Paper ID: 50686
oral
student

IAF SPACE SYSTEMS SYMPOSIUM (D1)
Cooperative and Robotic Space Systems (6)

Author: Mr. Victor Hertel
IRS, University of Stuttgart, Germany, victor.hertel@web.de

Dr. Rene Laufer
Baylor University / University of Cape Town, United States, rene.laufer@me.com
Prof.Dr. Georg Herdrich
Institute of Space Systems, Germany, herdrich@irs.uni-stuttgart.de
Dr. Ralf Srama
IRS, University of Stuttgart, Germany, srama@irs.uni-stuttgart.de
Prof. Jens Eickhoff
Airbus DS GmbH, Germany, jens.eickhoff@airbus.com
Dr. Peter Martinez
Secure World Foundation, United States, pmartinez@swfound.org

HOSTED PAYLOAD DESIGN AND SYSTEMS ENGINEERING FOR THE UN-SNC DREAM CHASER MISSION COLLABORATIVELY DEVELOPED BY INTERNATIONAL ACADEMIA AND INDUSTRY

Abstract

As part of a partnership between the United Nations Office for Outer Space Affairs and Sierra Nevada Corporation (SNC), hosted payload spaceflight opportunities on-board of the SNC's Dream Chaser spacecraft are made available in particular to developing and emerging countries.

Thus, the University of Cape Town, the University of Stuttgart, Airbus DS Germany and additional partners collaborate on a jointly developed payload to meet Sustainable Development Goals by the United Nations (UN) in the field of Quality Education, Industry, Innovation and Partnerships. By conducting research in remote sensing and in-situ measurement topics regarding disaster mitigation, atmospheric phenomena and space environment investigations, as well as technology demonstration, a compact assembly set with multiple sensor setups, an On-Board Computer (OBC) and further necessary architecture is proposed. Hence, special demands on space systems engineering is required due to specific requirements of multiple different subsystems to guarantee the functionality of the system itself and to enable promising research conditions.

Applying the methods of a space systems engineering approach, a detailed preliminary engineering design solution of the payload is identified and derived from an initial mission analysis and mission definition. This comprises the elaboration of mission objectives; identification, compilation and assessment of broad and detailed system requirements, constraints and additional boundary conditions; as well as subsystem and component requirements, engineering design and system/component selection for a low cost commercial-off-the-shelf solution for the UN-SNC Dream Chaser orbital mission. A modular setup is developed for an easy adaption of the payload for additional future flight opportunities.

The mission aims to strengthen international collaboration and to foster education and research. The scientific experiments of the payload are to verify and to evaluate the functional efficiency of a sub-scaled intake demonstrator for Atmosphere Breathing Electrical Propulsion, to determine and to record sprite-type lightning phenomena from space and to investigate measurements of cosmic dust and debris environment in Very Low Earth Orbit. Within this framework, the avionics core based on the Flexible Leo Platform 2 OBC architecture developed by Airbus DS Germany is to be verified for hosted payload systems.

In this paper, the space systems engineering process of this phase 0/Pre-A study is outlined including relevant methods and solutions as well as the preliminary design of the collaborative hosted payload, to later evolve into a stand-alone satellite mission.