

IAF SPACE OPERATIONS SYMPOSIUM (B6)
Ground Operations - Systems and Solutions (1)

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A PROPOSAL AN INNOVATIVE FRAMEWORK FOR THE CONCEPTION OF THE GROUND
SEGMENT OF SPACE SYSTEMS.

Abstract

An increasing number of space missions - which include the classes of Scientific, Earth Observation, Geostationary, and Educational - drives the search for solutions lined up between space and the ground segments. Space agencies, such as: CNES, DLR, ESA, ESOC, INPE, JAXA and NASA, stimulate initiatives and the development of projects aimed at efficiency and cost reduction of missions. The classes of satellites and spacecraft have requirements that, classically, determine the design and development of the mission; these requirements currently cover definitions, such as: communication protocols, uplink and downlink rates, onboard processing and remote reconfiguration of service and payload modules, and direct new modes (models) of controlling and operations that are requested from the Ground Segment. Among the activities for designing systemic solutions to attend a space mission, the Ground Segment has a significant number of questions to be answered in order to meet cost and operability requirements and reach a successful mission. From the perspective of the Ground Segment, it is essential to demonstrate the innovation of concepts that are required of systems due to the increase in volume and kind of data (Big Data), and their processes, for example, Machine Learning and Artificial Intelligence; and also of the utilization of communication protocols, and onboard processing. These concepts include the development of projects and the operation of missions and must be implemented according to the guidelines of the European Cooperation for Space Standardization (ECSS), in the area of systems engineering, as well as meeting the recommendations of the Consultative Committee for Space Data Systems (CCSDS), such as: Management Services for Data Transfer, Space Link Extension (SLE) Protocol Services for Cross Support and Interoperability. This paper presents a proposal an innovative Framework for Conception of the Ground Segment of Space Systems that allows support to the design of space systems solutions, in the perspective of the Ground Segment, improving and standardizing the procedures to systems engineering, establishing methodologies for the optimization of development, management, and implementation of the Ground Segment projects and their interaction with the Space Segment. The proposed Framework will allow the proposition, the conception and the specification of requirements for the Ground Segment that should collaborate to define requirements for the architecture of space systems and to ensure the fulfillment of mission objectives with efficiency and cost reduction. The possible contributions of the framework and suggestions for future works are also presented in the paper.