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COLUMBUS OPERATION AS BASIS FOR FUTURE EXPLORATION

Abstract

In 2017 some major milestones have been set for the international human spaceflight after ISS. The ISS International Partners focus on a manned space station around the Moon as the next step for human exploration of space. It would offer a lot of new challenges and opportunities compared to the well-known ISS in Low Earth Orbit:

- The new station will be outside the radiation belt of the Earth offering a radiation environment close to deep space valuable both for system validation and new experiments
- Larger distance to Earth and more complex logistic will offer a proving ground for future mission
- Testing of new communication means and short-term communication outages give way to new crew-ground interaction It could be used as gateway for manned lunar excursion with additional challenges

Col-CC will use the gained experience in 10 years of Columbus operations to study new ways of interaction with the crew, new communication ways and analyse new ground and on-board software solution suitable for the new setup:

- ATHMoS: New tool for supporting flight controller in analysing onboard systems on signatures of potential future failures
- Implement, use and analyse Delay Tolerant Networks and tools which allow communications between space and ground with minimum communication breaks
- Master-Timeline with MMI (Man-Machine-Interface): Preconfigured but flexible, automated on-board command system assisting the astronauts in reconfiguration and switching on/off onboard subsystems and experiments

The new opportunities and challenges of operating a manned station in the vicinity of the moon is compared to the “standard” operations of Columbus and ISS in near Earth orbit and to any potential future LEO station, e.g. the DLR proposal “Orbital Hub” for a smaller Post-ISS Low-Earth Orbit station. This will include a discussion of necessary changes in operations for this new phase of space exploration.

The paper will present results of the first studies performed in-house Col-CC/GSOC and will provide an outlook on the planned next steps towards deep space operations and exploration.