SPACE OPERATIONS SYMPOSIUM (B6)
New Operations Concepts (2)

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THE EUROPEAN DATA RELAY SYSTEM (EDRS): OPERATIONAL CHALLENGES

Abstract

This paper will illustrate the challenges and preliminary solutions in operating the EDRS constellation.

EDRS will include two communication payloads hosted on a dedicated spacecraft and as piggy-back on a commercial satellite. The two satellites will be positioned in geosynchronous orbit to provide near-global coverage for satellites in low earth orbit (LEO). EDRS is designed to reduce time delays in the transmission of large amounts of data and to allow faster access for end users. This is achieved by using an optical Laser Communication Terminal (LCT) for the link between the LEO and the EDRS payload and a Ka-band link between the EDRS payload and the ground. The latter will be established via three dedicated feeder link ground stations in Europe from where the data is distributed to the users. The users may also use their own ground stations directly receiving the data.

By using EDRS extended capabilities for TM/TC operations will be possible with LEO satellites. This will enable short-time changes to the payload timeline and better reactions to anomalies while optimizing the number of necessary ground stations.

DLR with its German Space Operations Center (GSOC) plays a major role in EDRS operations. This role includes design, development and integration of ground infrastructure and operations of the satellites and ground stations.

The EDRS concept of operations differs from the conventional communication satellites. Two challenging new technologies will be integrated in order to provide faster data turnaround times and downlink capabilities of up to 600 Mbit/s.

1. Laser-Optical Inter-satellite link: The large distance between a satellite in GEO and one in LEO makes the pointing of both LCT very difficult. Good attitude information and control of both satellites is required. A good quality orbit determination is vital for good laser acquisition times and both payloads need to keep accurately track of their fast moving counterparts. Thus, development of the operations concept requires consideration of the interfaces and coordination of operations with the LEO satellites, which are operated by different control centres.

2. Ka-band up- and downlink: The small wavelength of the Ka-band signal leads to significant atmospheric and rain attenuation. Besides that, due to the sensibility of Ka-band technology the requirements for ground stations (pointing accuracy, higher doppler shifts and high data rates) are very challenging compared to standard S/X/Ku-band ground stations. Careful consideration has to be taken designing the ground stations, during link establishment and station operations.