Day 2 (Wednesday, 26 October) 16:15 - 17:45, Hall C
Technical Session 9 Air Traffic Management 2

T9-1-A

Dynamic Airborne Delay Buffer Selection for Efficient Air Traffic Flow Management

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Air traffic flow management balances strategically demand and capacity by applying various initiatives such as ground delay programs and controlled enroute delays. The delay assigned to each flight is determined by the estimated time of arrival and the maximum allowed airborne delay (buffer) set to absorb uncertainties and minimize arrival runway throughput and capacity loss. Current operations often use a constant buffer regardless of the projected traffic. This research uses high-fidelity traffic simulations to investigate the effect of a dynamically-selected buffer optimizing the daily flow. Three metrics are introduced to measure the performance- ground delay, airborne delay and capacity loss. Simulations over 162 days of traffic show the potential for considerable savings using the proposed method. Furthermore, initial feasibility investigation of machine learning applied to the dynamic buffer selection problem is performed and it is concluded that despite a certain loss of optimality and estimation accuracy challenges, such techniques can be potentially used in real-life implementation.

T9-2-A

Non-CO_2 Market-Based Incentives Towards Robust Climate Optimal Aircraft Trajectories

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Over the past several years, the expansion of the aviation industry has created serious environmental challenges. By using aircraft trajectory optimization to reroute climate-sensitive areas, there is a potential to reduce non-CO2 climate effects, which account for approximately two-thirds of aviation radiative forcing. However, as the determination of such climate hotspots and aircraft trajectories requires meteorological variables obtained from weather forecasts, they are affected by uncertainty. In addition, there is no climate policy for aviation non-CO2 emissions in the current planned market-based instruments, implying that rerouting sensitive areas to climate increases the operational costs as the aircraft tends to fly longer routes. To this end, this study proposes the determination of robust aircraft trajectories with objectives ranging from cost optimal to climate optimal routing options, accounting for uncertain meteorological conditions. To motivate airliners to utilize climate optimal routing strategy, the obtained robust trajectories are then assessed in terms of considering charges for emitting in highly climate-sensitive regions. It is shown that by including the cost of climate impact in the operational cost, it is possible to find ”win-win” scenarios in which both the operational cost and the climate impact are reduced. The uncertainty analysis shows that as we increase the charges for emitting in climate hotspots, the uncertainty in operational cost increases, which needs to be considered while setting up market-based instruments for non-CO2 emissions. Such an increase in uncertainty is related to the effects of uncertain meteorological conditions, mainly relative humidity, on quantifying the non-CO2 climate effects.

T9-3-A

Research on CDO Trajectory Optimization Based on Cost Index using Gaussian Pseudospectral Method

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The shortest descent time and the lowest fuel consumption are the research focus on CDO trajectory opti-mization. Generally, the CDO trajectory optimization based on the best single parameter index has certain limi-tations. In this paper, a direct optimization method of CDO trajectory based on the comprehensive index of fuel consumption and total flight time is presented, namely the CDO trajectory segmentation optimization method based on cost index with Gaussian pseudospectral method. Theoretical analysis indicates that CDO tra-jectory optimization should mainly study the optimization of segment 1 and segment 2. The results of status analysis show that CDO trajectory optimization based on cost index is the optimum.