Proceedings of the Annual General Donald R. Keith Memorial Conference
West Point, New York, USA
May 4, 2017
A Regional Conference of the Society for Industrial and Systems Engineering

Design of a Flight Planning System to Optimize Contrail Generation

Caroline Abramson, Faie Almofeez, John Carroll, and Chris Margopoulos

George Mason University

Corresponding author's Email: cabrams4@gmu.edu, falmoof@gmu.edu, jcarro10@gmu.edu, cmargopo@gmu.edu

Author Note: The authors would like to acknowledge Dr. Lance Sherry for his guidance; Kevin Ray, Computer Scientist, MITRE; Lt. Jonathon Malycke, Pilot, U.S. Navy; and Carrie Merlin, Operations Manager, FAA.

Abstract: Contrails generated from flight produce a positive radiative forcing (RF) that heats Earth's atmosphere and contributes to global warming. A simulation was developed to test the feasibility of nine different cruising altitudes to minimize RF. The feasibility of these routes was determined using a trade-off between RF against CO_2 emissions, fuel burn, and flight duration. Results from this indicate that two of the nine flight paths lowered net RF values from the baseline by an average of 84%, with the most optimal route decreasing net RF by 94%. Furthermore, this justified efforts to reduce RF values for routes generated in real-time via Contoptimal, a decision support system. Specifically, a case study timestamped '2015-08-16 09:00' was analyzed and found a route that decreased net RF by 84% to 2.38 x 10^{-7} W/m^2. This information suggests that contrail mitigation strategies could be realistically used to reduce net RF due to aviation.

Keywords: Contrail, Radiative Forcing (RF), Ice Super Saturated Region (ISSR), Shortwave Radiative Forcing, Longwave Radiative Forcing, Albedo, Solar Zenith Angle

ISBN: 97819384960-9-7