IAF SPACE OPERATIONS SYMPOSIUM (B6)
Mission Operations, Validation, Simulation and Training (3)

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CHALLENGES IN THE DEFINITION, VALIDATION AND SIMULATION OF THE GROUND OPERATIONS OF THE EXOMARS 2020 ROVER SURFACE MISSION AT THE ROVER OPERATIONS CONTROL CENTRE (ROCC)

Abstract

The Rover Operations Control Centre (ROCC), located in Turin at ALTEC premises, will be the place where the Mars surface operations of the Exomars Rover will be planned, monitored, commanded and controlled. The ROCC facilities are currently under finalization, in order to be operative from July 2020, when a Proton rocket will insert the ExoMars spacecraft in a eight month long interplanetary cruise, marking the beginning of an ambitious, ESA-led, scientific and robotic exploration mission. This paper explains some design choices and the ROCC's state of the art, highlighting the main challenges encountered in the definition and validation of the Ground Operations.

Earth-Mars communications, performed through data relay Orbiters, have imposed specific time constraints in the operations concept definition. Ground processes have to be efficient and optimized such

that enough "ground time" is left for the teams to assess the data from the Rover and plan coherently the upcoming sols.

The workload during the mission will vary significantly, depending on the mission phase and the associated required data analysis and operations control. Daily tactical planning activities can be frenetic and intense, followed by other less time demanding periods devoted to data assessments and high level long term strategic planning. The ground tools designed for the ROCC are designed to be flexible enough to cope with highly variable workload. Furthermore, they need to guarantee user-friendly interfaces and accessibility also to remote users from their home institutions. ROCC planning tools, in particular, have been conceived to be capable to process not only "time driven" inputs associated to a pre-defined mission timeline, as performed during standard missions, but also "event based" activities which require a quick assessment and re-plan, more appropriate to cope with the operational needs of a remote robotic platform.

Operations validation and simulations campaign will be a key point in ensuring that the designed processes can fit in the operations cycle. Training instructors will have to handle a vast and heterogeneous group of people, making them capable to work together, learning the tools, procedures and processes. People are going to be trained to react to unexpected contingency situations. A dedicated facility within the ROCC, the Mars Terrain Simulator will host a Ground Test Model of the Rover, representative of the Flight Model design, offering the capability to rehearse the same operations to be executed on the Mars surface, in an environment designed to reproduce a terrain with Mars-like characteristics.