

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

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ENVISAT OPERATIONS AUTOMATION SYSTEM - ENHANCING MONITORING AND CONTROL  
OF A LEO SPACECRAFT

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**Abstract**

Envisat is the largest LEO spacecraft of the European Space Agency (ESA) operated since March 2002 from ESOC, the Agency's operations centre in Darmstadt, Germany, Routine operations are conducted via the Kiruna (Sweden) and the Svalbard (Norway) ground stations which allow 10-12 minutes of telecommanding for up to 12 of the 14.3 orbits each day. The routine operations include uplink of the platform and payload commands according to a pre-defined strategy with a one day periodicity. In order to allow the spacecraft controller to monitor additional LEO spacecrafts, the routine monitor and control operations will be handled by a novel Operations Automation System (OAS) as from 2010. Other advantages are an immediate, automated reaction to known payload anomalies and optimisation of the timing of operational activities. The transition will be gradual to allow the controller team to adapt to the new system. Dedicated automation procedures are required to be human readable and to match as closely as possible those written for human operators.

Commands and command sequences are scheduled by the OAS and are serviced immediately by the Envisat Mission Control System (MCS), which applies prior to uplink the same commanding checks as if they were sent by the human operator. Telemetry and special Events (e.g. parameters out of limit reported by spacecraft systems) generated by the MCS are delivered by the MCS upon request from OAS. Events can be used to trigger Automated Procedures for autonomous or human controlled, interactive execution.

The Flight Control Procedures used by the Spacecraft Controller to perform the routine pass operations have been converted to Automated Procedures using an off-line system, separate from the operational systems. Testing is performed with the Envisat simulator which is connected to a dedicated simulation environment, independent but representative of the live system. Mechanisms have been put in place to ensure that accidental connection to the live system is not possible.

This paper describes the specific constraints imposed by LEO spacecraft operations on an operations automation system and details the benefits and disadvantages of automating spacecraft operations.