

Fundamental Analysis of Airport Operation and Capacity in Disaster

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Abstract:

Based on the experience of the past disaster, especially the large-scale disasters, it is clear that rescue activities by aircrafts including helicopters is so important because of its high mobility. Such aircraft activities during the disaster are often conducted also in the local airports as a base. However, the airport capacity such as apron and runway of the local airport is usually limited since the facilities and human resources are developed only for responding the usual demand which is relatively lower in the local airports. When a large-scale disaster occur, the huge number of aircrafts can also use local airports for the rescue and then such local airports with lower capacity can face the unexpected congestion and confusion in the ground facilities and the surrounding airspace. At the time of the Great East Japan Earthquake in 2011, the restriction and the delay of the aircraft operation has occurred due to the capacity problems in local airports.

Therefore, when considering the aircraft activity during disasters, it is necessary to clarify the special needs for airport operation and capacity in disaster, however the existing researches regarding airport capacity is often targeting the large congested airports like hub airports (not small local airports). The evaluation methods for airport capacity that focuses on the "local airport under large-scale disaster" has not yet been clearly analyzed.

In this study, we firstly investigate the air traffic control rules and procedures especially in the local airports with limited facilities and equipment based on the literature reviews and also on the interview survey to the air traffic controllers who have actually managed the aircrafts including helicopters in the past recent disasters in Japan. The special operations of the airport and airspace (air routes configuration) conducted in the past disasters and planned in the future are also investigated and summarized.

Next the evaluation model of airport capacity in local airport during disaster are developed based on the result of the above-mentioned interview survey. In the developed model, the different separation rules between aircrafts according to the flight rule and type of the aircraft, layout and special operation of taxiway and apron operation can be considered that are major bottlenecks in the airport capacity in disaster. The model output and its validity are checked by comparing with the actual aircraft operation statistics in the Great East Japan Earthquake.

Finally, the impact the changes in traffic condition and airport facility usage such as the ratio of the fixed-wing aircraft (IFR) and helicopters (VFR) and special operation of the taxiway on airport capacity are analyzed by using the developed model, and discuss the issues when considering the operation of the airport in future large-scale disasters.