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A FEASIBILITY ANALYSIS OF DREAM CHASER LANDING IN AN AIRPORT IN NEPAL

Abstract

The United Nations Office for Outer Space Affairs (UNOOSA) and the Sierra Nevada Corporation (SNC) signed an agreement to use the Dream Chaser Space Orbital Mission for the promotion of science technology in UN member states, developing countries in particular. Furthermore, the SNC has given its intent to land the Dream Chaser Space Plane in a suitable civilian airport anywhere in the world. Nepal Astronomical Society (NASO) presented its interest to take part in such a mission during the call for interest, in UNOOSA, Vienna, 2019. Since then, NASO has set the vision to conduct a feasibility analysis on landing the Dream Chaser in an airport in Nepal. As an active non-profit organization facilitating the promotion of space technologies and applications in support of the Sustainable Development Goals (SDGs), also the motto of UNOOSA and the Dream Chaser Mission, NASO has conducted an engineering project for students of different universities to analyze the feasibility of landing the Space Plane in Nepal. A Model-Based Systems Engineering (MBSE) approach is used for the stakeholder's analysis, requirements elicitation, functional analysis, and design synthesis. Global Navigation Satellite Systems (GNSS) is identified as a key technology that has the potential to enable navigation and surveillance services for the Dream Chaser approach and landing. The monitoring and control procedures (analogy to the Air Traffic Control (ATM)) for an effective terminal area energy management of the Dream Chaser are designed based on the functional analysis. An automatic downlink of the flight critical parameters and the continuous on-board monitoring and alerting mechanism of the trajectory are the main functions that drive the design synthesis. An interaction of the Mission Control Center (MCC) and the Nepalese ATM infrastructure is analyzed from the perspective of ATM-STM interface. Automatic Dependent Surveillance-Broadcast (ADSB), Required Navigation Performances (RNP), Satellite Based Augmentation Services (SBAS), and Ground-Based Augmentation System (GBAS) are the GNSS based technologies that need to be implemented in the Nepalese airspace to support the landing of Dream Chaser Space Plane and future sub-orbital flights with horizontal landing capability. The outcome of the project is expected to contribute towards broadening the aerospace curriculum in Nepalese universities. In addition, the aviation and space industries which are in an early infant stage in Nepal are expected to benefit from the skilled engineers working on the project.