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THE ESA GROUND SEGMENT FOR HUMAN EXPLORATION – MIGRATION TO A  
MULTI-MISSION ENVIRONMENT

**Abstract**

Preparing the support of ESA's ISS Columbus laboratory, an engineering team at the German Space Operations Center GSOC designed the Columbus Control-Center and the ESA Ground Segment. This Interconnection Ground Subnet (IGS) was designed to connect all European sites involved in the Columbus, ATV and ISS operations with the international partner facilities at Houston, Huntsville, and Moscow.

During the ATV program this Ground Segment served two missions, ATV and Columbus. Whereby the ATV flights marked the peak loads. Since after ATV this Ground Segment was solely supporting the Columbus utilization, optimized for (the one) Human Space Flight mission.

Since its inauguration the ground segment underwent different iterations. ESA's participation in the Gateway program, expands human missions. The close cooperation of EAC and GSOC/Col-CC introduces a third ground-based mission, the LUNA Analog Facility at Cologne.

The changing focus within governmental space agencies from LEO to planetary operations and the transition of LEO operations to private space service providers will impact space mission control. During the last two decades most ESA ISS missions had a duration of about 180 days. In the nearer future, as already observed with the two ESA project astronaut missions, the number of short duration ISS missions will increase, where their duration will decrease to about 10 days. The same mission duration is planned for Gateway missions. Equally to moving from a one mission scenario to a three-mission scenario as described before we will observe here a shift to a three-fold scenario as well. ISS long-term mission, ISS short-term mission and Gateway short-term mission.

This paper will elaborate on this extension from one to three missions and duration scenarios. The evolution of the control centers evolving into HECC (Human Exploration Control Centers). The required implementation of new systems dedicated to Gateway or LUNA and the extension of the capacity of existing services. Secure data segregation, different access and security levels will be required. The impact that this extension will have on the ground segment with more diverse requirements for ground service personal, physical infrastructure and operational concepts. Not only considering the pure technical level, but that the operational set-up must be defined to plan and support missions and activities in parallel.