ames Research Center

MS 202A-3
Moffett Field, CA 94035
855-627-2249
ARC-TechTransfer@mail.nasa.gov

<http://technology.nasa.gov/>

www.nasa.gov

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