

# Correlations between airspace activities and air traffic controller activities

## Mots clés :

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- **Domaine scientifique principal**: Divers

## Résumé du projet de recherche (Langue 1)

One of the main objectives of Air Traffic Management (ATM) research is to safely and efficiently utilize ATM system resources in order to accommodate steadily growth in traffic demand. Advanced technologies applied in the ATM field and new concepts of operation proposed, have been improving the system capability as well as increasing its complexity. Human, as manager and decision-maker, have always been central in ATM system and will continue to constitute the core of future ATM system. Meanwhile, human cognitive complexity could still be the limiting factor of future ATM system. Determination of airspace capacity is prerequisite to realize traffic flow management programs, which aim at ensuring a safe and orderly air traffic flow. A popular definition of sector capacity is the maximum number of aircraft that can be handled in the sector during a given time period, without causing excessive controller workload. A conservative estimation of capacity can waste system resource and cause aircraft delay, whereas an aggressive capacity may increase cognitive complexity and result in situations that are beyond controller ability to manage safely. Due to interdependencies between airspace complexity, sector activities, and the air traffic controller activities, airspace capacity is difficult to predict and determine. Air Traffic Control authorities commonly use fast-time simulation techniques to estimate capacity. In some ATC centers capacity are even determined based on operational experience. Human resource and airspace resource are both essential for a safe, reliable and efficient operation of ATM system. The capacity that reflects both human cognitive constraints and physical system constraints is of great value. As the global ATM system shifts to modernization, including both the NextGen initiative led by U.S. and SESAR led by European Commission and EUROCONTROL, better models of capacity estimation are needed.

## Résumé du projet de recherche (Langue 2)

This research is to develop a novel method, from the approach of Complex Systems theories, to define and measure the "capacity" in terms of ATM resource availability. Measurement and Analysis of traffic flow characteristics and controller activities, to provide some relevant, measurable, and meaningful indicators to evaluate the intrinsic difficulty of the ATM tasks, as well as the methodologies to quantify these indicators impact on the system performance are involved in this research. Establishing the relationship between sector activities and controller activities is critical and challenging. Then a hybrid model will be constructed embedding a macroscopic level of controller cognition, to model the availability of system resources. Mechanisms that are used to balance the cognitive complexity and desired system performance will be described. We hope that the proposed model and mechanisms not only can estimate the available capacity, but also will provide an effective way to allocate traffic to traffic management.