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A MODEL TO ESTIMATE CO_2 EMISSIONS FROM AIR TRAFFIC MOVEMENT IN AIRPORTS

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Abstract

A model to estimate CO_2 emissions from Air Traffic Movement in airports

The importance of airport emission inventory is more specific in the local context as it directly affects the local air quality. The assessment of emission from different phases of flight separately has not received sufficient attention. The specific gap addressed by this research is evaluating the CO_2 emission from different phases of aircraft within the Landing Take-off (LTO) cycle and the CO_2 emission from flight delays since they allow initiating more precise emission reduction strategies. Using currently available methodologies for assessing the emission from the LTO cycle in the Sri Lankan context has significant limitations. Industry-wide standards have been found to overestimate actual volumes specific to local conditions.

Reviewing current CO_2 emission calculation methods related to aeronautical activities within the LTO cycle, developing a model incorporating data specific to local conditions to estimate CO_2 emission and estimating additional CO_2 emission due to delay and validating the model are the main objectives of this study. The results of the suggested methodology for calculating CO_2 emission were compared with the industry standards and actual operational values. The CO_2 emission of different phases of flight and the CO_2 emission due to delays within the LTO was assessed using the suggested methodology.

The suggested methodology shows the unnecessary fuel burn and emissions according to current practices. The outcomes encourage stakeholders to initiate emission reduction methods. This study can be used as a reference when implementing those reduction methods. The suggested methodology can be applied in any airport which has data and technological constraints. The CO_2 emission from delays at the taxiing phase has a significant influence on local air quality. The taxiing out phase which is the highest contributor to delays within the LTO should be given the most priority when initiating emission reduction methods.

Keywords- CO_2 emission, LTO cycle, taxiing delays, APU, WTC

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List of Abbreviations

AASL	Airports and aviation services Ltd
ACI	Airport Council International
ACA	Airport Carbon Accreditation
ACERT	Airport Carbon and Emissions Reporting Tool
ACRP	Airport Cooperative Research Program
ADS-B	Automatic dependent surveillance-broadcast
AEDT	Aviation Environmental Design Tool
AEM	Advance Emission Model
APU	Auxiliary Power Unit
ATC	Air Traffic Control
BIA	Bandaranaike International Airport
CAEP	Committee on Aviation Environmental Protection
CCD	Climb, Cruise, and Descent
CORSIA	Carbon offsetting and reduction scheme for international aviation
DAMR	Daily Aircraft Movement Record
EASA	European Aviation Safety Agency
EDMS	Emissions and Dispersion Modeling System
EEA	European Environment Agency
EF	Emission Factor
EFPS	Electronic Flight Processing Strips
EIA	Environmental Impact Assessment
FDRs	Flight Data Recorders
GHGs	Greenhouse Gases
GPU	Ground Power Unit
GSE	Ground Support Equipment
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
IRENA	International Renewable Energy Agency
LTO	Landing Take-off
NDCs	Nationally determined contributions
SAGE	System for assessing aviation’s global emissions
SARPs	Standards and Recommended Practices
SDGs	Sustainable Development Goals
TIM	Time-In-Mode
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme

UNFCCC	United Nations Framework Convention on Climate Change
USEPA	United States Environmental Protection Agency
WHO	World Health Organization
WMO	World Meteorological Organization
WTC	Wake Turbulence Category

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