

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

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INFORMATION VISUALIZATION FOR SUPPORTING SHORT-TERM AND LONG-TERM
SITUATION AWARENESS IN GROUND SEGMENTS MONITORING: APPLICATION TO SWOT
COMMAND AND CONTROL OPERATIONS**Abstract**

As the nature and complexity of ground segment operations increase, operators' work is required to evolve in nature. Mostly manual, interactive operations performed by one single operator on a single satellite have been partially automated to allow a few operators to monitor and manage a constellation of satellites. This increase in automation transformed the main controllers' tasks evolve from the monitoring of satellites' passes to the high-level supervision of flight phases and operations scheduling. The CNES-funded project called STRECCC (STudy and Recommendations for the Ergonomics of Command and Control Centres) studies ground segment interactive applications, their user interfaces and how the controllers interact with them, to identify solutions ensuring the usability of future, more automated command and control centres. In parallel to these evolutions of the nature of operations, the skills, knowledge and expertise of operators are also evolving. Their profile evolves being less technical and with less knowledge in the underlying systems or telecommunications. The STRECCC project addresses these evolutions by designing advanced user interfaces improving performance and situation awareness of the operator. The designs deeply exploit knowledge and research contributions in the area of information visualization and Human-Computer Interaction. The proposed interactive system enhances operations by improving the perception and understanding of numerous information while performing different types of tasks (e.g. identifying a disconnected antenna, comparing the processing state of two telecommands...). Beyond, it improves the situation awareness of the operator by providing a long-term (a full week) perspective on recent-past and future operations. In the final article, we will present the results of the project. First, the set of observations and contextual inquiries performed with SWOT (Surface Water and Ocean Topography) operators. Second, we will present the techniques we applied exhaustively to describe controllers' tasks. Third, based on the analysis of the complexity of those tasks and on the existing ground segment operator interface, we will present prototypes embedding infovis knowledge and new interactions. These prototypes improve operations at different levels: short-term monitoring of the progress of telecommand files, performant interactions for setting the ground segment interactive system depending on flight phases and long-term monitoring of operations over a week. While these improvements have been performed on

SWOT ground segment (operated by CNES), we will show that they are generic enough to apply to other ones.