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A STUDY TO MAXIMIZE THE OPERATIONAL EFFICIENCY OF URBAN SPACE MOBILITY SPACEPORT

Abstract

In the distant future, there will be a space airport (spaceport) that travels to and from other planets just as we travel to and from other continents now, and even then, the same phenomenon of takeoff and landing saturation as today may occur. Urban Space Mobility (USM) will be a new meaning of transportation using vertical takeoff and landing (VTOL) spacecraft, although it is a distant future. USM has many advantages, such as traveling space easy, short transportation time from home to spaceport and spaceport to home, so it needs to establish itself as a transportation system that the public can easily access. To achieve this, stable USM services must be provided, and one of them is a way to efficiently plan the scheduling of VTOL spacecraft departing and arriving at a USM spaceport. Accordingly, the range of VTOL spacecraft that a spaceport can accommodate must be carefully analyzed, and the fact that the scheduling of VTOL spacecraft may operate differently than planned must also be taken into consideration. This study used VISSIM, a traffic simulation program, to build and operate a 1 Touchdown and Liftoff (TLOF), 2Gate type spaceport, and utilized the on-time rate that can apply uncertainty to the departure and arrival of VTOL spacecraft. This study determined that an operating spaceport at a dispatch interval that maximizes spaceport capacity and minimizes delay time is the most efficient operation plan.

Three cases were considered for proposing the most efficient operational approach for a spaceport: a case based on mathematical calculations, a case based on simulation without considering on-time rate, a case based on simulation considering on-time rate. If it is not possible to determine the efficient operation of a spaceport based on maximizing spaceport capacity and minimizing the delay time, it will be determined by focusing on spaceport capacity and delay time separately. As a result, the optimal interval for operating a spaceport was found to be 7 minutes, 8 minutes, or 9 minutes respectively, depending on the three cases which this study supposed. When using this to actually operate a spaceport, it was possible to predict spaceport capacity and delay time and suggest an operation plan. We hope that the assumptions made in this study and how the scenario was created will serve as a reference during USM commercialization.