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## **IMPLICATIONS OF PASSENGER ANXIETY AND MOTION SICKNESS FOR COMMERCIAL SUBORBITAL SPACEFLIGHT**

*RÉPERCUSSIONS DE L'ANXIÉTÉ DES PASSAGERS ET DE LA MALADIE DES MOUVEMENTS DANS  
LE SPACEFLIGHT SUBORBITAL COMMERCIAL*

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**Introduction:** A concern that faces operators of commercial human spaceflight is whether anxiety or panic during a flight has the potential to detract from the flight experience, cause disruption during flight, or put the mission, vehicle, or crew at risk. We designed this study to evaluate layperson responses to centrifuge-simulated spaceflight. Our goals were to identify predictive indicators for anxiety in commercial spaceflight participants and develop methods to prevent mission-impacting events.

**Methods:** Volunteers participated in centrifuge training programs of 2-7 centrifuge runs over one-half to 2 days, depending on the cohort group to which they were assigned. Each cohort protocol culminated in two simulated suborbital spaceflights. Suborbital spaceflight profiles included combined +Gx and +Gz (peak +6.0Gx and +4.0Gz). Two cohorts received dedicated anxiety-mitigation training. All cohorts completed psychological questionnaires which were evaluated for any predisposing factors that might correlate with poor tolerance. Test monitors observed subjects for signs of anxiety and motion sickness during their experience.

**Results:** Of the total of 148 subjects participating in centrifuge trials, test monitors identified 29 subjects as concerning for anxiety. Overall, 10 subjects opted out of one or more run or limited their G-exposure. Training length was not associated with subjects withdrawing from participation. Of note is that motion sickness was significantly associated with non-completion of the centrifuge runs. Various means were used to obtain feedback from subjects. Private, written format was the most likely method to receive reports of anxiety-related symptoms.

**Discussion:** It is unknown whether the correlation between motion sickness and anxiety will hold true in commercial spaceflight. Close observation and intervention during training for an upcoming space flight will be critical to lessening the risks from inflight anxiety. Written, private reporting may be a means of identifying issues during training and before a space flight. Enabling SFPs to develop a strong trust relationship with training and medical personnel will likely improve the ability to identify participants at risk before anxiety becomes detrimental to the flight experience.