Aeronautics

Dynamic Weather Routes Tool

A method and system for dynamic automated corrections to weather avoidance routes for aircraft in en-route airspace

NASA has developed a ground-based aircraft flight automation system and tool that can save significant amounts of time and fuel in challenging weather situations. The Dynamic Weather Routes (DWR) tool continuously and automatically analyzes in-flight aircraft in en-route airspace to find corrections to pre-selected weather avoidance routes. Convective weather, such as severe thunderstorm activity, is the largest cause of delay in the U.S. National Airspace System. When such weather is present or forecast on preferred flight routes, weather avoidance routes are selected before takeoff. They often include large buffers to compensate for forecast uncertainty. As flights progress, airline dispatchers and Federal Aviation Administration (FAA) traffic managers strive to find improved routes to reduce delay. However, operators are busy, especially during weather events, and may miss opportunities for more time- and fuel-efficient routes. Automation hasn't previously existed to help operators determine when weather avoidance routes could be modified or eliminated to reduce delay.

BENEFITS

- Real-time automation finds high-value reroute options
- Time and flight efficiency
- Fuel savings
- Rapid feedback Interactive user interface for visualization and analysis
- Auto formatted for updates
- Wind-corrected flying time analysis
- Minimum-delay weather avoidance
- Minimum-delay conflict resolutions
- Integration of many factors relevant to airborne reroutes

technology solution

THE TECHNOLOGY

Every 12 seconds, the Dynamic Weather Route (DWR) automation system computes and analyzes trajectories for en-route flights. DWR first identifies flights that could save 5 or more flying minutes (wind-corrected) by flying direct to a downstream "return" fix on their current flight plan. Eligible return fixes are limited so as not to take flights too far off their current route or interfere with arrival routings near the destination airport. Using the direct route as a "reference route," DWR inserts up to two auxiliary waypoints as needed to find a minimum-delay reroute that avoids the weather and returns the flight to its planned route at the downstream fix. If a reroute is found that can save 5 minutes or more relative to the current flight plan, the flight is posted to a list displayed to the airline or FAA user. Auxiliary waypoints are defined using fix-radial-distance format, and a snap to nearby named fix option is available for today's voice-based communications. Users may also adjust the alert criteria, nominally set to 5 minutes, based on their workload and desired potential savings for their flights. A graphical user interface enables visualization of proposed routes on a traffic display and modification, if necessary, using point, click, and drag inputs. If needed, users can adjust the reroute parameters including the downstream return fix, any inserted auxiliary waypoints, and the maneuver start point. Reroute metrics, including flying time savings (or delay) relative to the current flight plan, proximity to current and forecast weather, downstream sector congestion, traffic conflicts, and conflicts with special use airspace are all updated dynamically as the user modifies a proposed route.

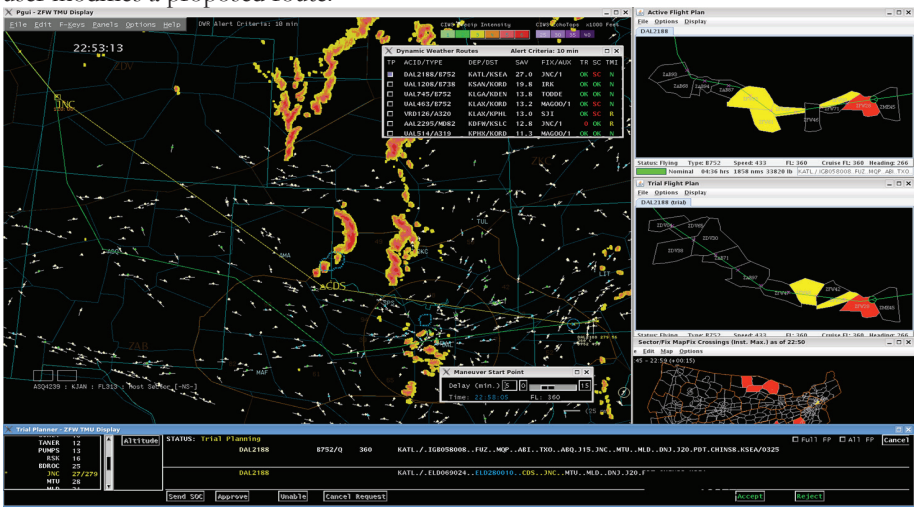

FIGURE 1 – Graphical user interface showing a trial Dynamic Weather Route (DWR)

APPLICATIONS

The technology has several potential applications:

- Air Traffic Management
- Airline Flight Dispatch Operations

PUBLICATIONS

U.S Patent 6,314,362

ARC-14359-1, ARC-16846-1

For more information go to:

http://www.aviationsystemsdivision.arc.nasa.gov/research/strategic/dwr.shtml

More Information

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