



## Séminaire conjoint CIRRELT / SCRO CIRRELT/CORS joint seminar

# Franklin Djeumou Fomeni

Lancaster University Management School, Lancaster, United Kingdom



## An Optimization Model for the Trajectory Based Operations TBO in Air Traffic Flow Management

**Abstract:** The forecasts of the European organization for the safety of air navigation (EUROCONTROL) suggest that the air traffic system in Europe is likely to record about 14.4 million flights in 2035, which will represent 1.5 times the level of traffic recorded in 2012. Furthermore, the corresponding number of passengers is also expected to double from 0.7 billion in 2012 to 1.4 billion passengers in 2035. Such a dramatic growth brings up many challenges that need to be tackled to ensure the sustainability and competitiveness of aviation in Europe. In response to these challenges, the European Air Traffic Management (ATM) Master Plan and the Single European Sky ATM Research (SESAR) Concept of Operations identify the trajectory based operations (TBO) concept as one of the cornerstones of the future ATM system. The TBO concept creates an environment for information sharing and collaborative decision making between the ATM stakeholders. This means that airspace users (AUs) share information about the intended 4D-trajectories of their flights, which are then negotiated with other stakeholders for a better use of the air traffic system capacity resources. It is no doubt that integrating optimization within this framework of information sharing and trajectories negotiation could only be more beneficial to the ATM system. Another important feature of the TBO concept is the consideration of the trade-offs existing between the needs and objectives of the individual AUs to optimize their operations (user optimum) and the objective to ensure sufficient predictability and optimum performance of the ATM network as a whole (system optimum), without compromising flights' safety. Hence, the development and implementation of the TBO concept require the development of optimization models and algorithms that will allow pertinent decision makers and stakeholders to examine the trade-offs between user and system optimum trajectories and to facilitate the definition of commonly accepted trajectories by all stakeholders. In this presentation, we will discuss a 4D-trajectory based mathematical model recently built to verify the viability of the TBO concept and which can also provide the basis for its implementation. This model is formulated as a multi-objective binary optimization problem which optimizes the efficiency of the ATM system under the TBO concept by assigning 4D-trajectories to flights based on the AUs' preferences and priorities, and the constraints of the ATM system. Some computational results will also be presented along with pertinent analyses.

JEUDI / THURSDAY

18 janvier 2018 /  
January 18, 2018  
10h30

**Nouvelle salle / New room 5441**

Pavillon André-Aisenstadt  
Université de Montréal

Ouvert à tous / Open to all

**Organisateur / Organizer  
Fabian Bastin**



UNIVERSITÉ  
LAVAL



McGill



UNIVERSITÉ  
Concordia  
UNIVERSITY



Le génie pour l'industrie

UQÀM

HEC MONTREAL



POLYTECHNIQUE  
MONTREAL

Université  
de Montréal