

Using Aircraft Allocation and Fleet-Level Metrics to Analyze NASA's Subsonic Fixed Wing Emission Goals

*Abstract submitted for the Purdue University School of Aeronautics and Astronautics
2010 Research Symposium Series*

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NASA's Subsonic Fixed Wing (SFW) Project places high importance on reducing fuel burn, nitrogen oxide (NO_x) emissions and noise exposure in future generations of aircraft. However, the SFW goals only incorporate individual aircraft performance and do not account for how fleet-level emissions will change with the introduction of new, more efficient aircraft. Furthermore, the environmental and economical impact of a new aircraft is not only a function of the aircraft's performance but also how the airline uses the new aircraft with other existing aircraft. Evaluating the impact of new aircraft by measuring fuel burn, NO_x emissions, local noise exposure and direct operating costs at the fleet-level is done as an optimization problem through allocating existing aircraft models, several future aircraft models and various conceptual aircraft based on SFW goals over a network exceeding 150 airports. Examining these fleet-level metrics helps to determine if NASA's SFW goals are acceptable for meeting environmental goals established by various organizations, or whether more ambitious emission goals for future and current aircraft are needed. This approach shows that while meeting future aggressive technology development goals for individual aircraft, the total fleet emissions will continue to increase but emissions per passenger mile will decrease.

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