

## CHALLENGES ABOUT DECISION MAKING PROCESS AND HUMAN FACTORS IN COMMERCIAL SPACE OPERATIONS – A PILOT’S PERSPECTIVE

*LES DÉFIS CONCERNANT LE PROCESSUS DE DÉCISION ET LES FACTEURS HUMAINS DANS LES OPÉRATIONS SPATIALES COMMERCIALES - PERSPECTIVE D'UN PILOTE*

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Introduction: Commercial space operations and activities have emerged consistently and successfully in the last decade all over the world. Human access to space with commercial vehicles will be a reality in 2018, thanks to the efforts of companies like Boeing, Space-X, Blue Origin and Virgin Galactic. However, the level of difficulty to master such an incredible feat is at least one or two orders of magnitude higher than launching unmanned payloads into space. Independently from the technology level and readiness available today, humans will remain the weak-link element to successfully foster commercial space initiatives.

Background: Traditionally, the limits of human performance will be tested within two primary areas: 1) Decision making process: 55 years of human space exploration have demonstrated that poor decisions are at the core of avoidable space tragedies, such as the Apollo 1 fire accident in 1967, the loss of the Space Shuttles Challenger in 1986 and Columbia in 2003. Root cause in all these cases was complacency with a poor decision process, substantiated by previous positive outcomes from risk scenarios not well understood. 2) Mission execution: The loss of SpaceShipTwo VSS Enterprise during a flight test in October 2014 highlighted once again the performance limits of the human mind and how “human factors” play an essential role in cockpit design and operations.

A study case will be analyzed for the SpaceShipTwo accident, with particularly emphasis on how human factors and performance have been considered in the redesign and operations of the vehicle.

Summary: Other than facing many technical challenges, human commercial exploration will need to address the multitude of risks humans trigger when directly involved in the operations of spacecraft. A methodical and consistent risk-assessment approach will allow for fully developments in commercial space exploration, allowing humanity to become a truly spacefaring civilization.