

# Mission Support Control Center and Suborbital Spacecraft Simulator to support commercial space missions and customer activities

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## Abstract

The era of space travel, where anyone can go to space, is coming to life. As a result, the needs for spaceflights and zero-g flights are increasing, and what customers want to do in the cabin is also diversifying. It is important to have mission control centers and space craft simulators to rehearse their missions repeatedly before real flight, and support the passengers' missions during real-time operations from ground. Here, we introduce the roles of our mission support control center and suborbital spacecraft simulator to support passengers and Mission Commander (commercial mission support astronaut).

## Introduction

The Mission Commander (mission support astronaut) will board the spacecraft with space travellers and support their missions in the spacecraft, but it is possible that some tasks cannot be performed alone by themselves. In such cases, a mission-supporting control center and a mission director who supports the Mission Commander from the ground are required. Also, depending on the mission, there may be some cases that can be realized by real-time cooperation with the ground (in some cases, in both directions), where the presence of a Mission Support Control Center becomes more significant (for example, live relay to the ground, filming and recording support etc.). In addition, there may be missions in which two or more spacecraft (in some cases, spacecraft from different companies) work together. In this case, multiple mission control centers will be arranged. Therefore, many types of Mission Support Control Centers are required for realizing many types of missions. Although it is like the Payload Operation Center of each country in terms of the International Space Station, it may not support experiments but supports missions (customer's dreams, i.e. weddings, concerts, commercials, filming, etc.) performed by space travellers (passengers) and Mission Commander in the cabin. Because we need real-time support to satisfy various customer needs, ASTRAX has a Mission Support Control Center that can work in cooperation with a support Mission Commander.

## Mission Support Control Center and Spacecraft Simulator

ASTRAX has a spacecraft simulator of World View Enterprises "Voyager" for space mission training and rehearsal for space travellers, which is also used for training of Mission Commanders and Space Flight Attendants (SFAs). In order to support Japanese space travellers aboard a private spacecraft, a spacecraft simulator and Mission Support Control Center will be established in Japan, where our customers reside, rather than in the United States where most of spaceships are operated. We rehearse repeatedly starting about one year before the actual missions take place. Not only space travellers, but the supporting personnel on the ground as well as aboard the spacecraft must train and rehearse together. In some cases, family members may also participate in facility tours and rehearsals, similar to NASA's family support. Therefore, even without going to the United States where the spaceship company is located, our customers can rehearse as many times as they like in Japan, and train as a team. Finally, the mission and mission support are performed by switching from the spacecraft simulator to the actual spacecraft. As a result, during actual space flight, our customers will be able to carry out more fulfilling missions and increase the success rate of missions in production. In particular, the suborbital spacecraft flights in the early days have a short time in space, therefore accurate rehearsal to achieve missions within a limited time is very important. Furthermore, ASTRAX plans to prepare a simulator for every spacecraft so that the mode of the Mission Support Control Center can be switched for each spacecraft. In this way, mission support control, which can handle multiple spacecraft models, only exists at ASTRAX.

## Conclusions

In this paper we described the necessity of the world's first private commercial mission support control center, which is necessary to realize the dreams of space travellers and commercial missions that are carried out on a private spacecraft for the space-travelling era. In addition to the Mission Support Control Centers, the accompanying facilities and services were also introduced. We look forward to seeing the results of these facilities and services and the data obtained to be compiled in the future and to help to build a mission support control center that can provide higher quality services.